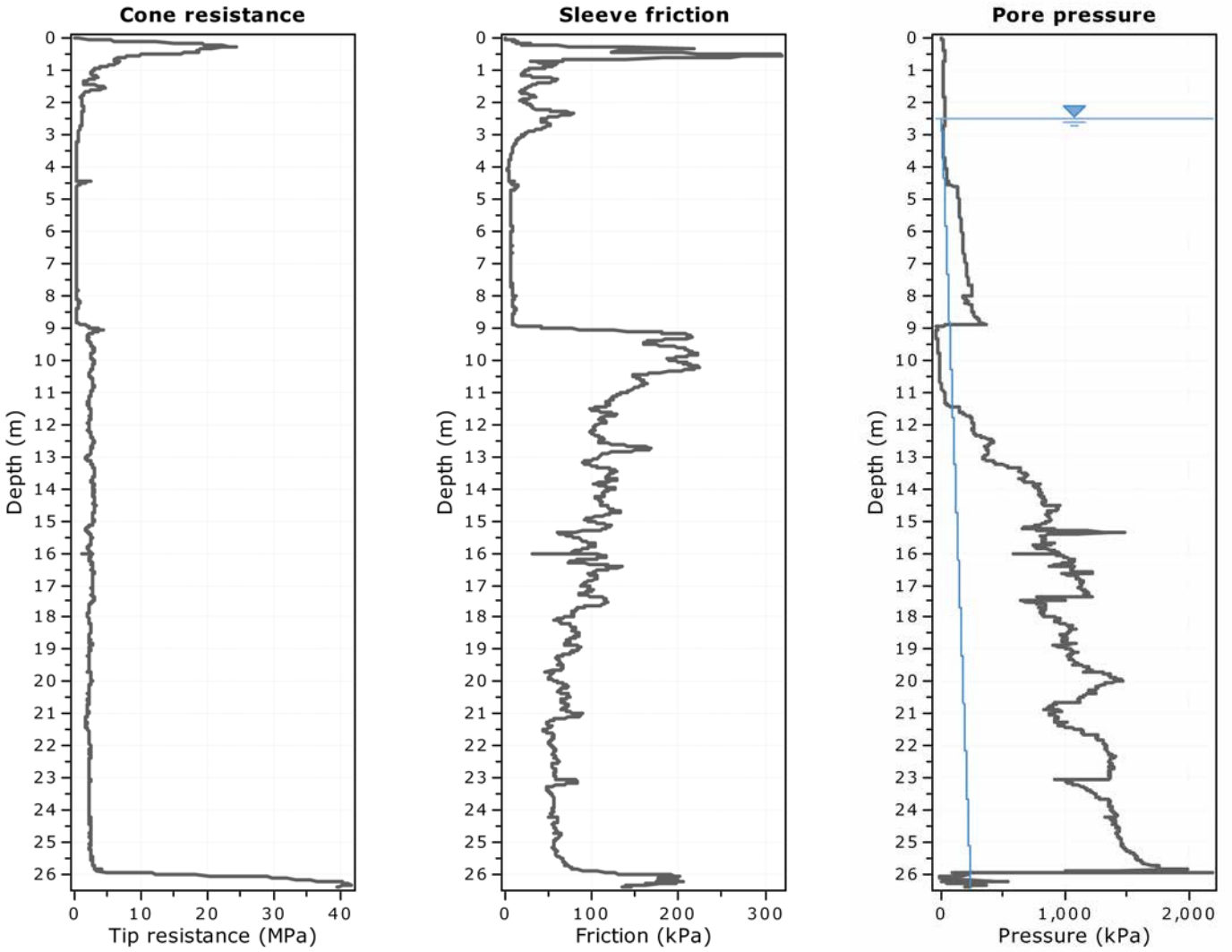
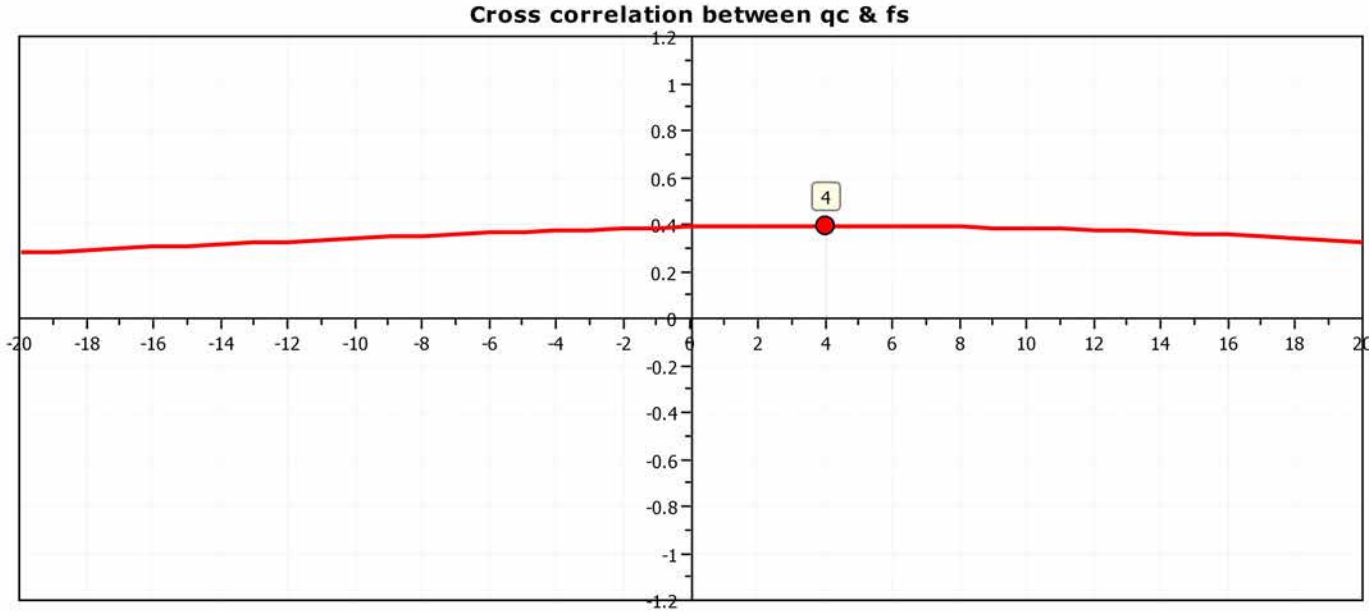
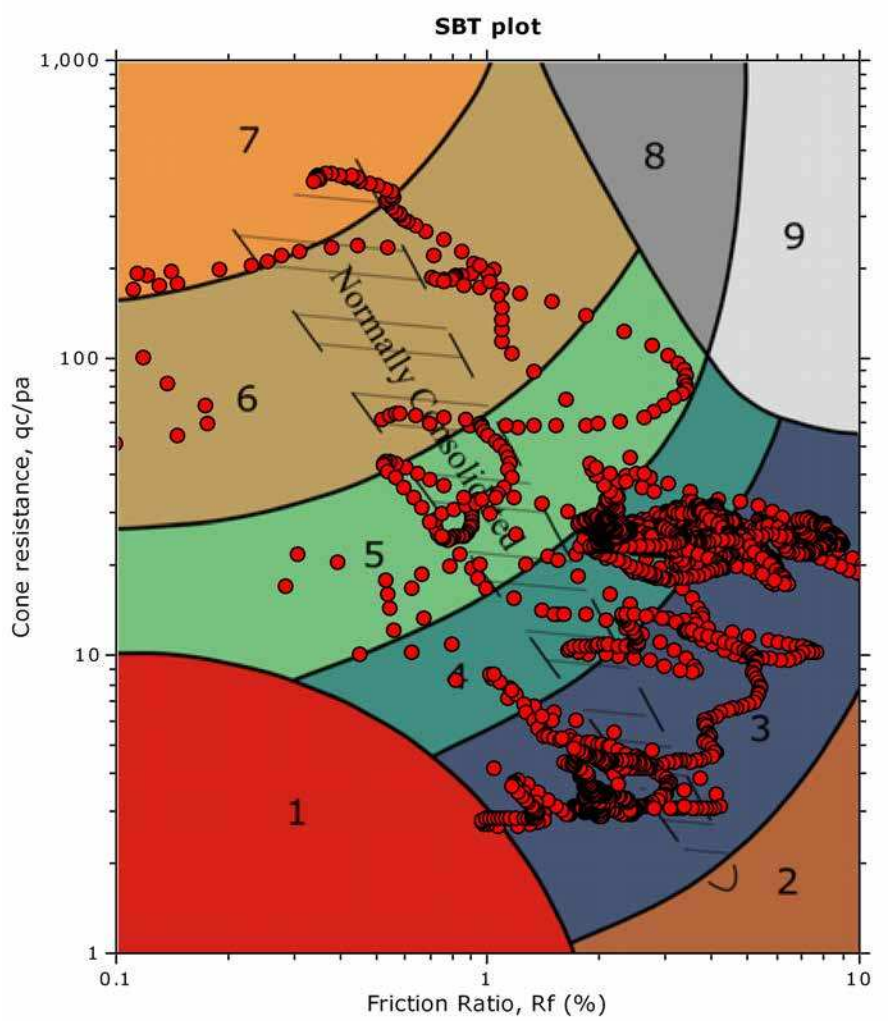
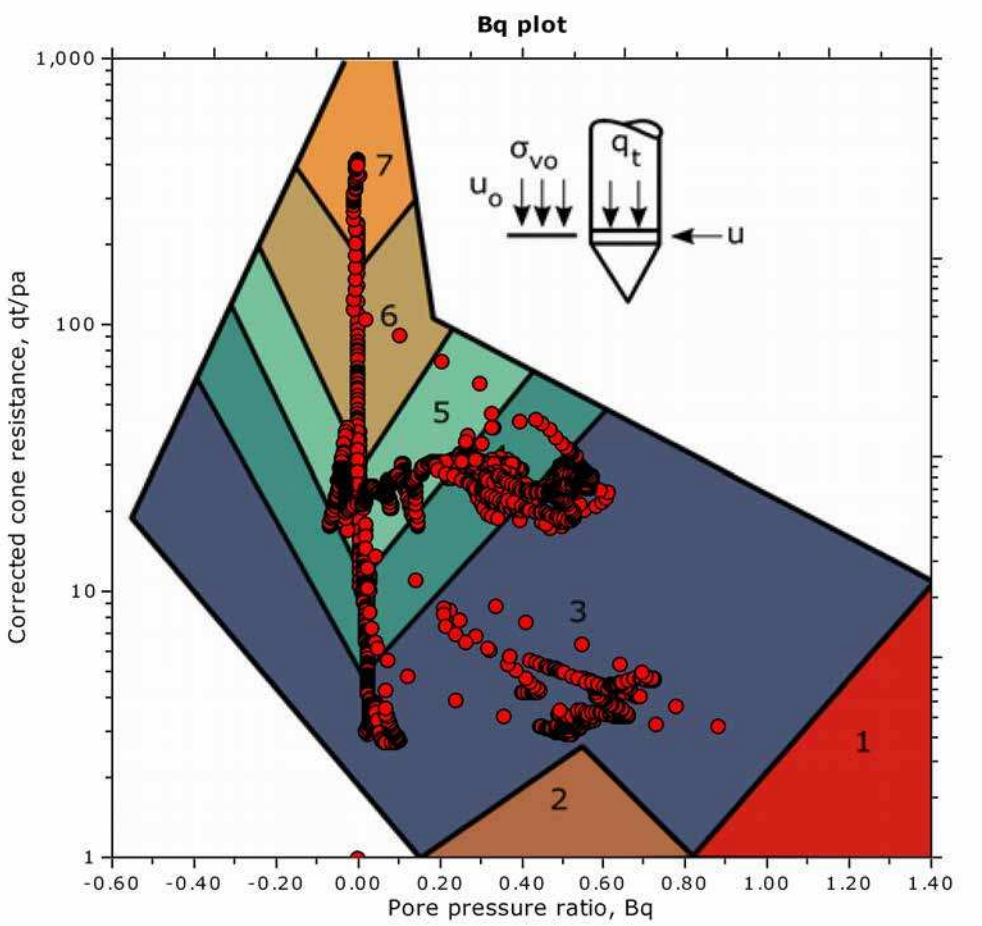



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

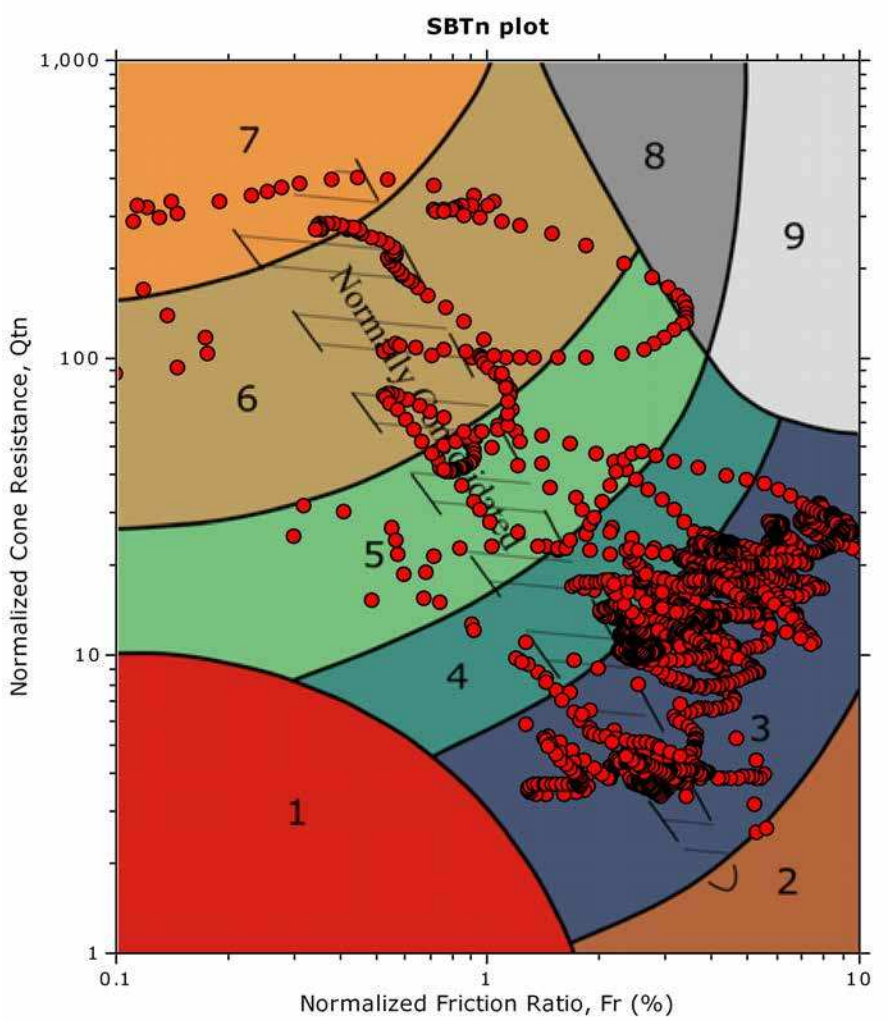


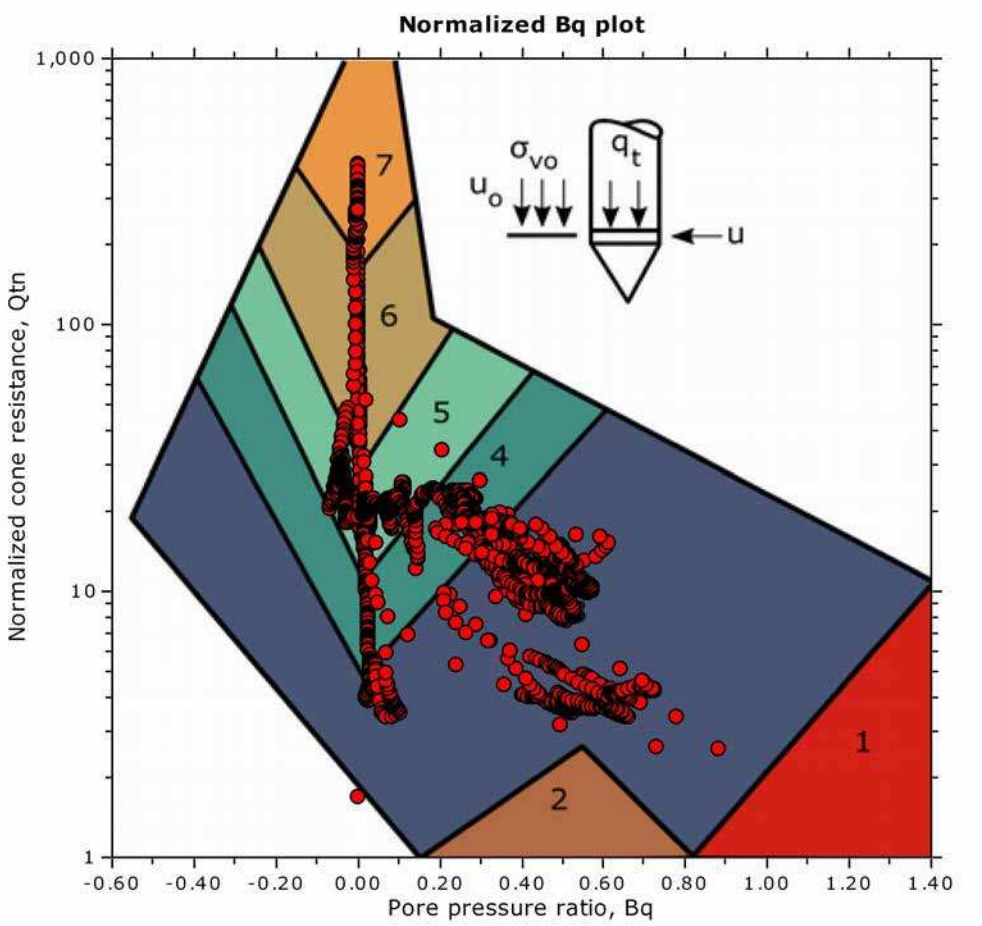




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

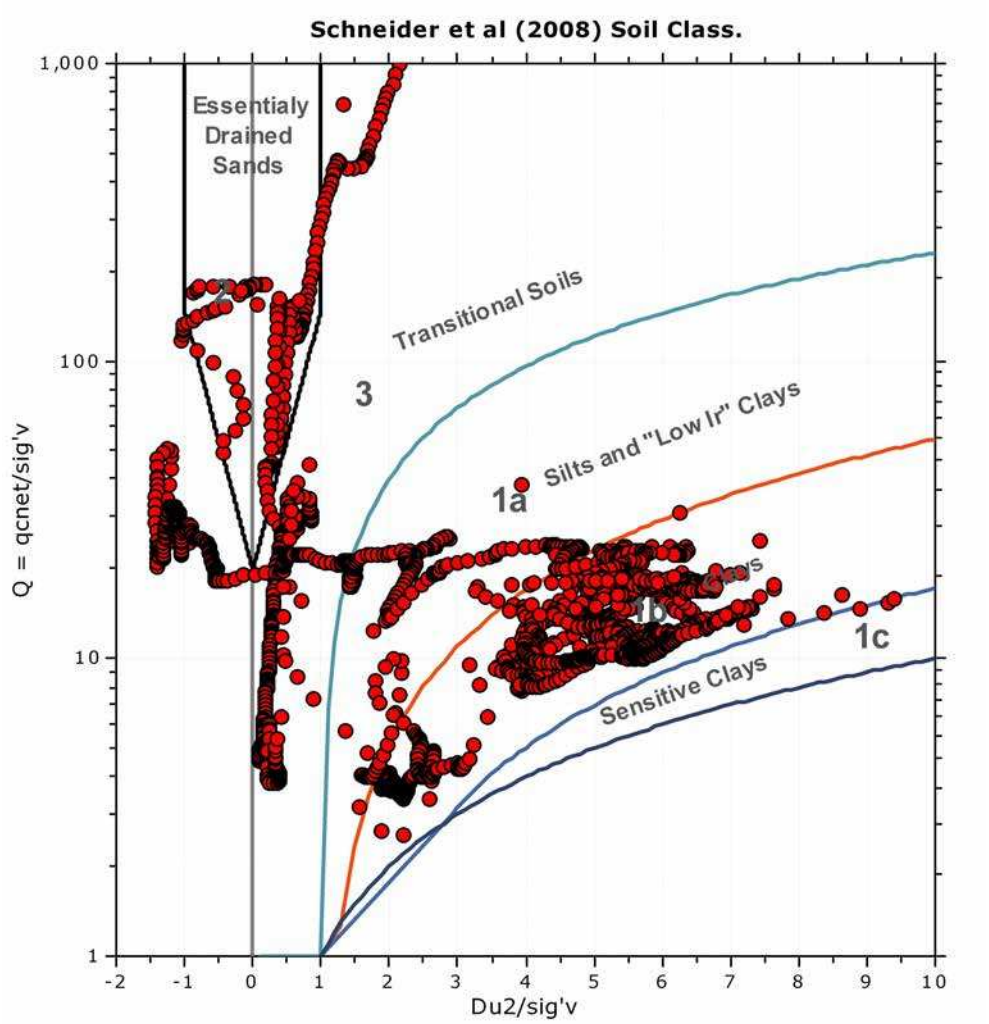


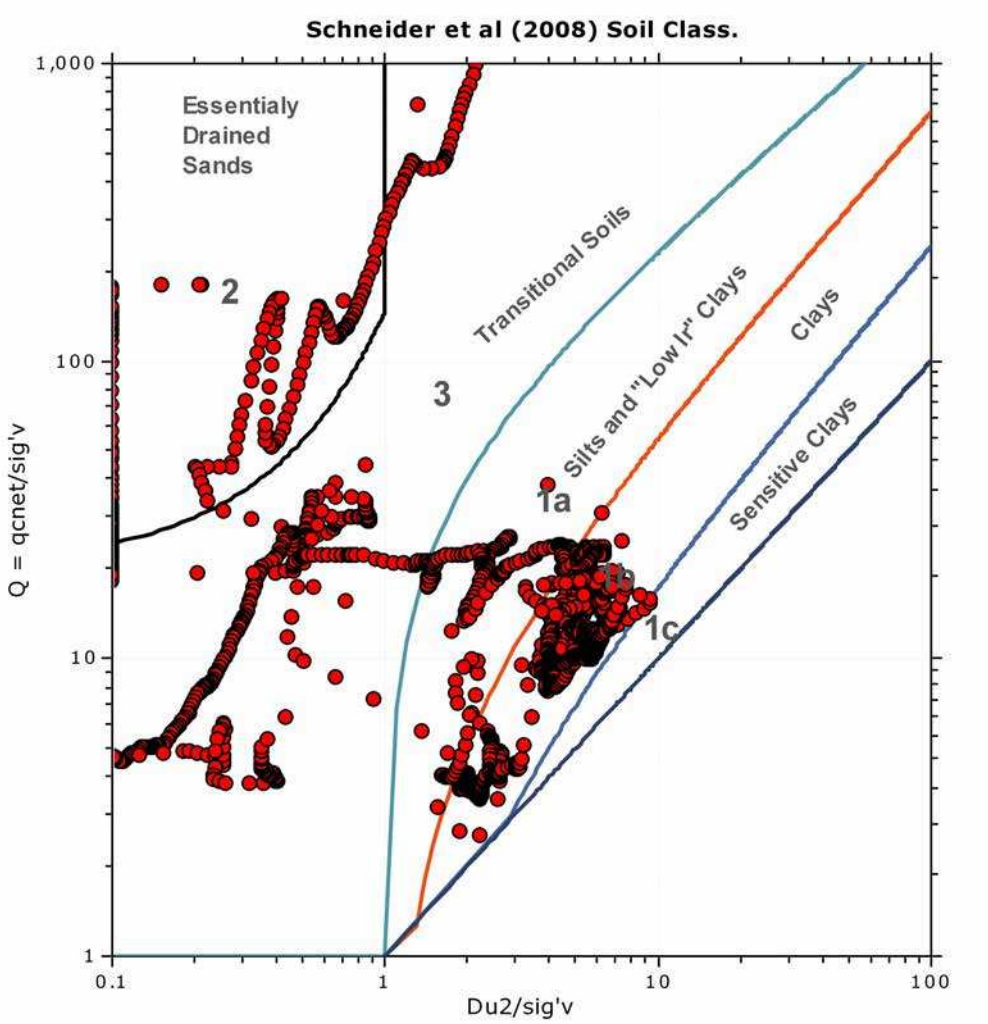



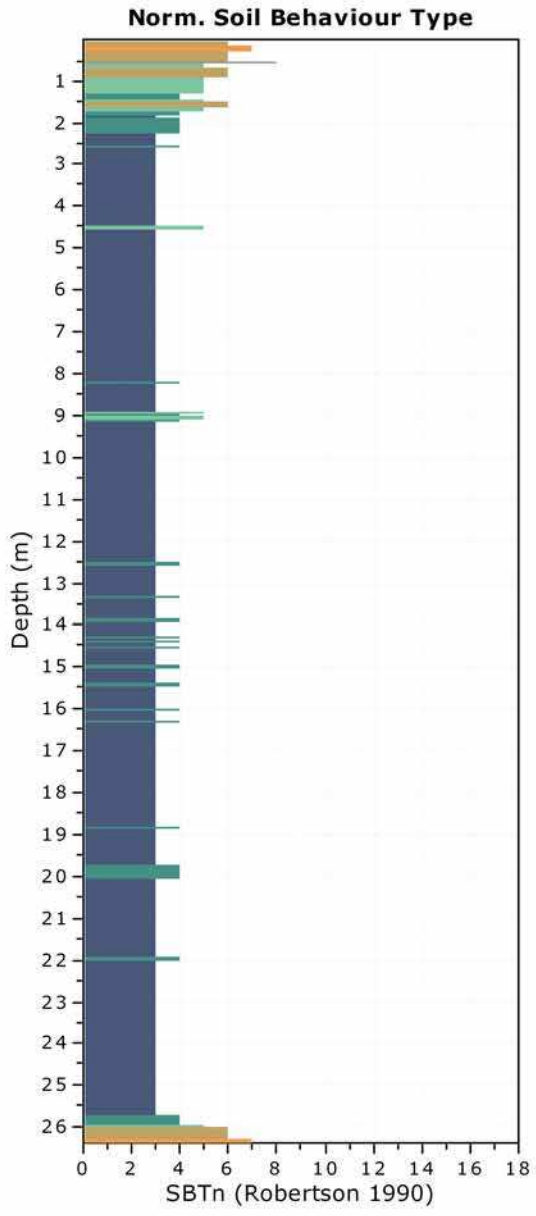

**SBTn legend**

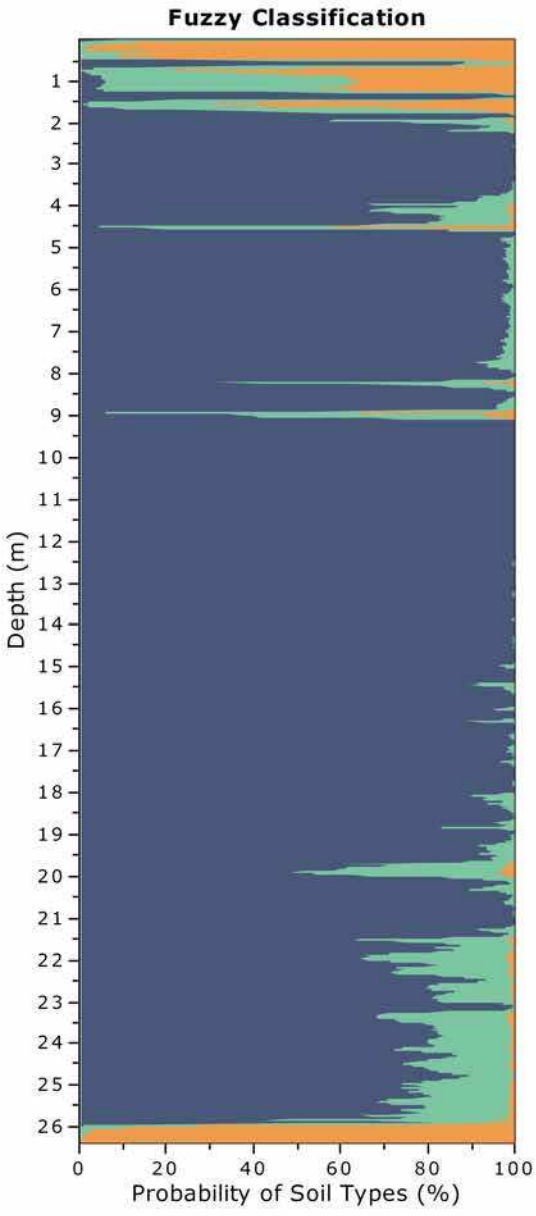
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



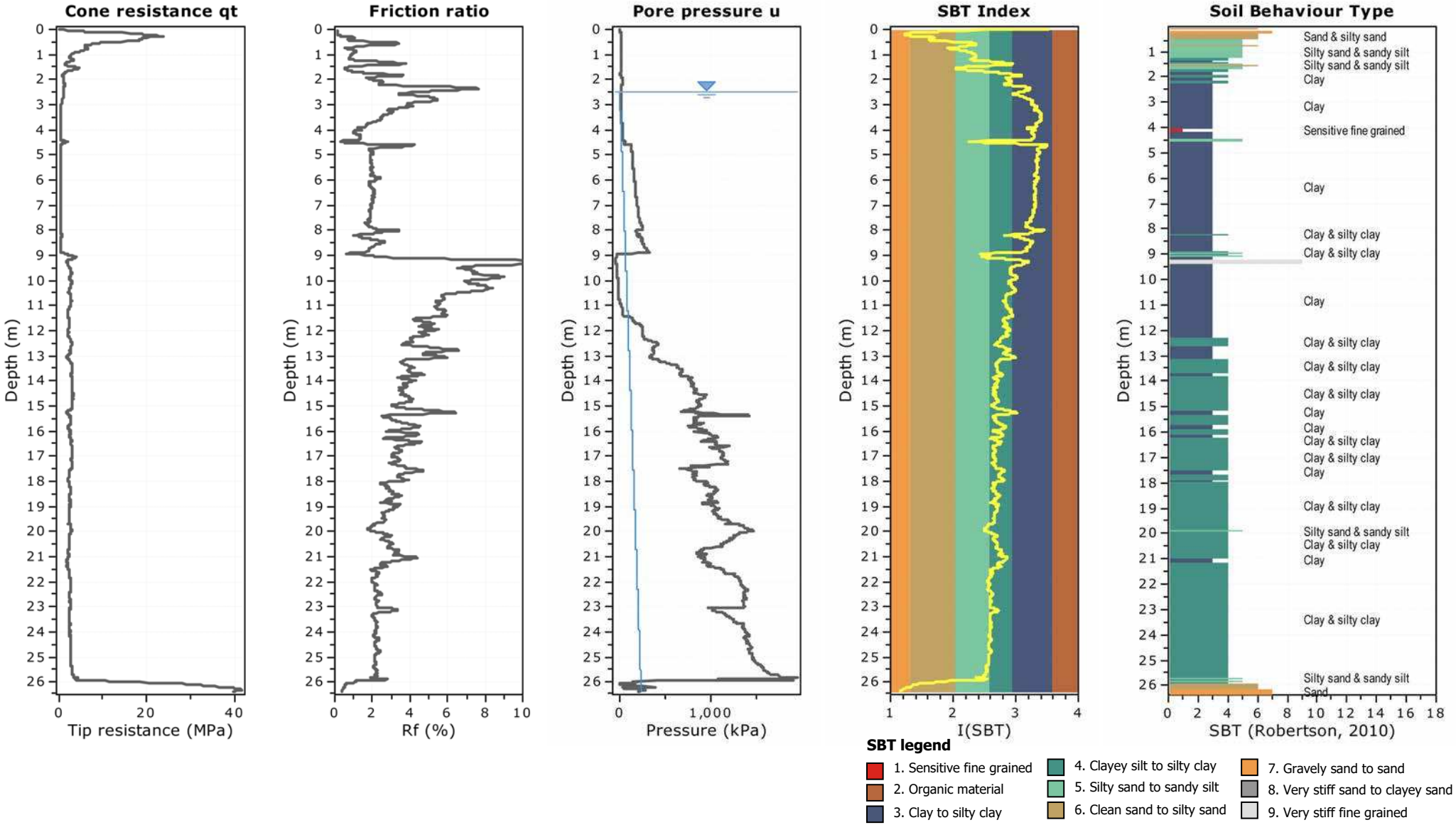



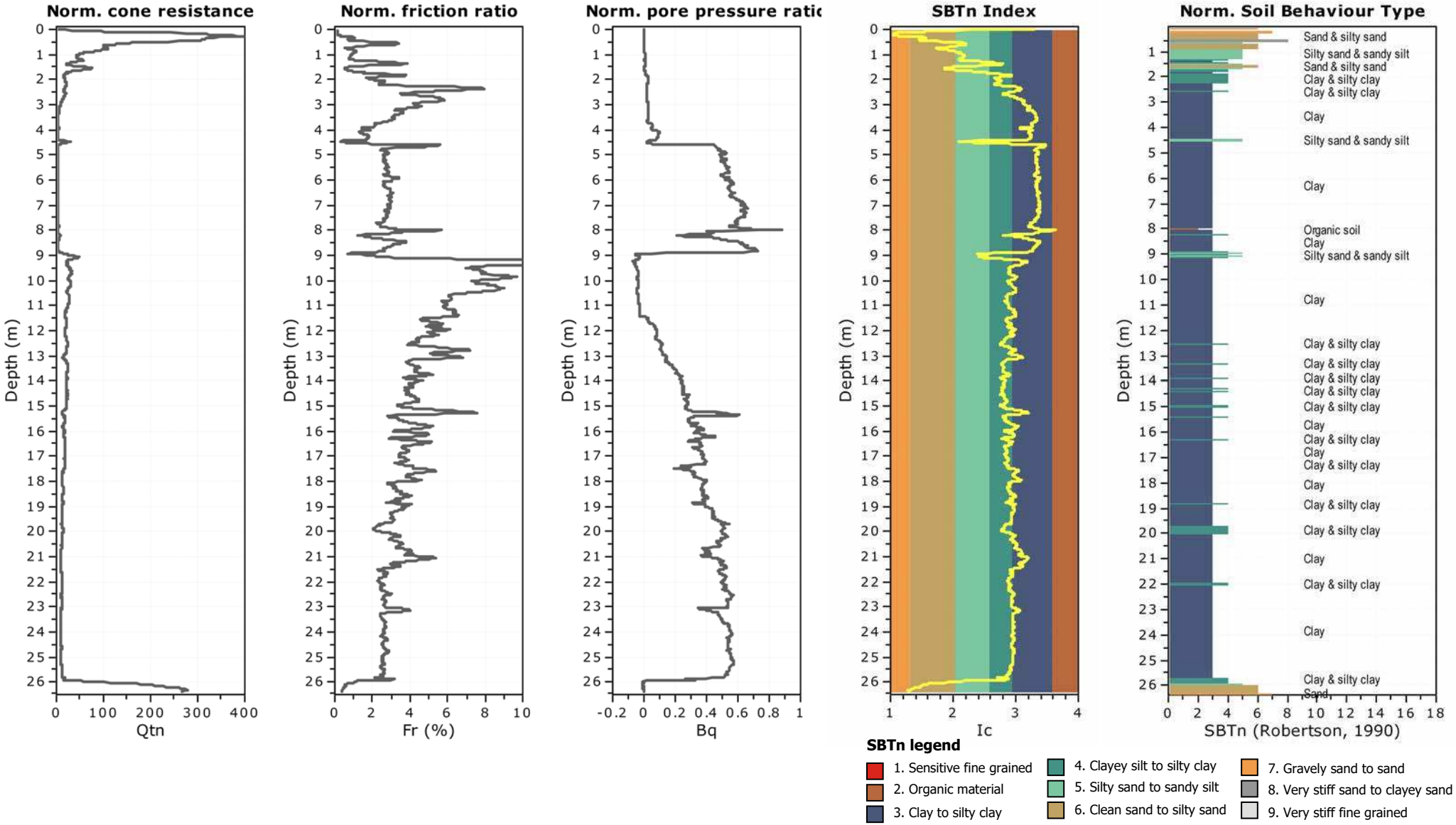


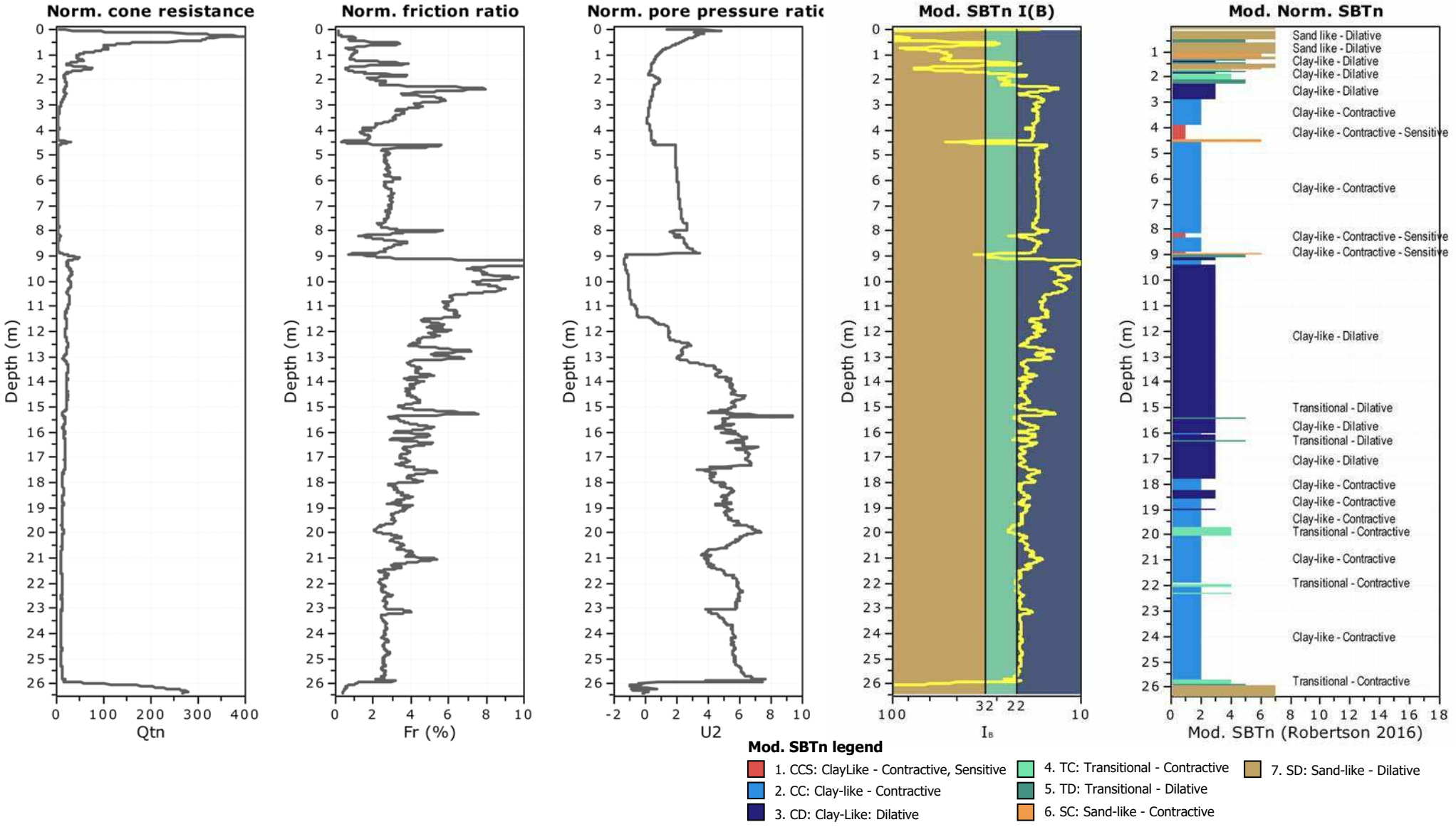




**Fuzzy classifiaction legend**

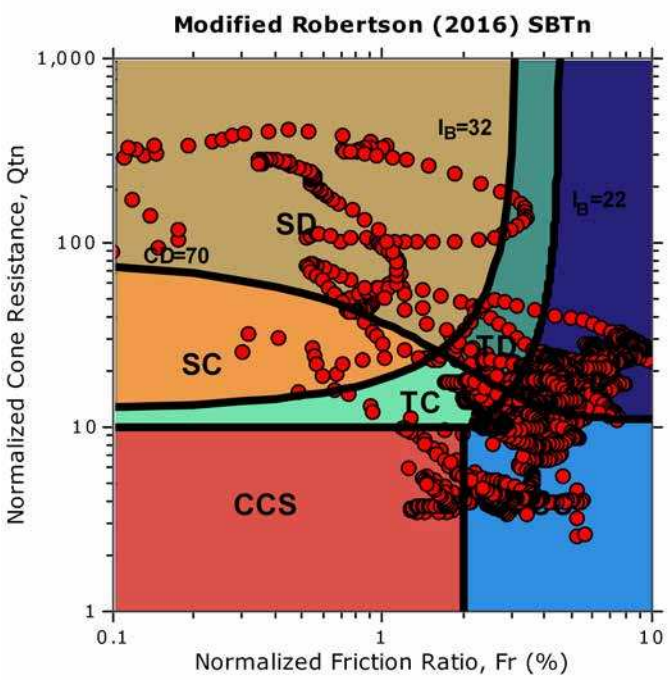
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

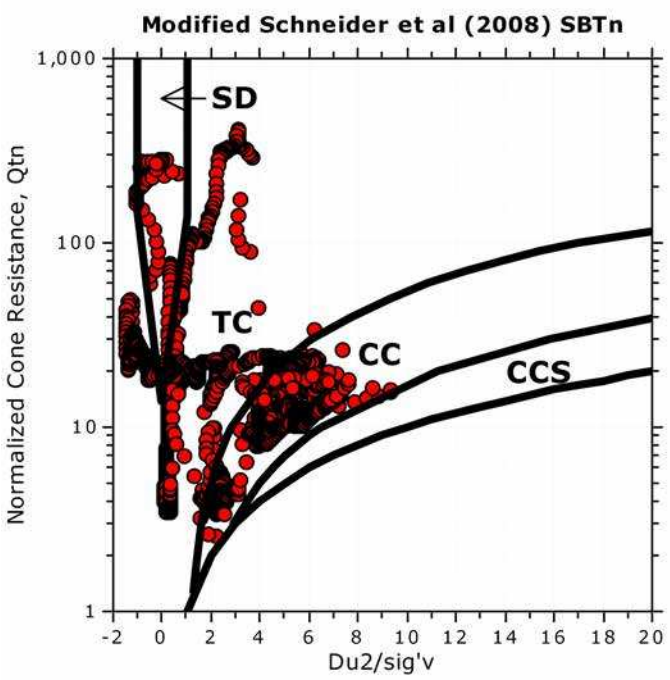

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Silty sand & sandy silt
Clay
Clay
Sensitive fine grained
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Clay & silty clay
Clay
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Clay
Clay & silty clay
Silty sand & sandy silt
Sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

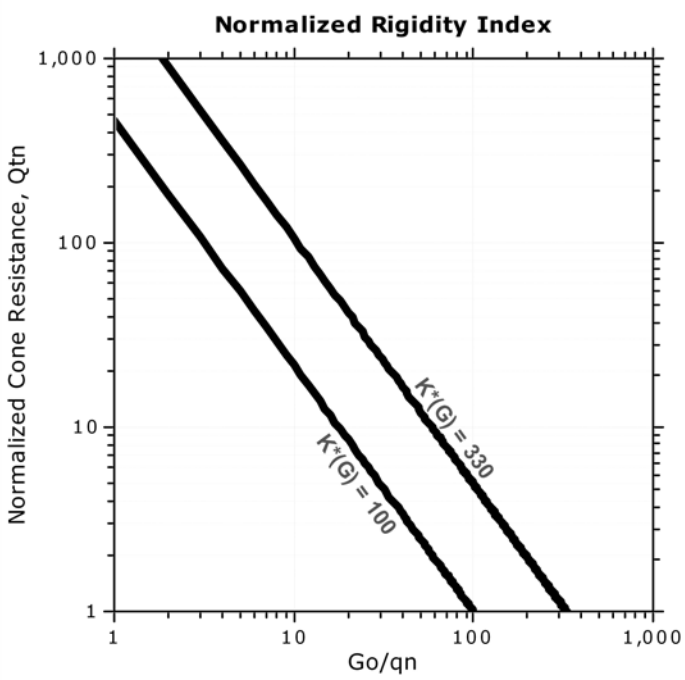

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
Clay & silty clay
Clay & silty clay
Clay
Silty sand & sandy silt
Clay
Organic soil
Clay
Silty sand & sandy silt
Clay
Clay & silty clay
Clay & silty clay
Clay & silty clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Sand,
SBTn (Robertson, 1990)
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Depth (m)
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Transitional - Dilative
Transitional - Contractive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

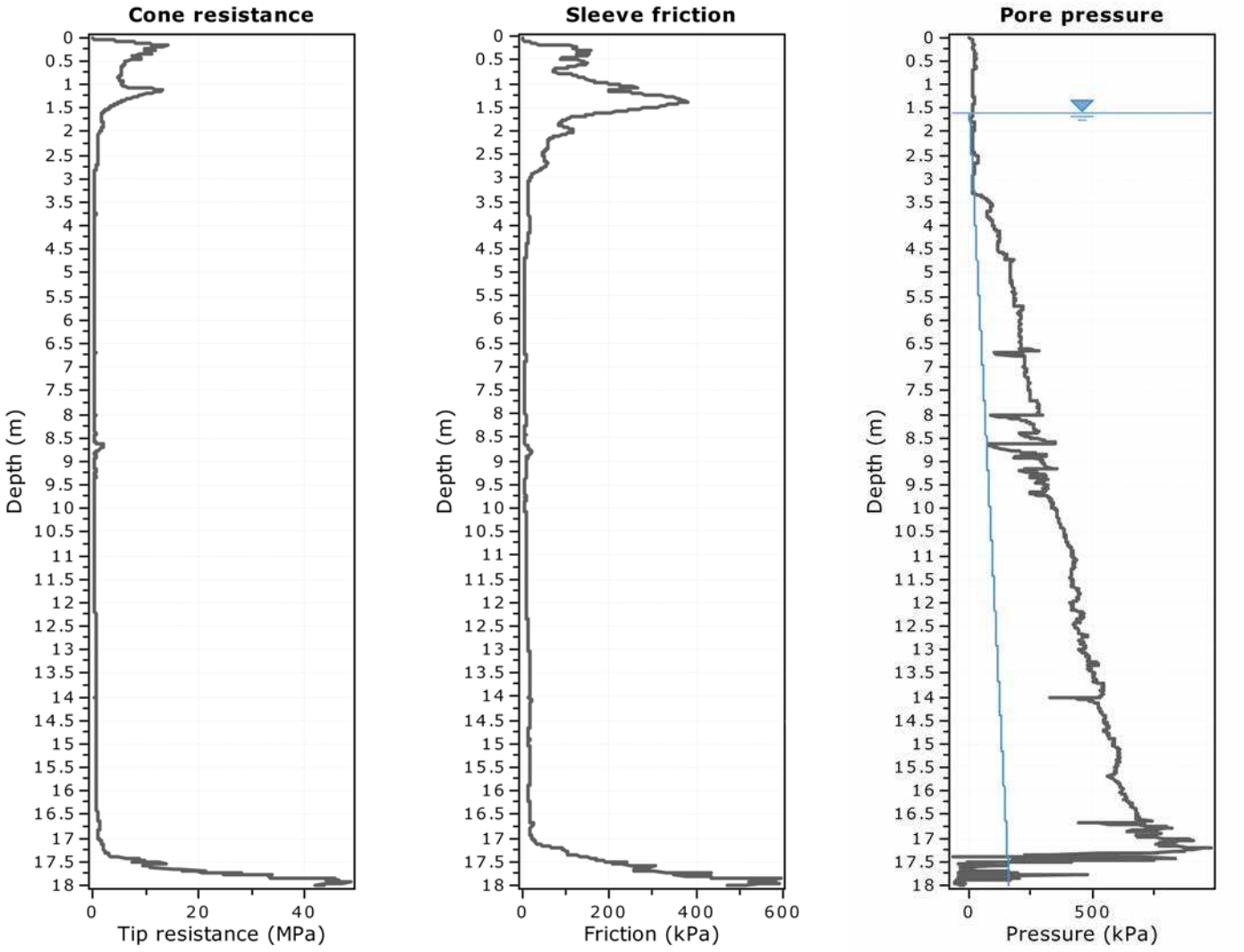


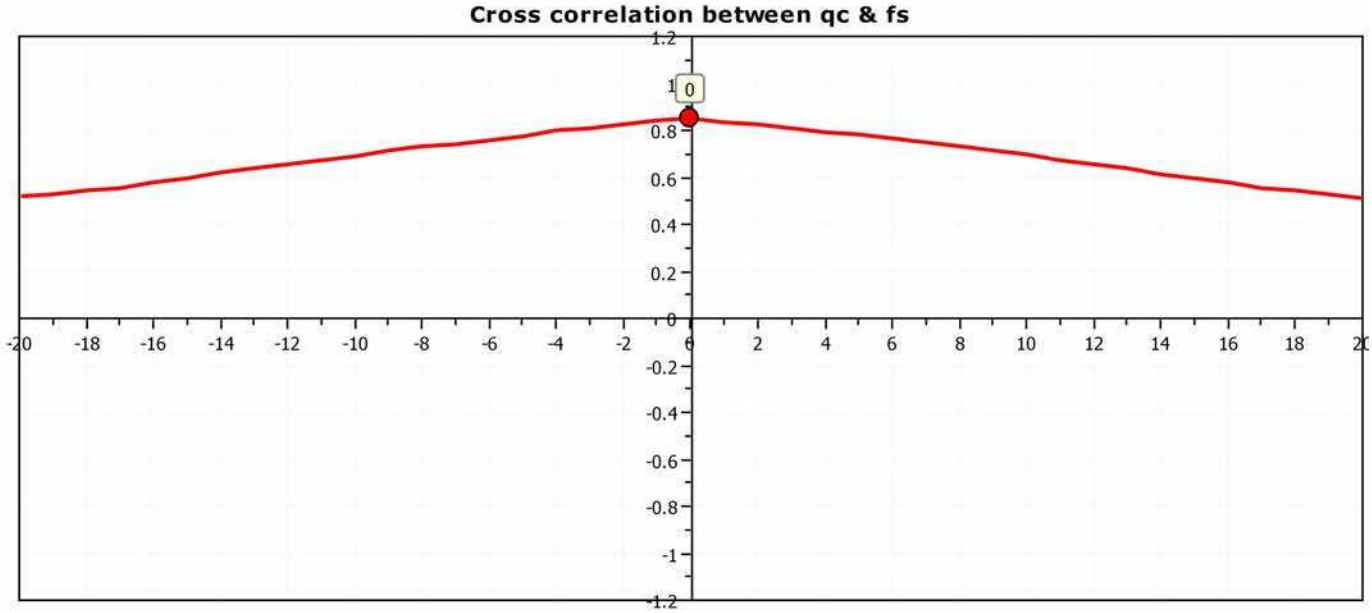




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

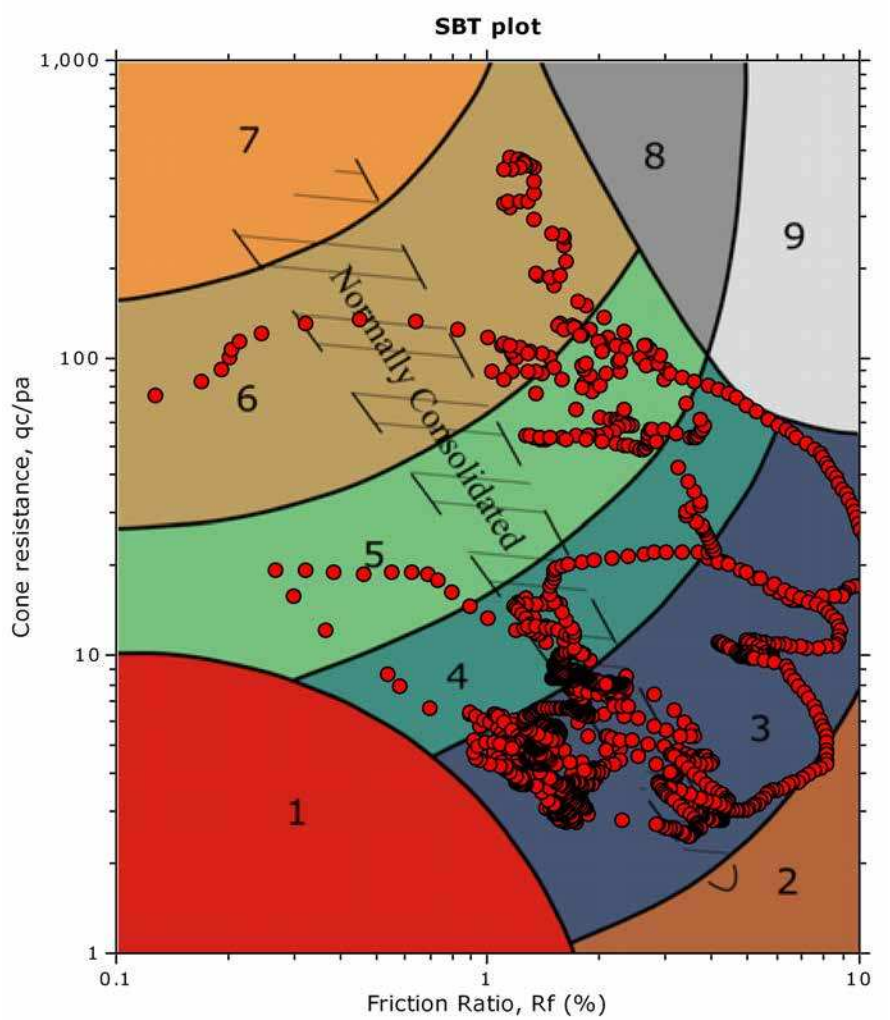
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

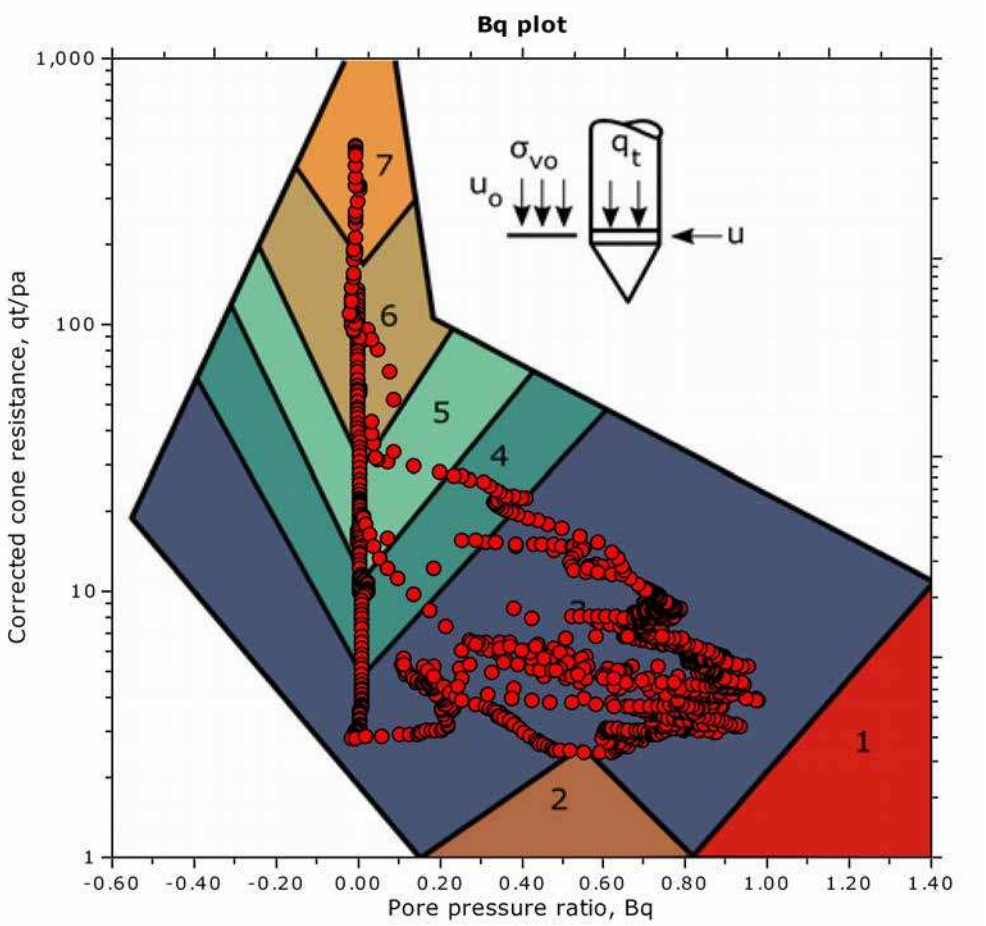



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

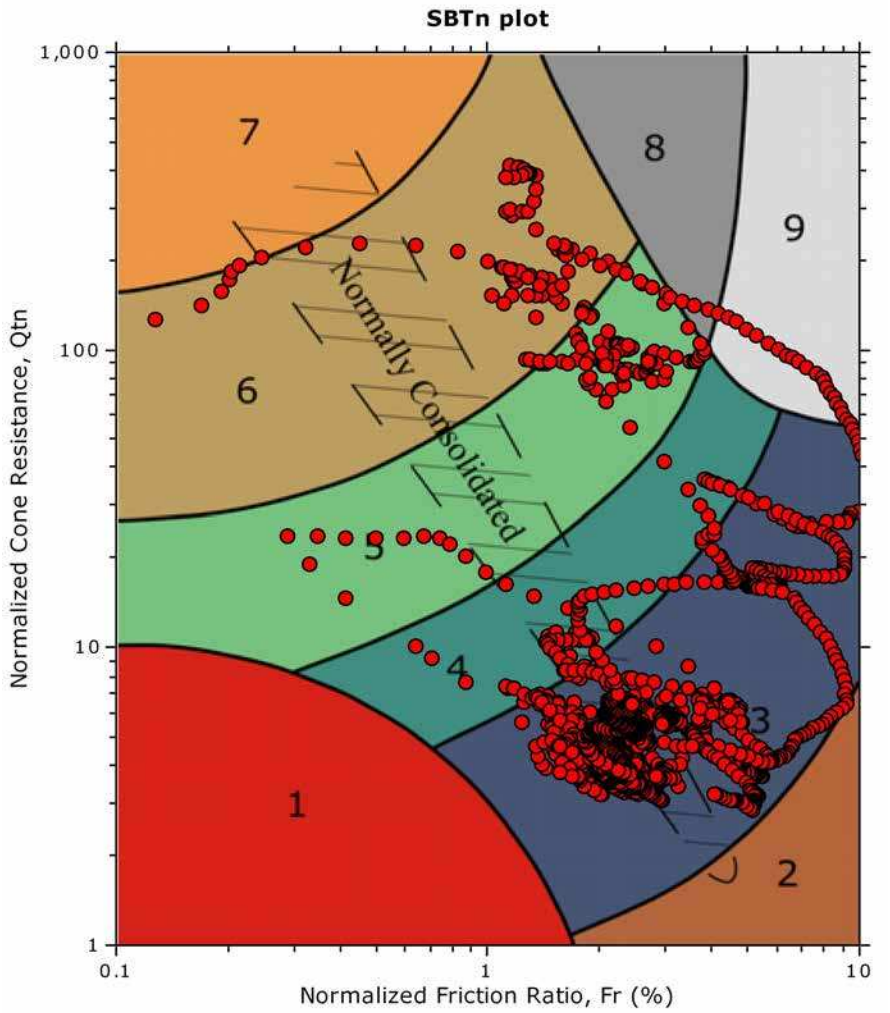


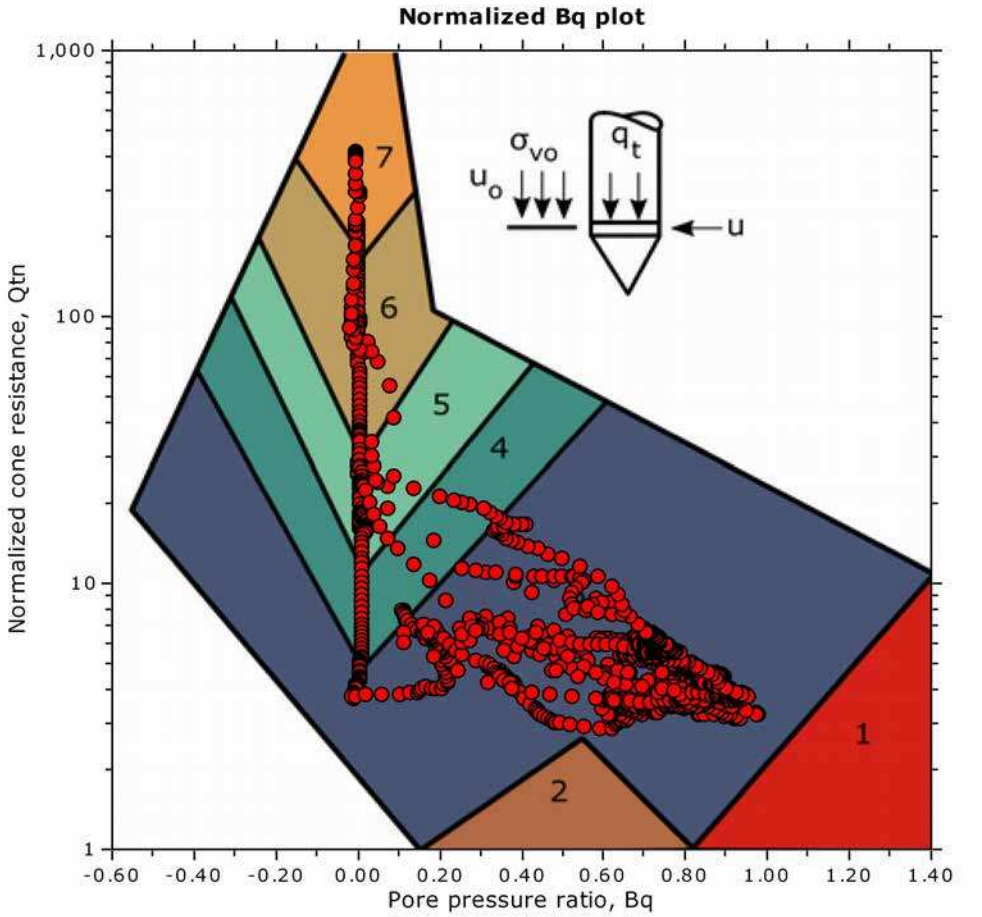




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

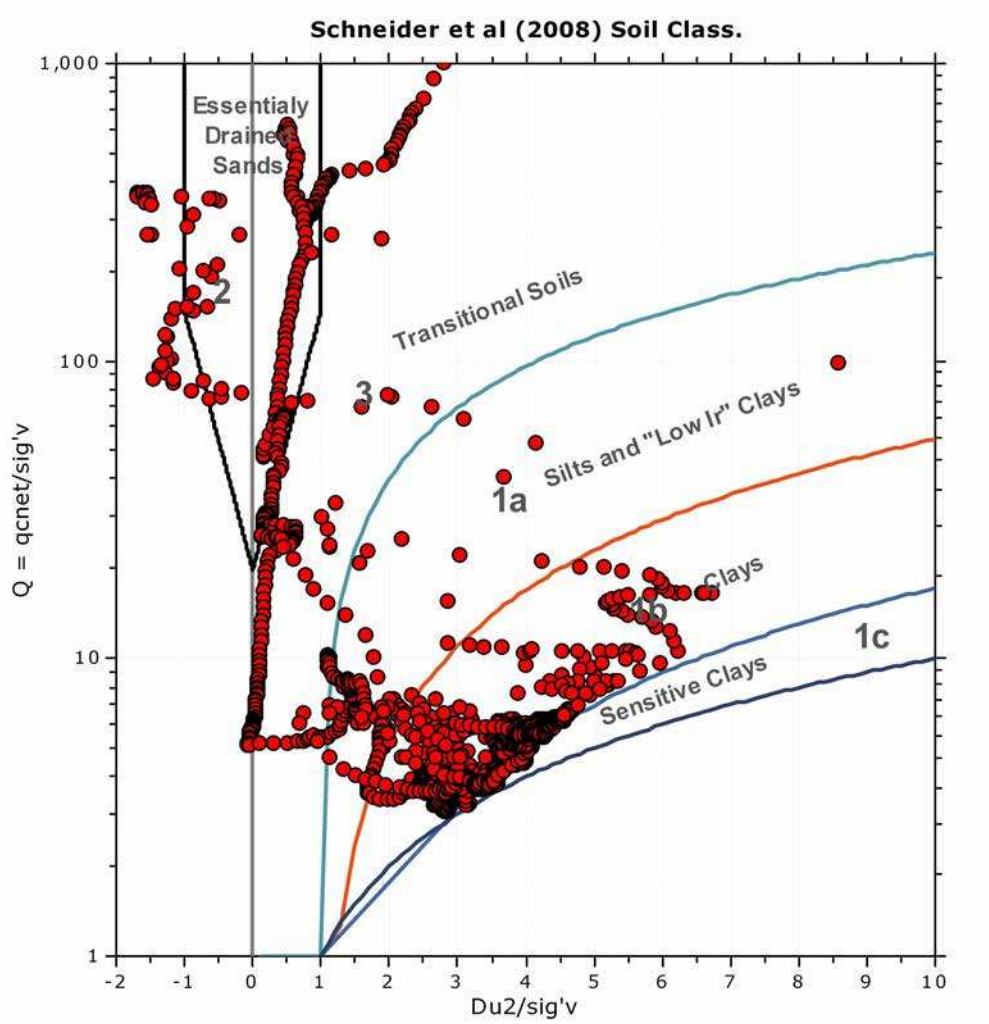


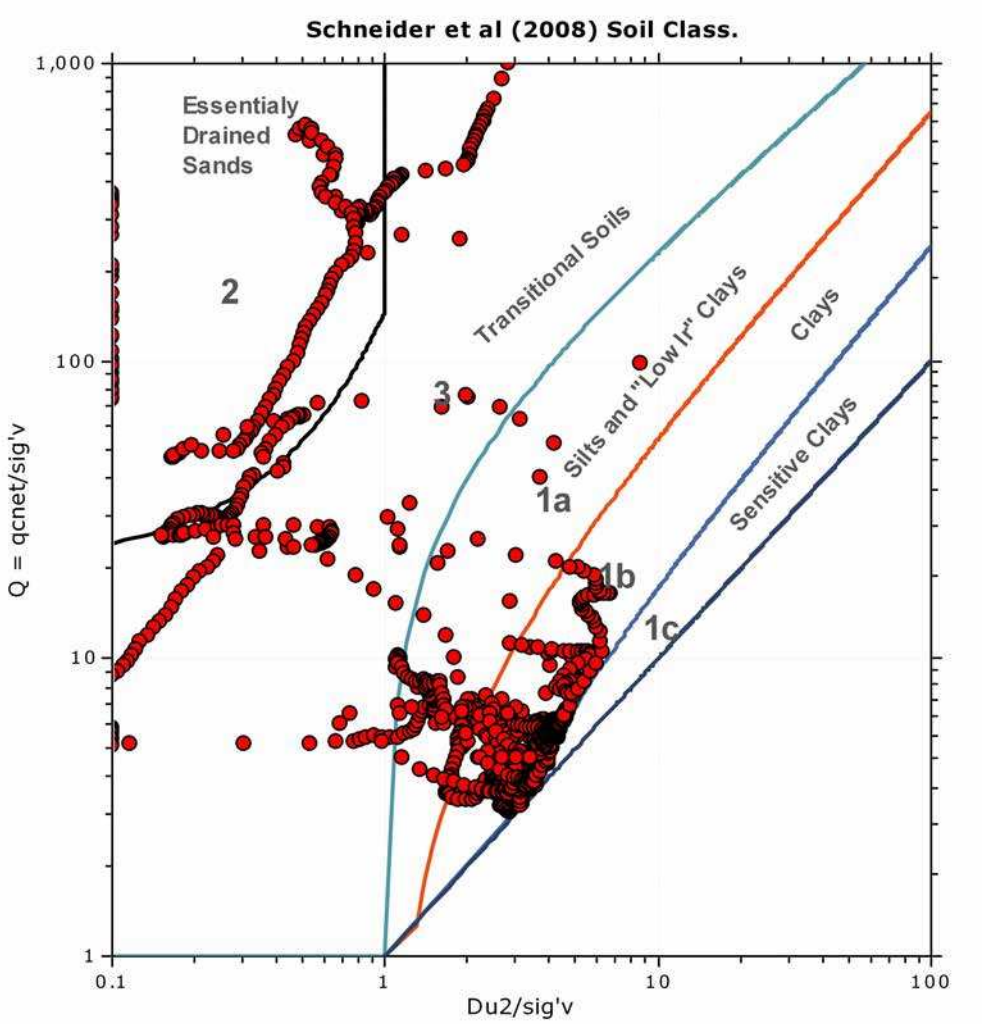



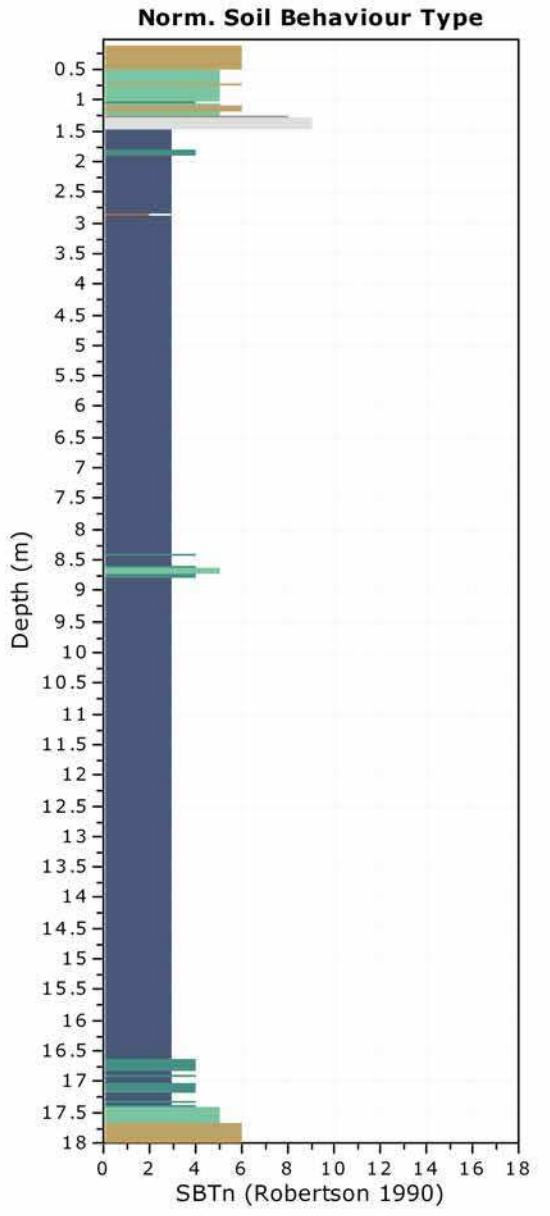

**SBTn legend**

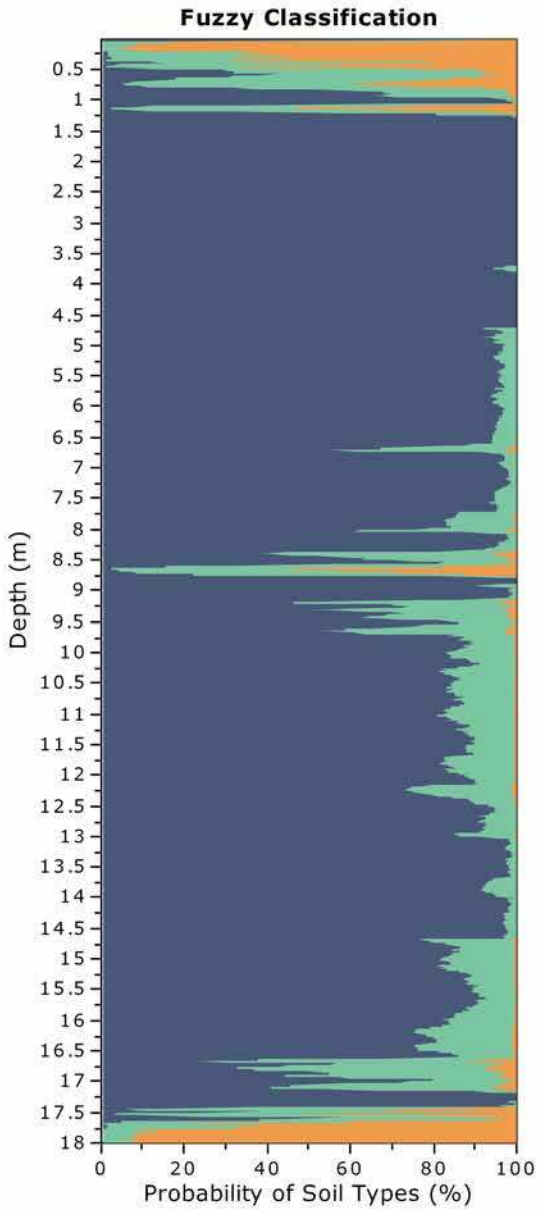
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



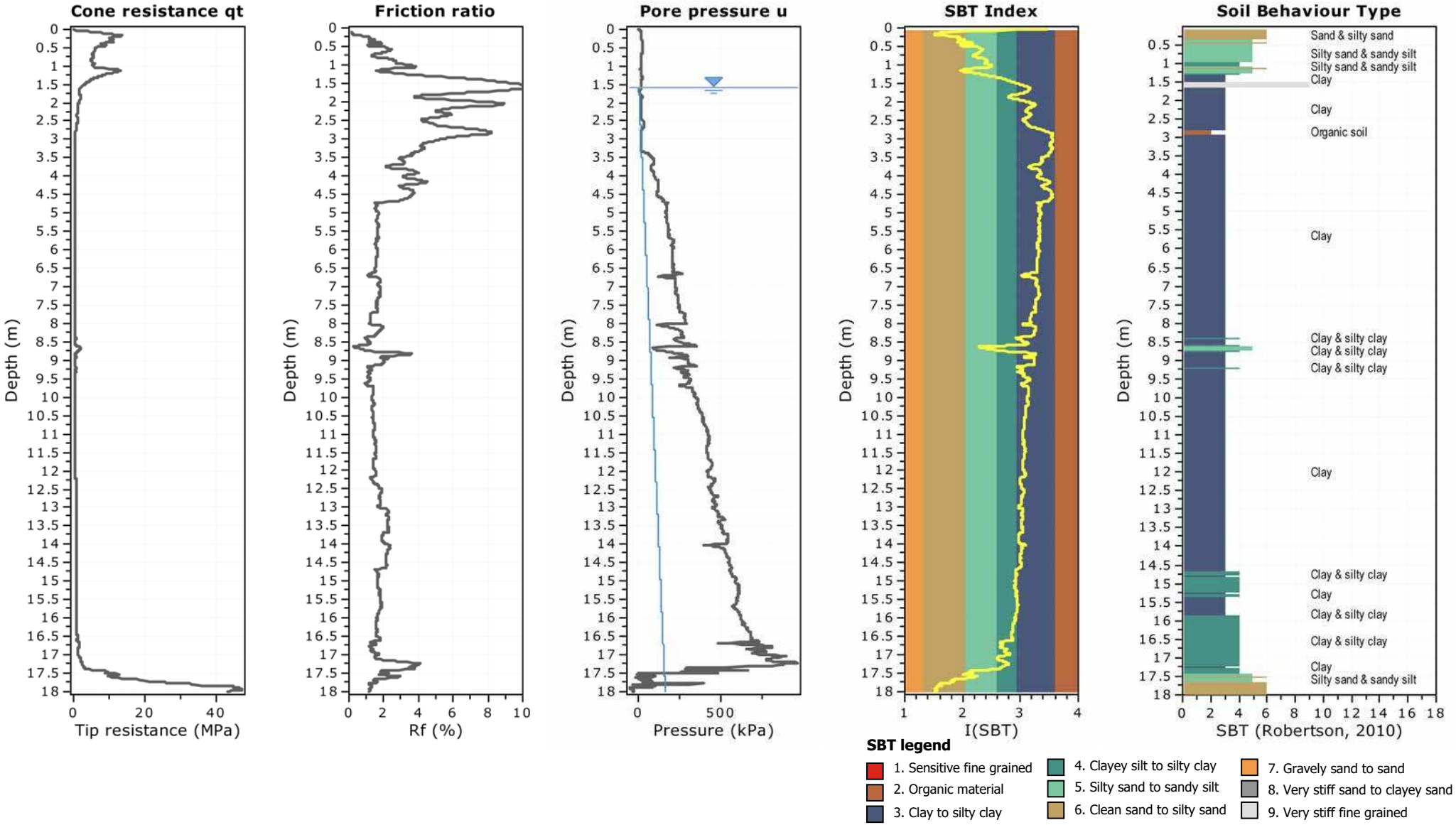



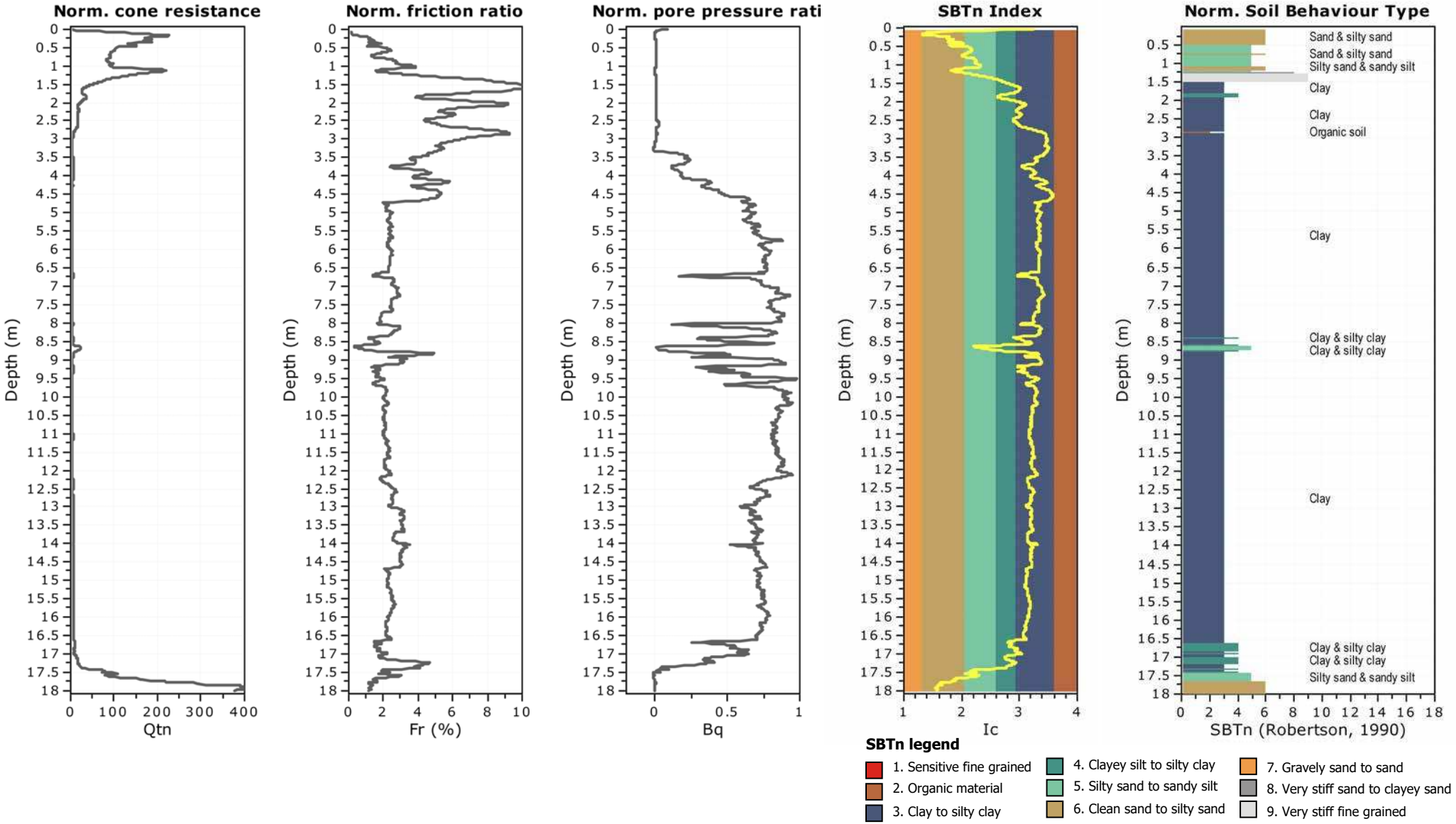


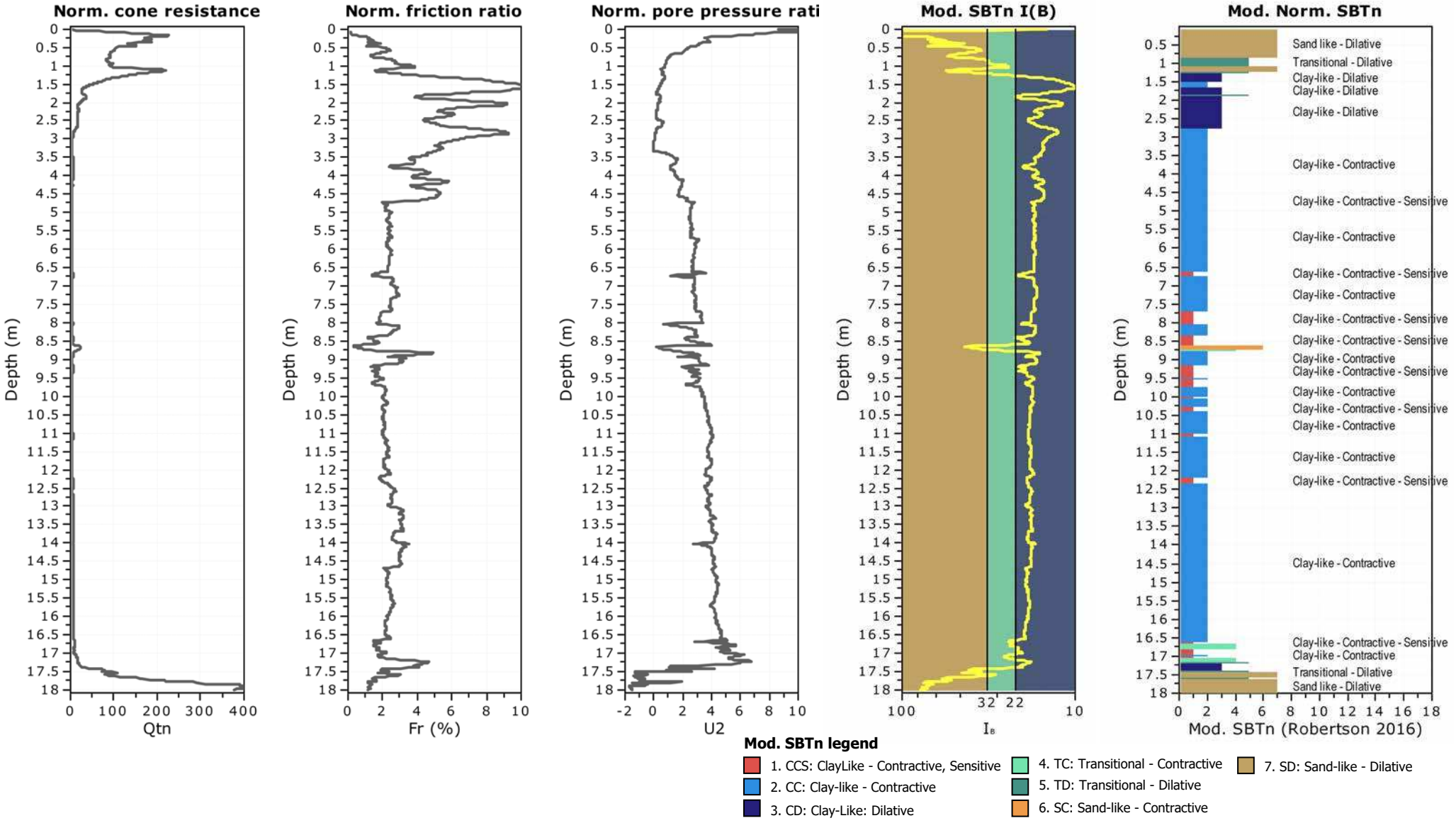




**Fuzzy classifiaction legend**

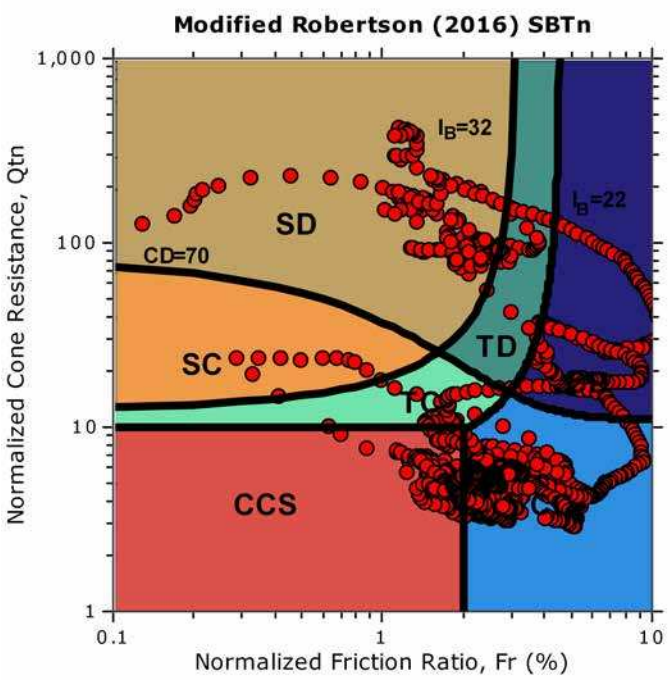
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

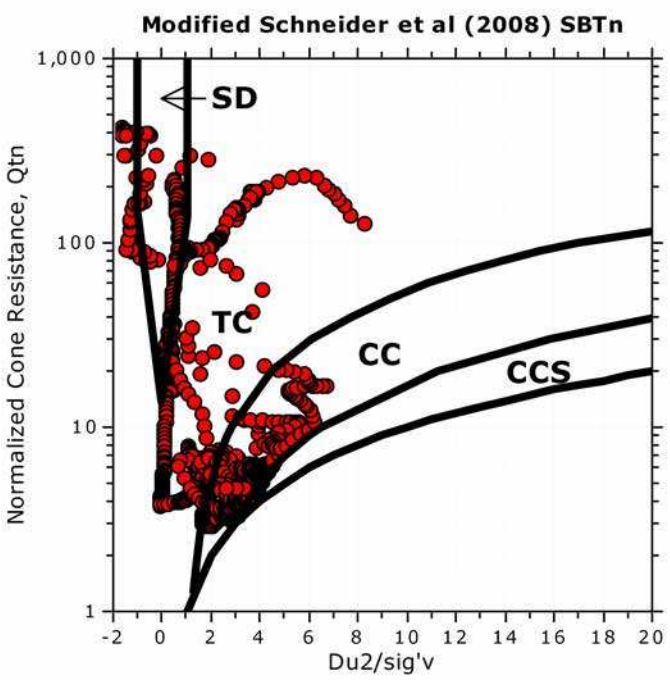

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Silty sand & sandy silt
Clay
Clay
Organic soil
Clay
Clay & silty clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Clay
Silty sand & sandy silt
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

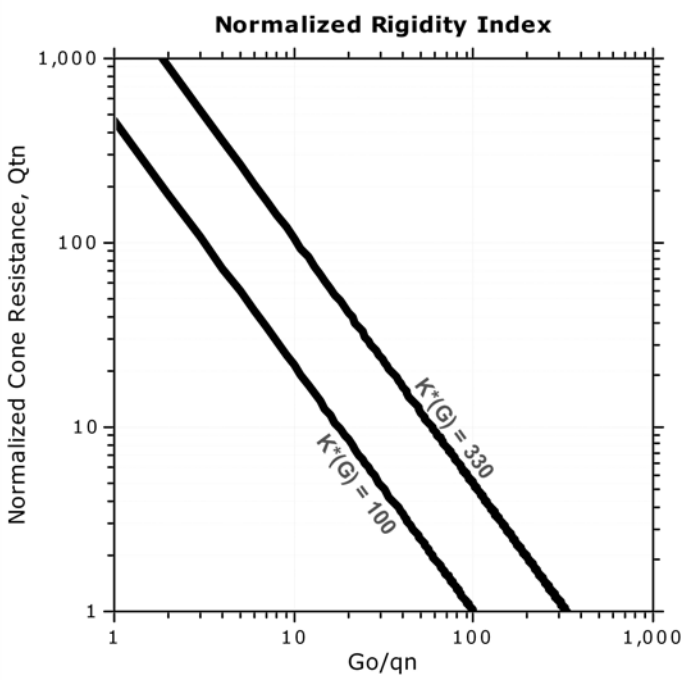

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Clay
Clay
Organic soil
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Silty sand & sandy silt
SBTn (Robertson, 1990)
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

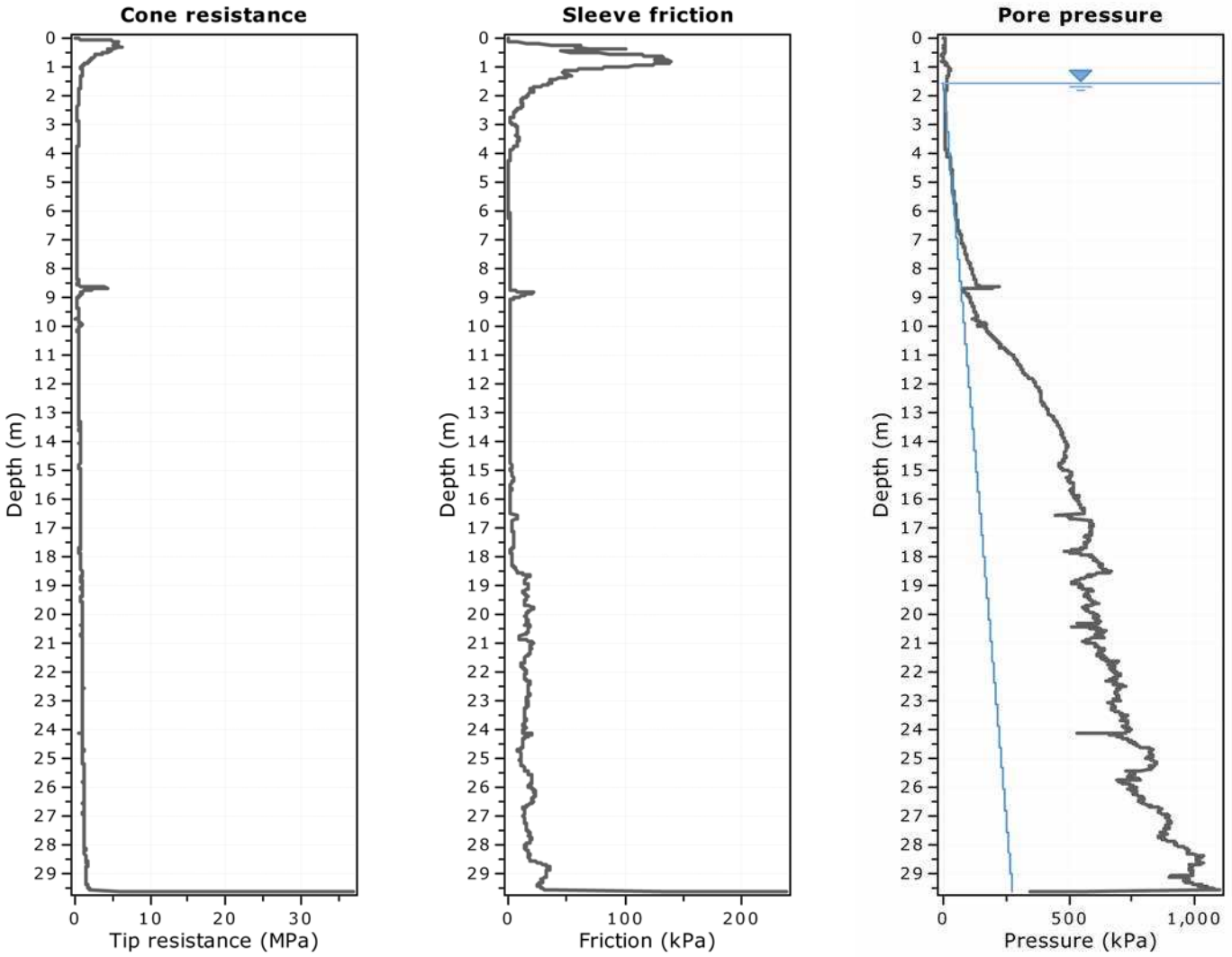


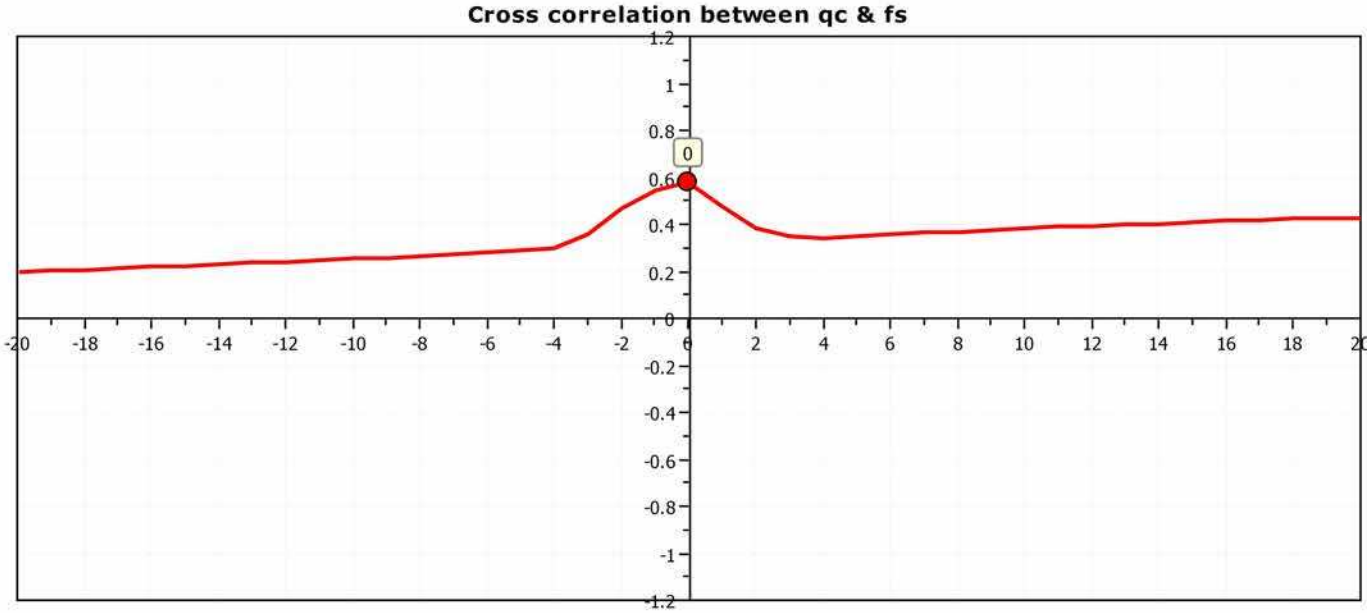




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

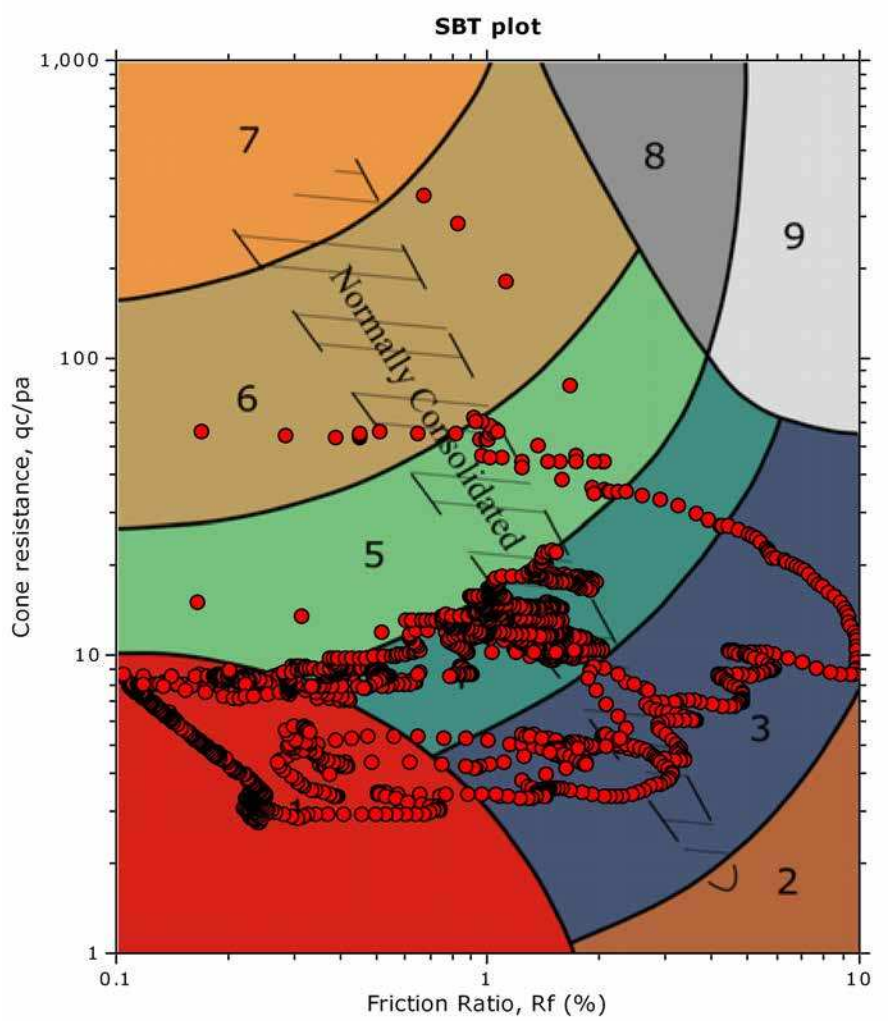
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

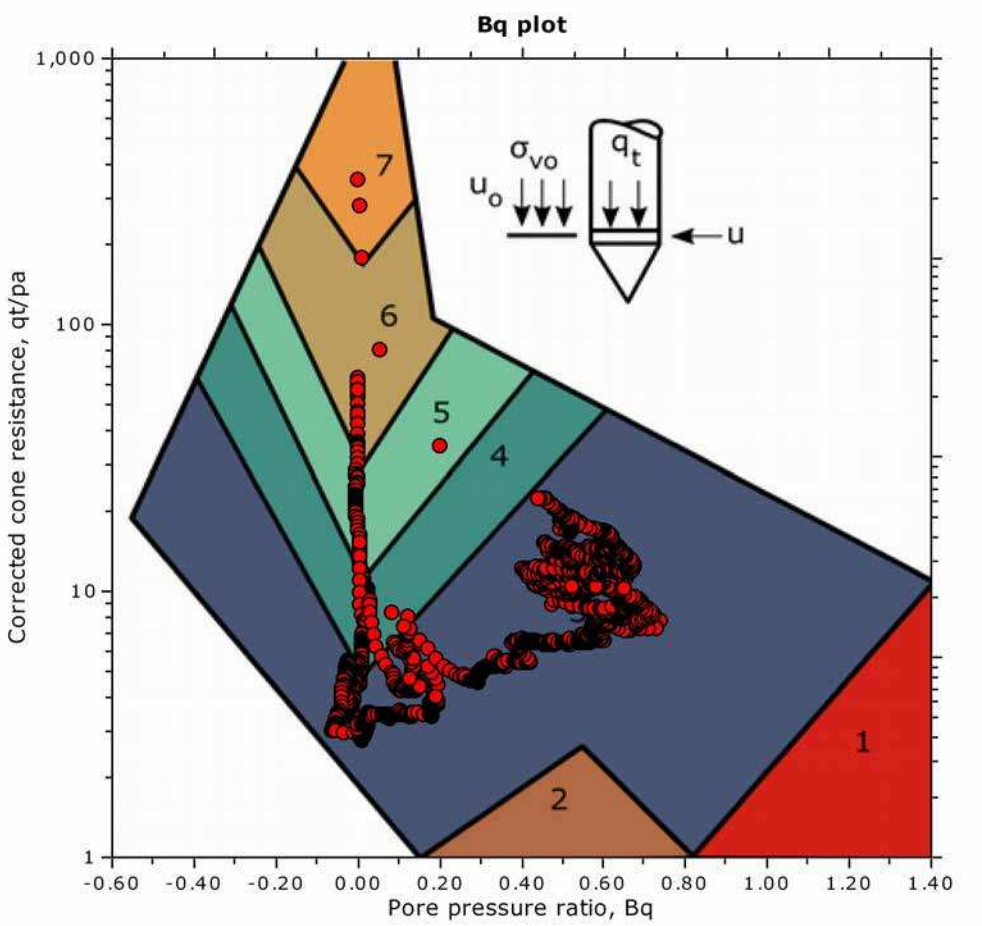



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

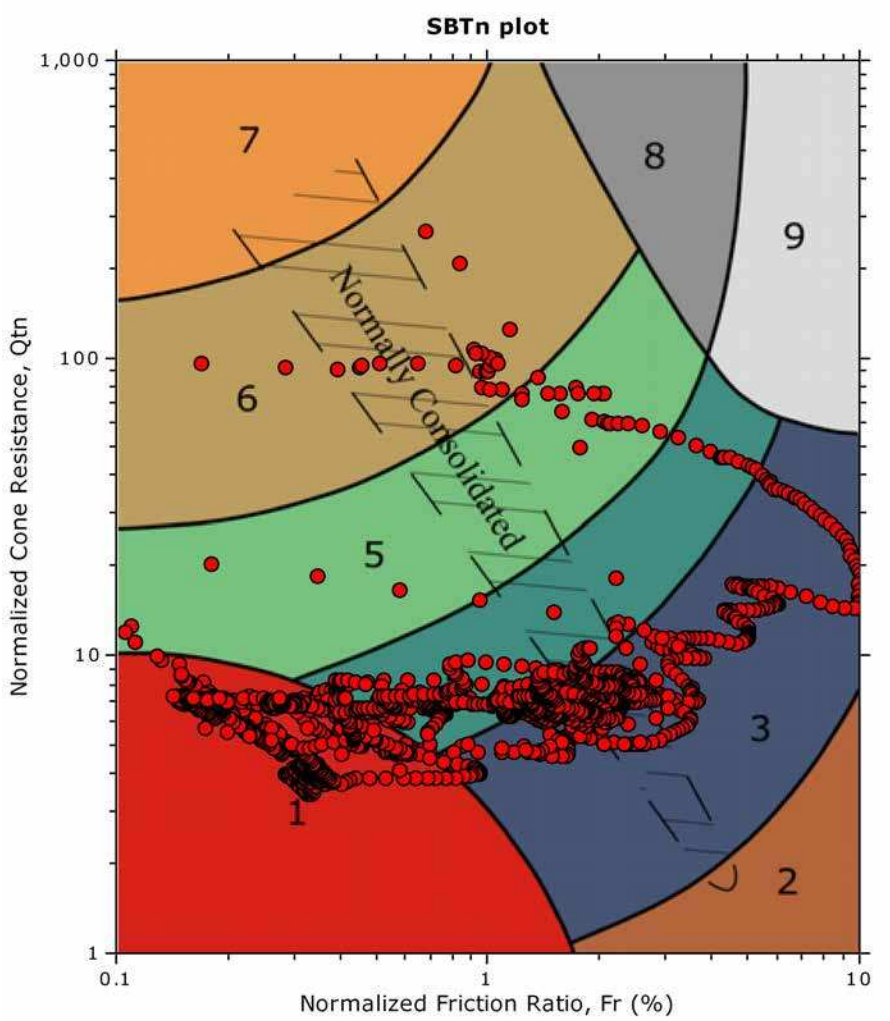


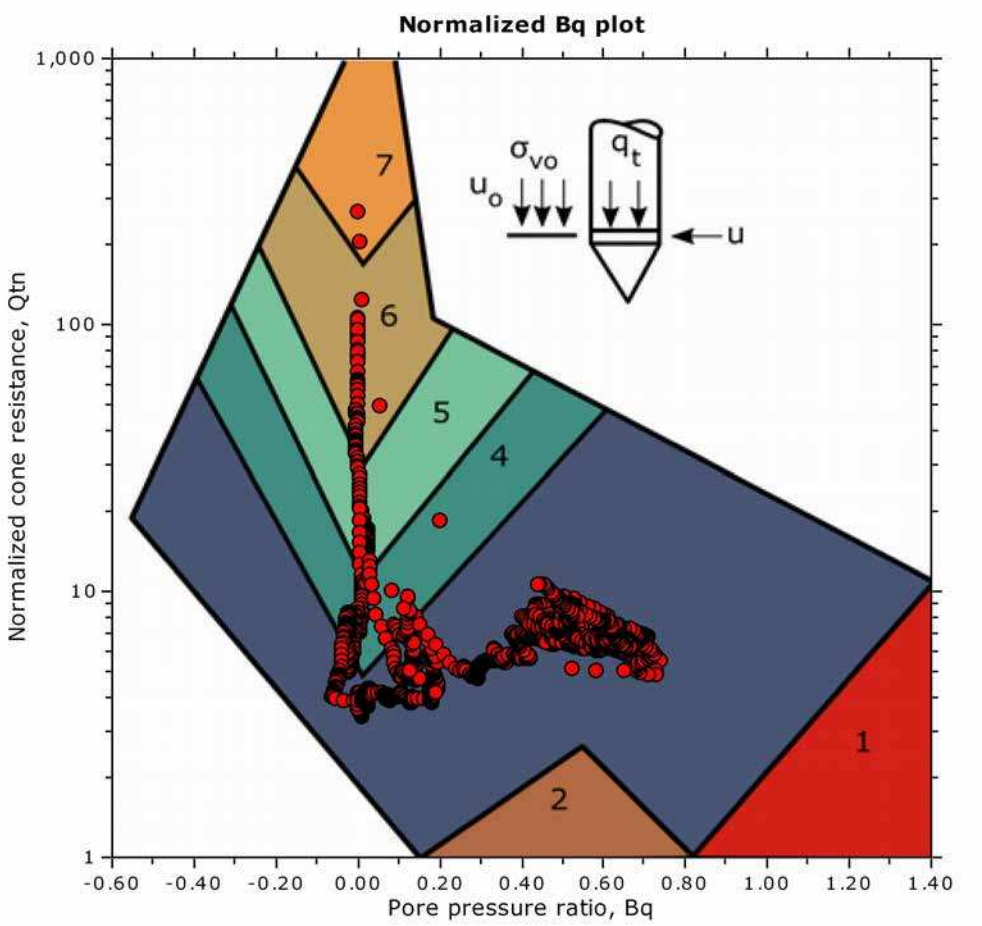




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

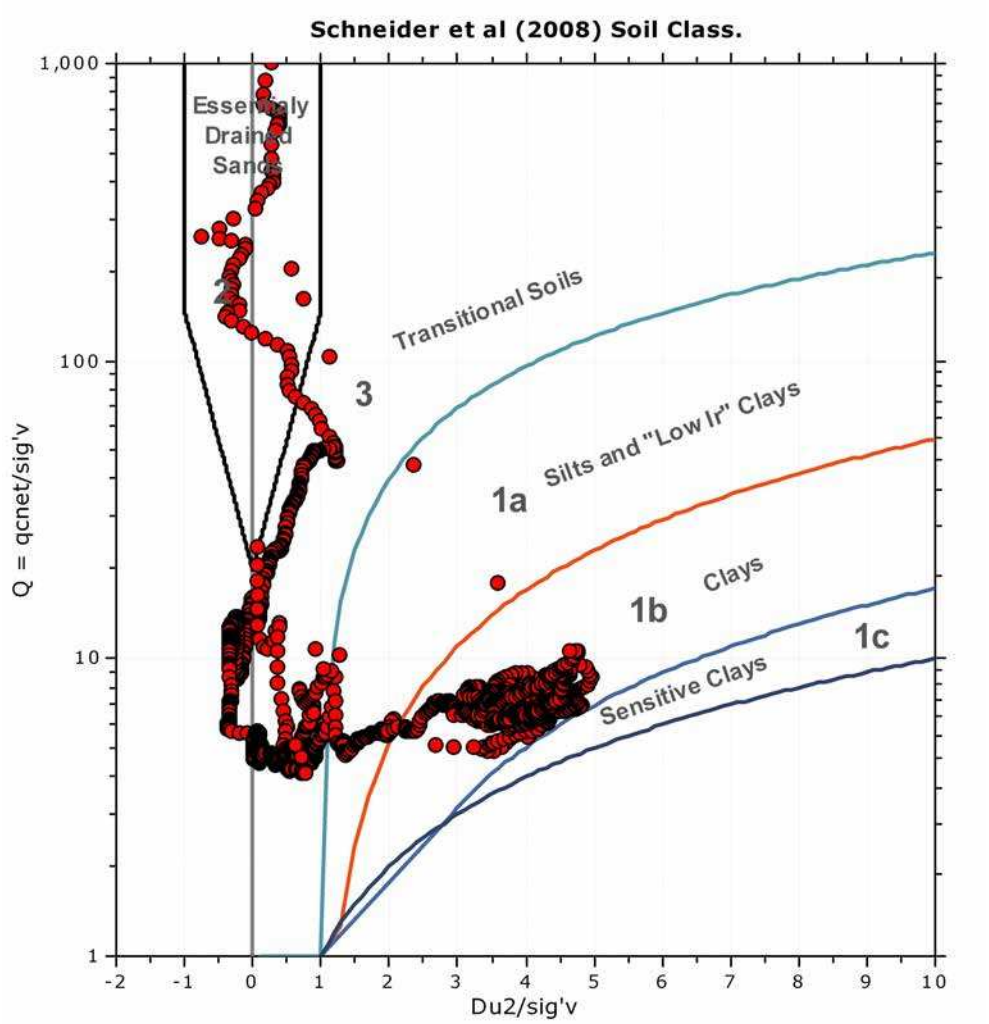


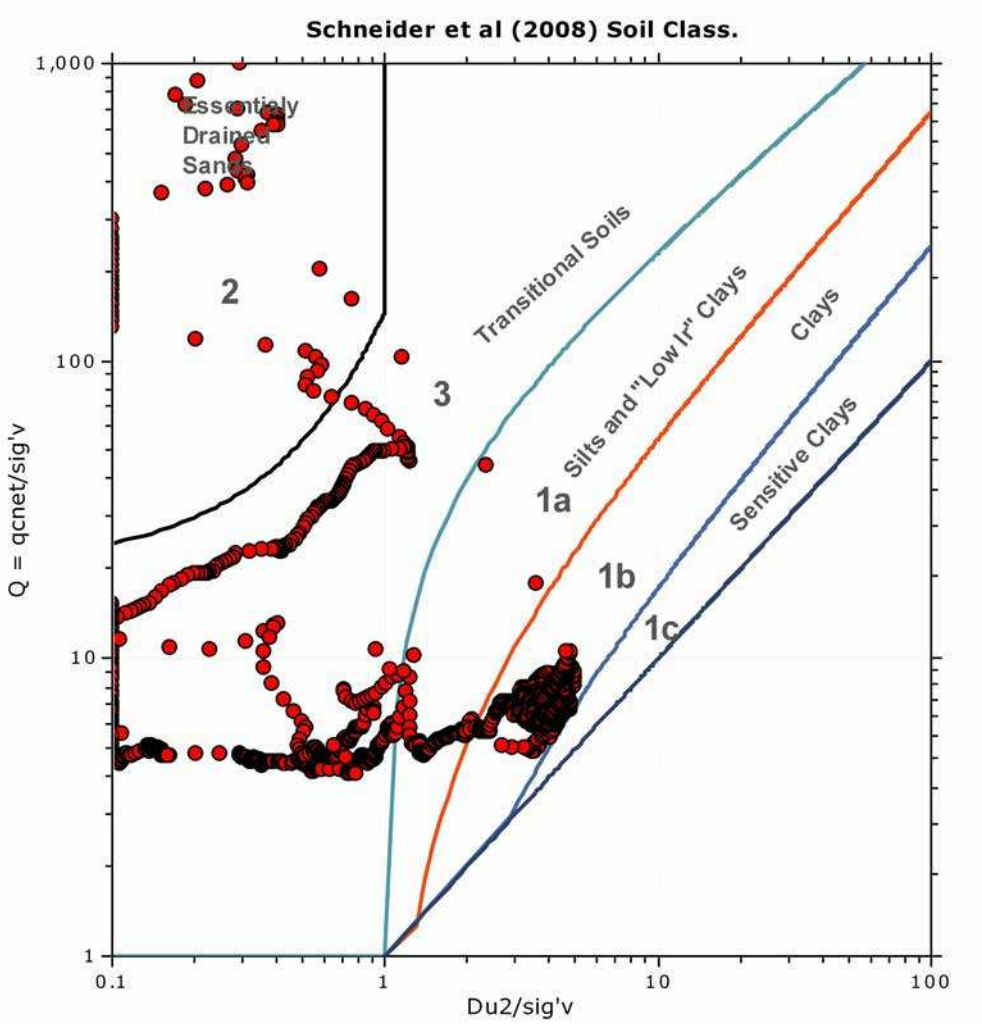



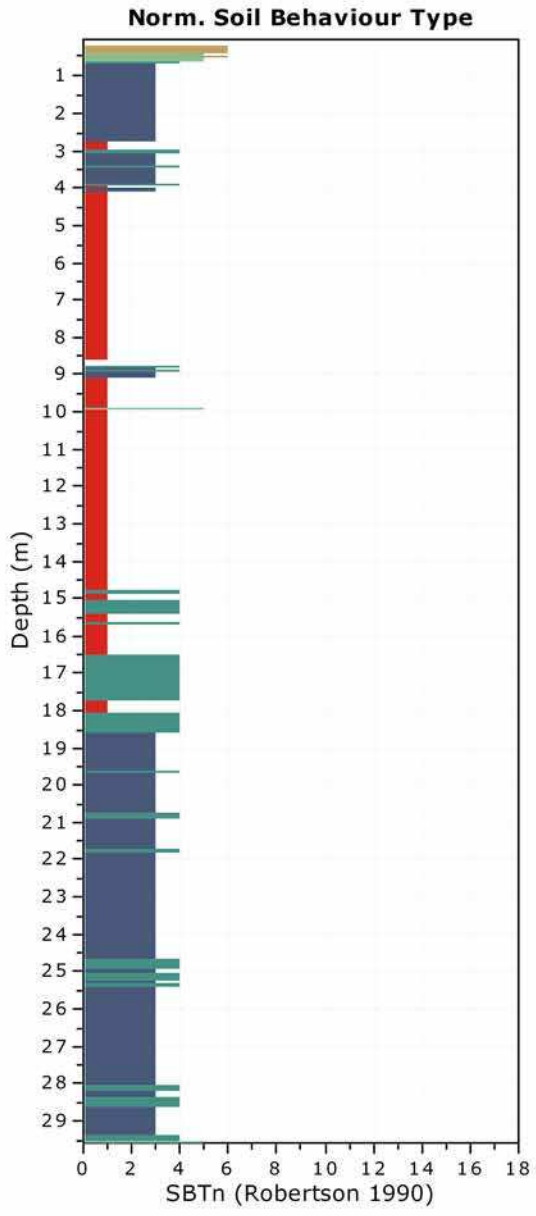

**SBTn legend**

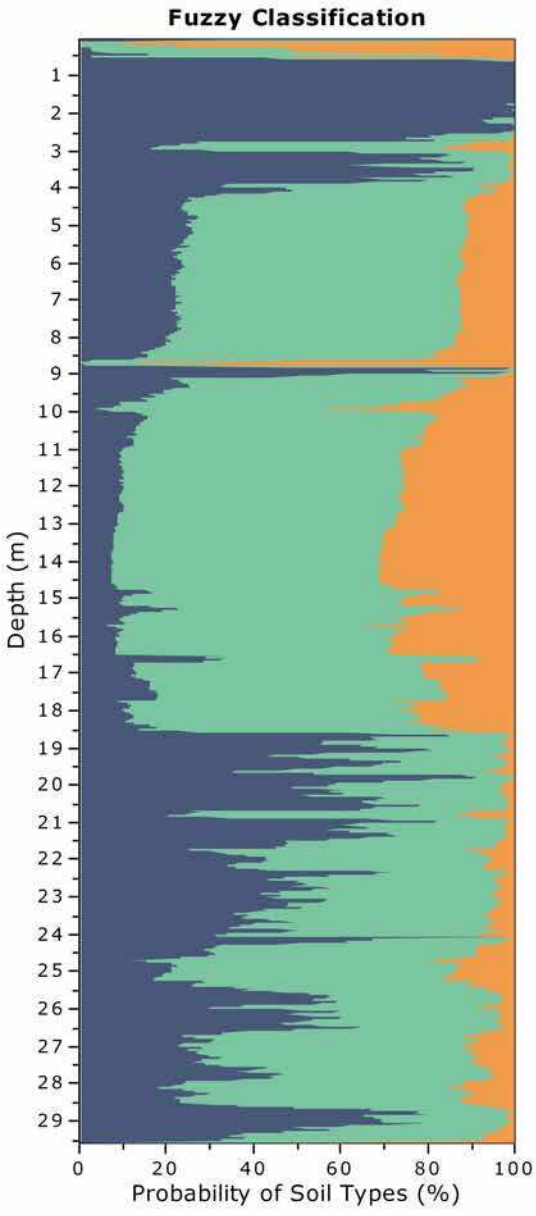
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



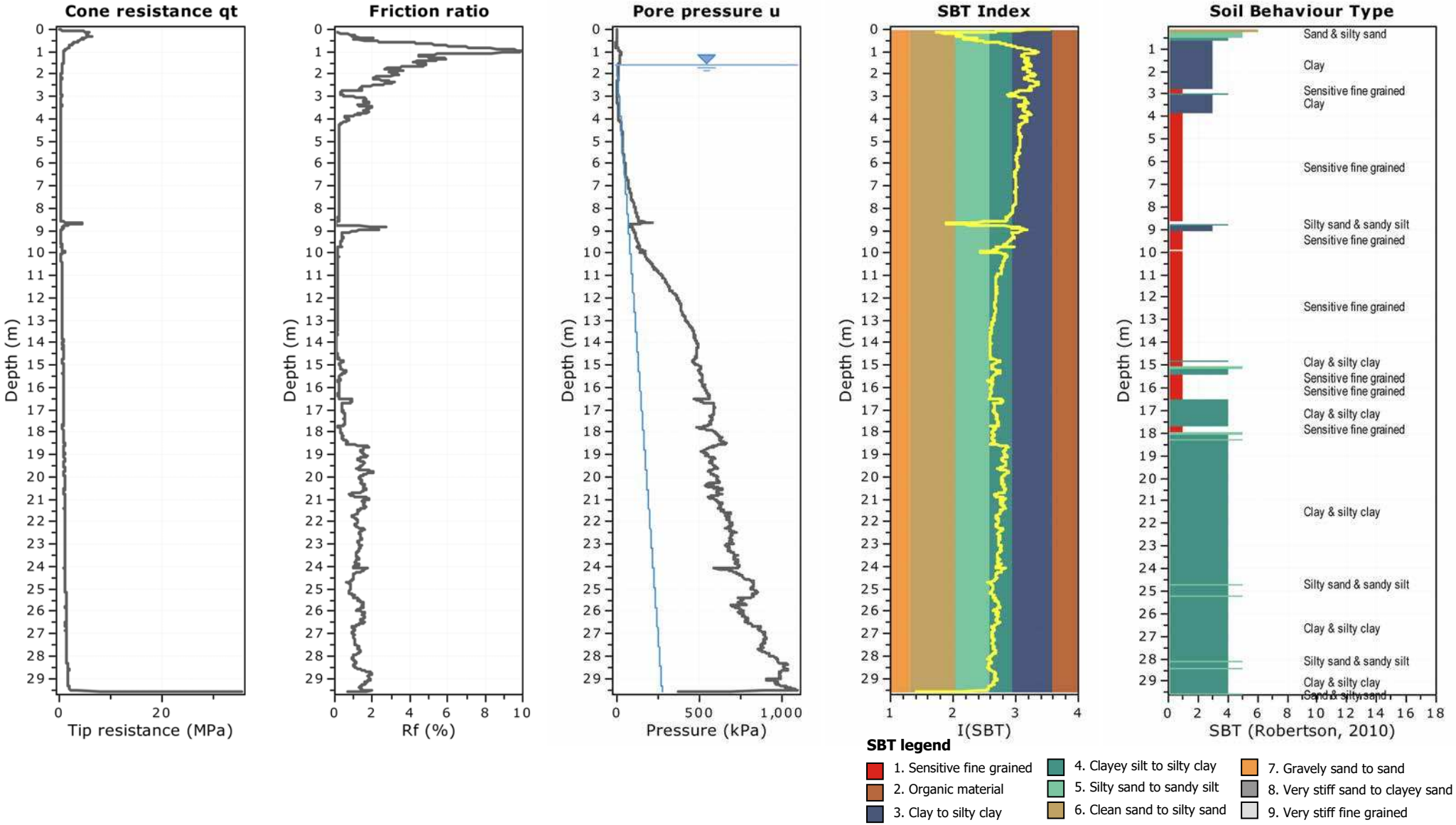



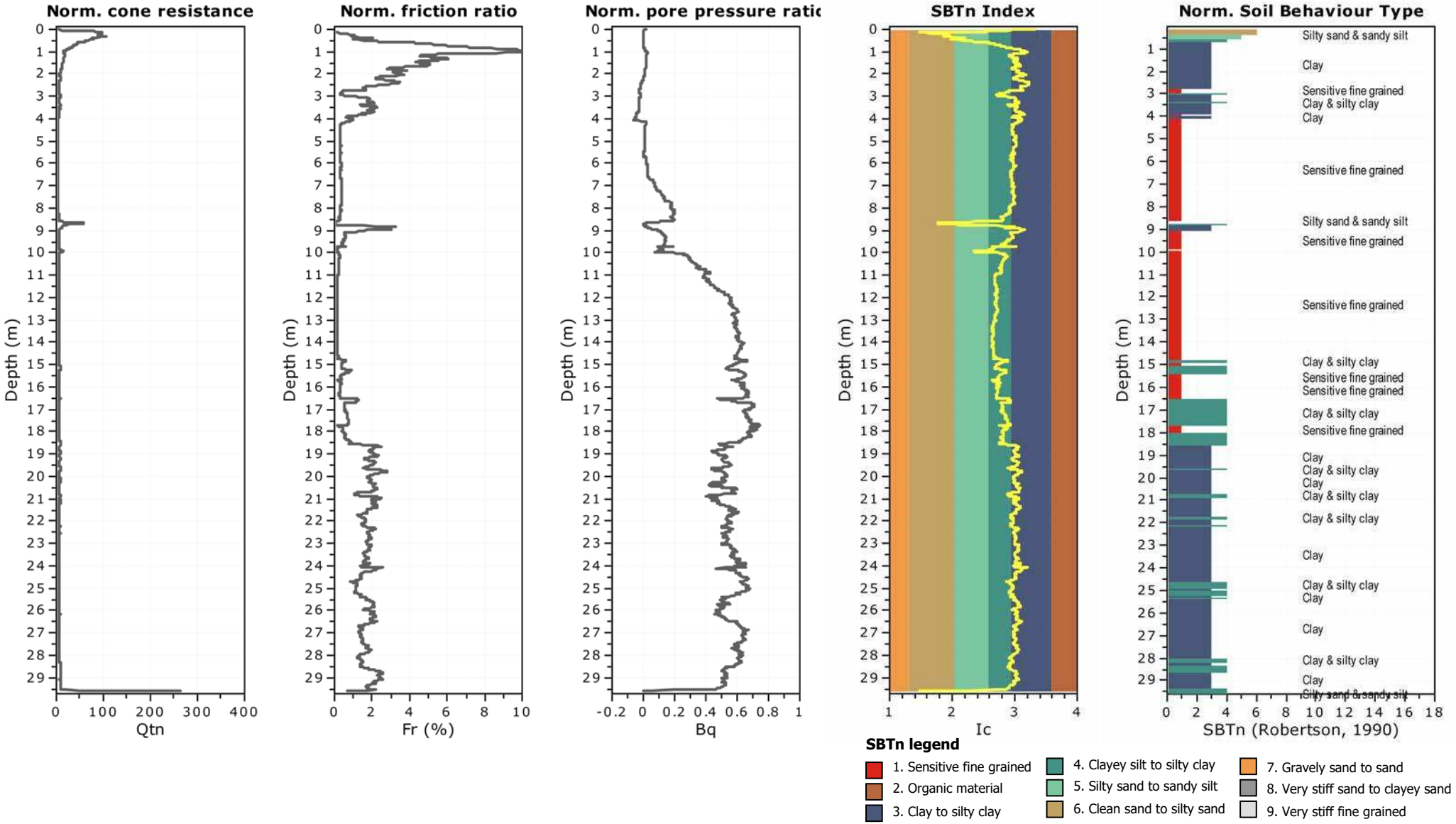


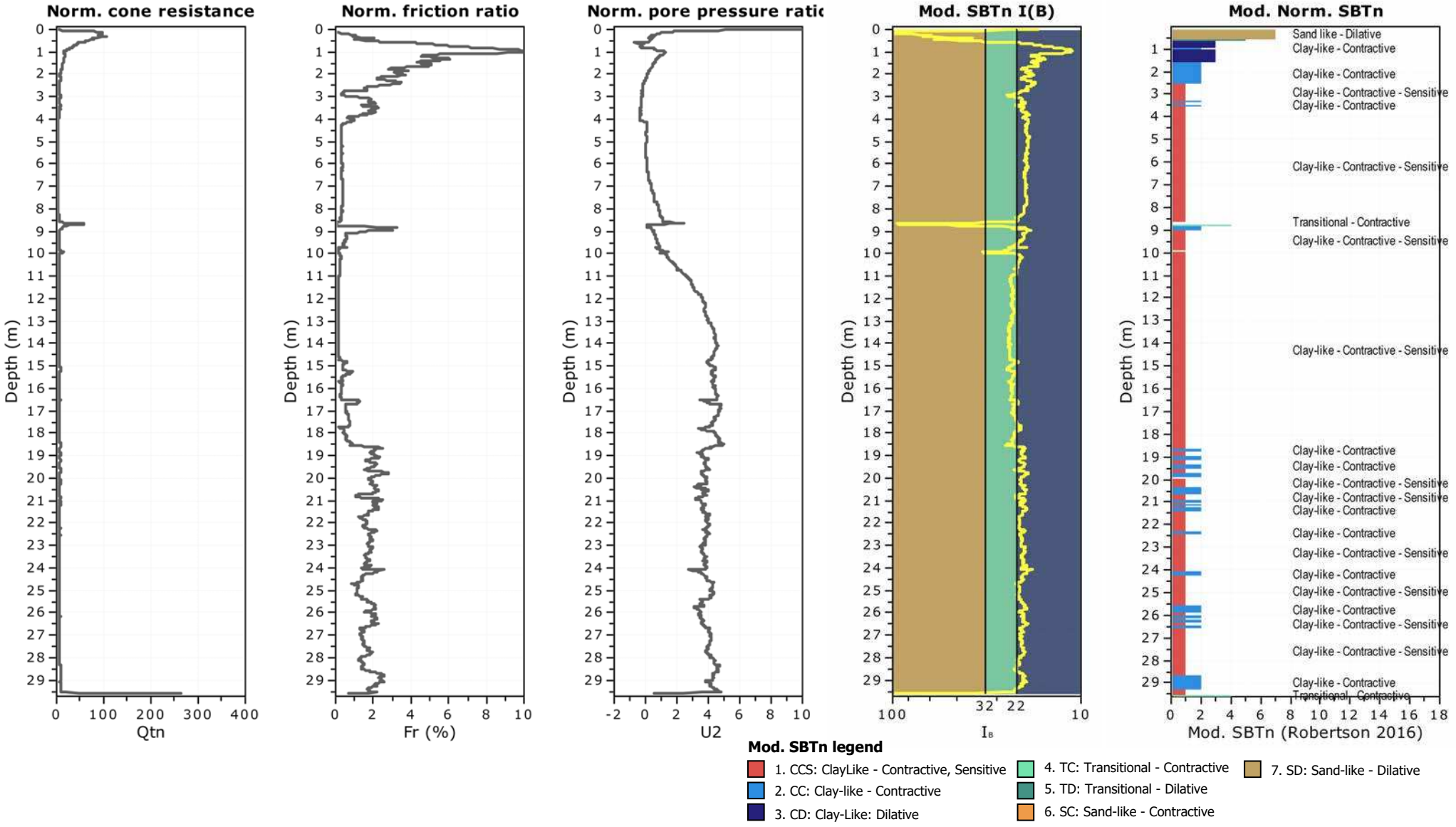




**Fuzzy classifiaction legend**

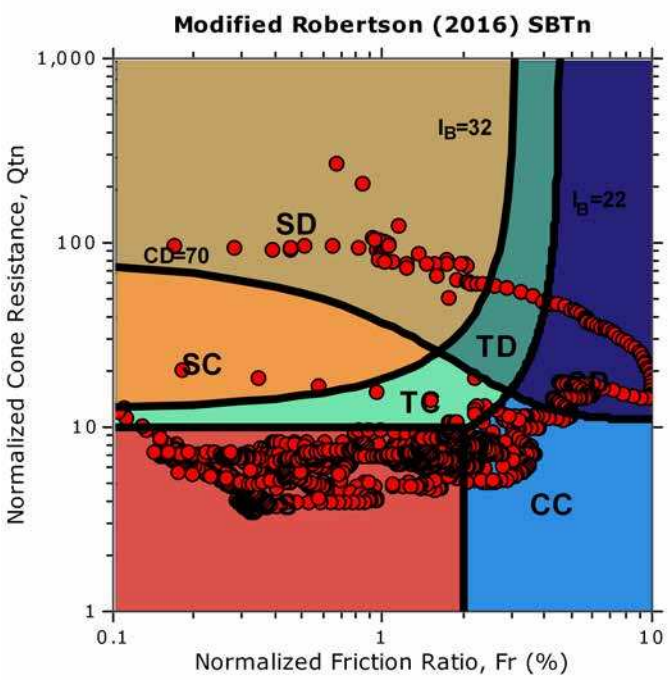
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

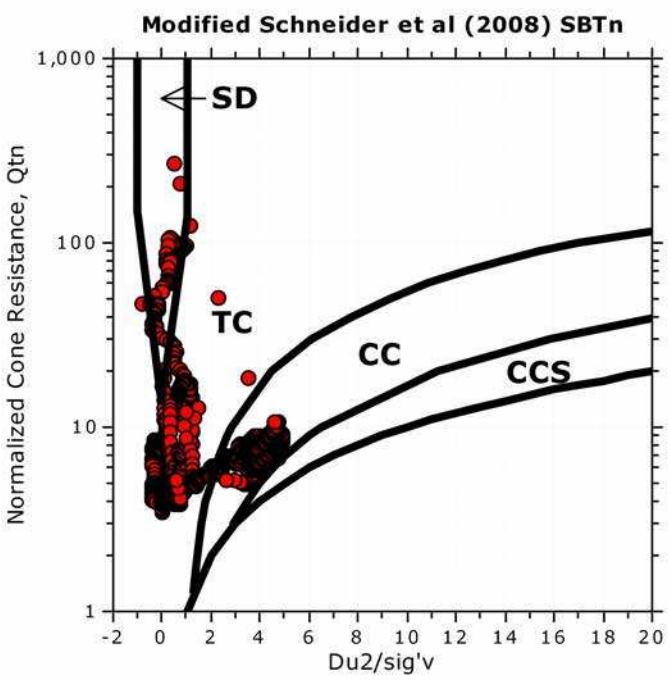

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Clay
Sensitive fine grained
Clay
Sensitive fine grained
Silty sand & sandy silt
Sensitive fine grained
Sensitive fine grained
Clay & silty clay
Sensitive fine grained
Sensitive fine grained
Clay & silty clay
Sensitive fine grained
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

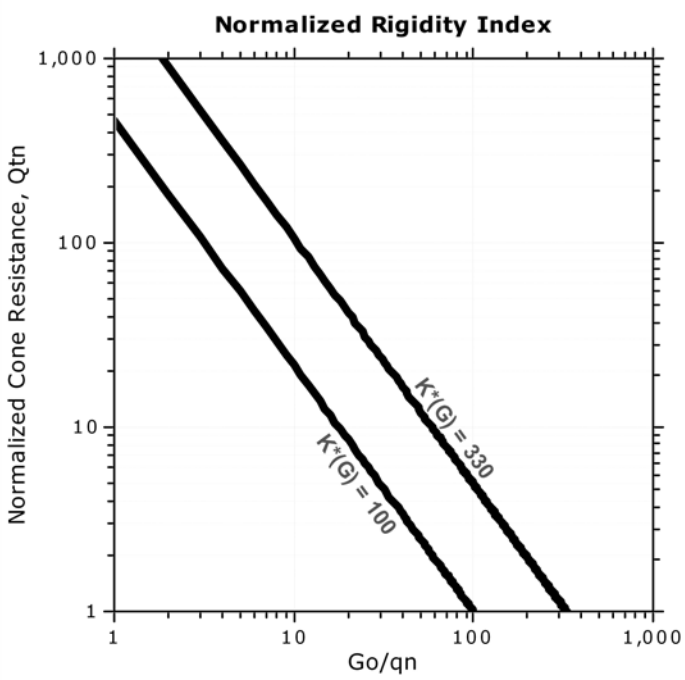

Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Depth (m)
Silty sand & sandy silt
Clay
Sensitive fine grained
Clay & silty clay
Clay
Sensitive fine grained
Silty sand & sandy silt
Sensitive fine grained
Sensitive fine grained
Clay & silty clay
Sensitive fine grained
Sensitive fine grained
Clay & silty clay
Sensitive fine grained
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay
Clay & silty clay
Clay
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Iв
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

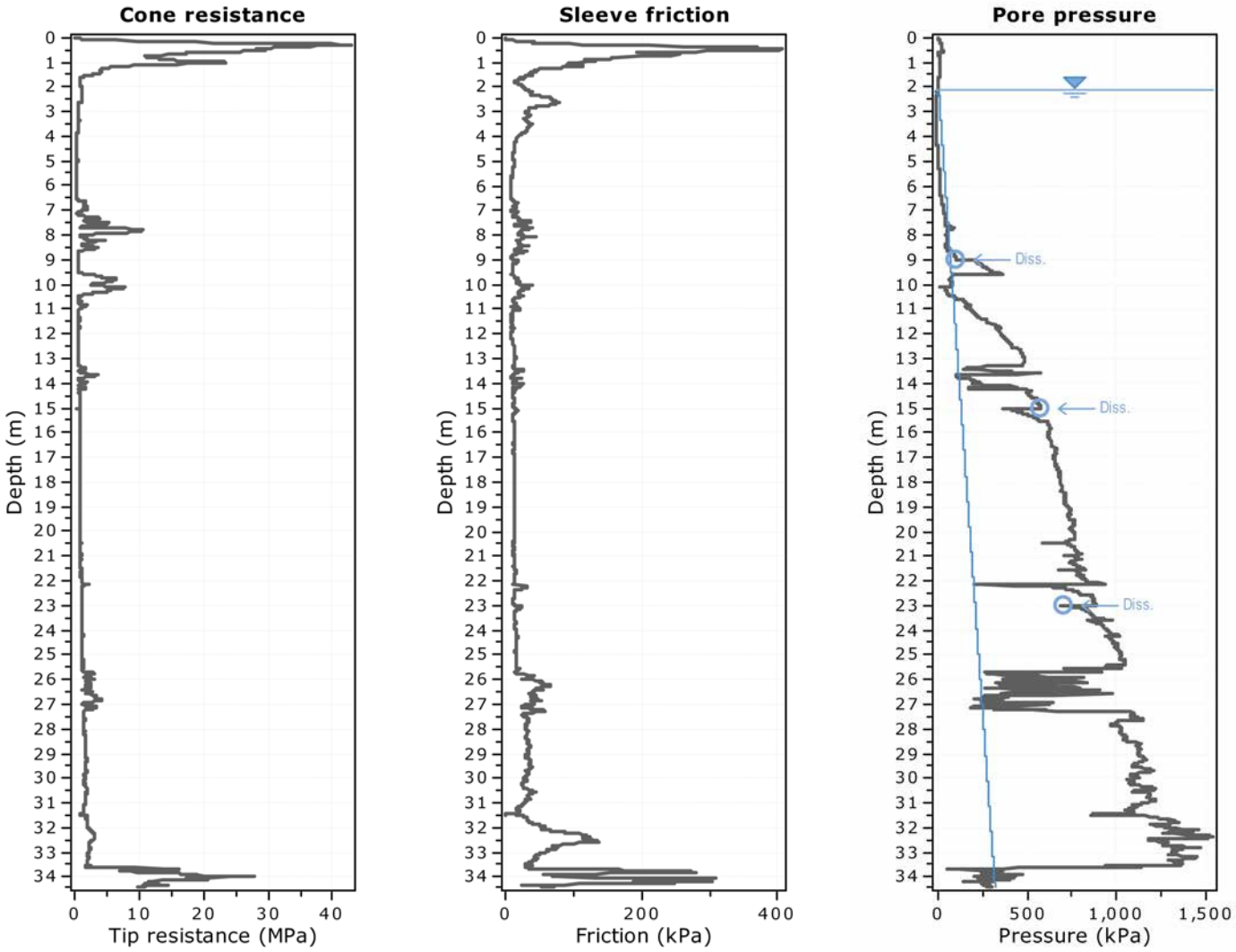


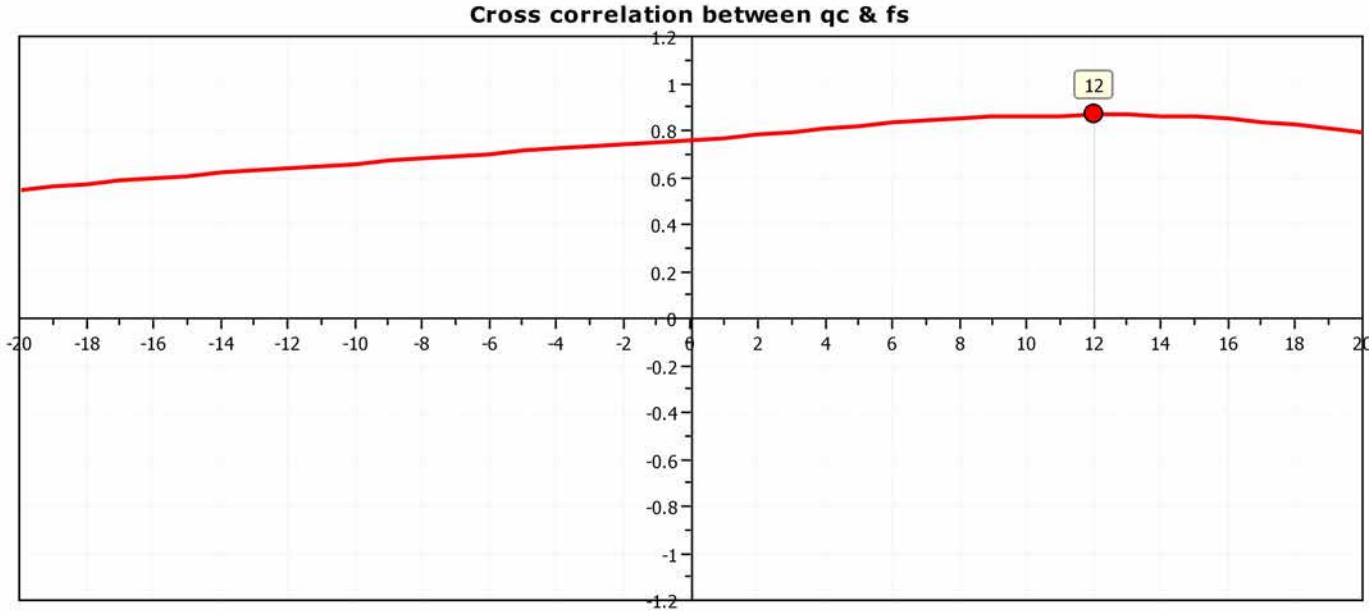




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

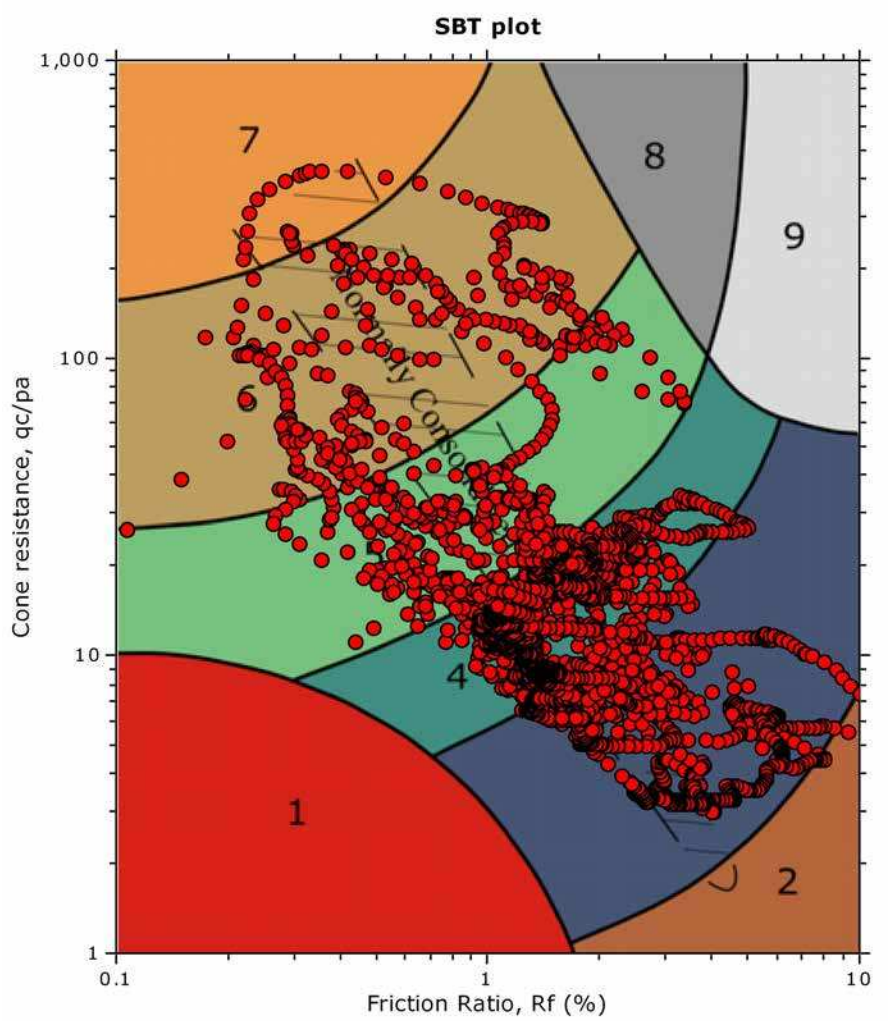
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

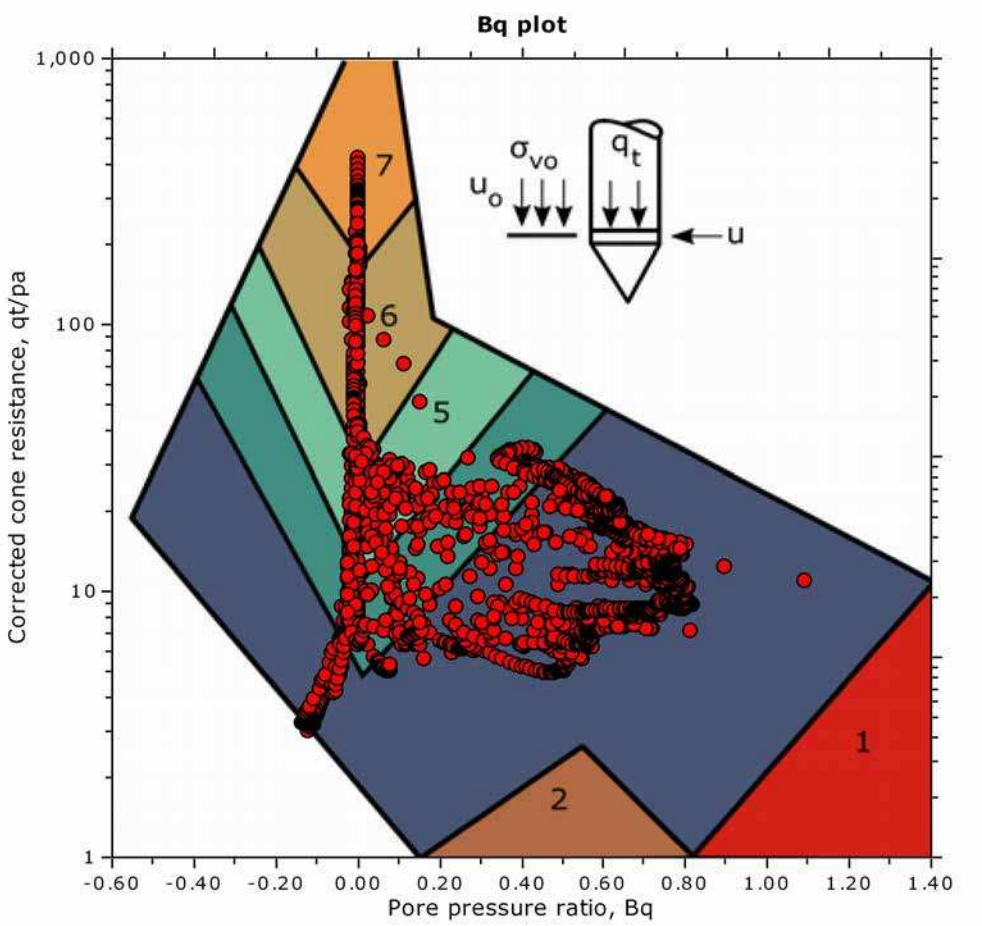



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

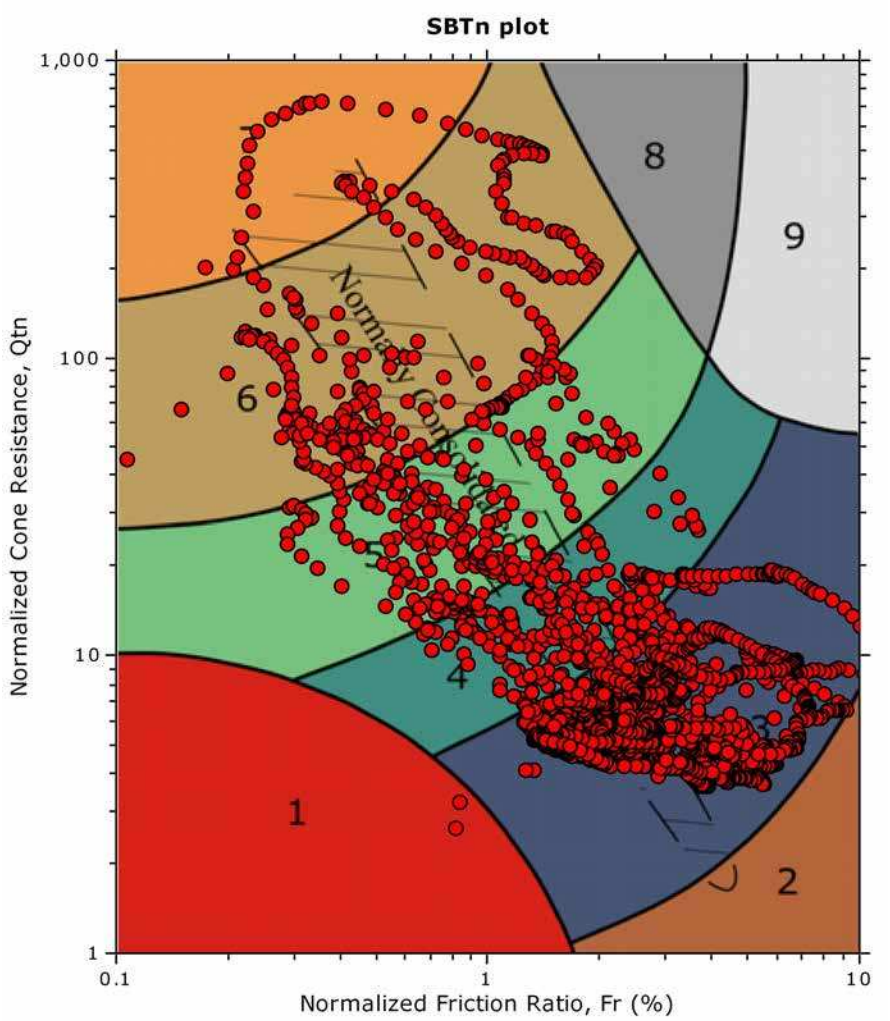


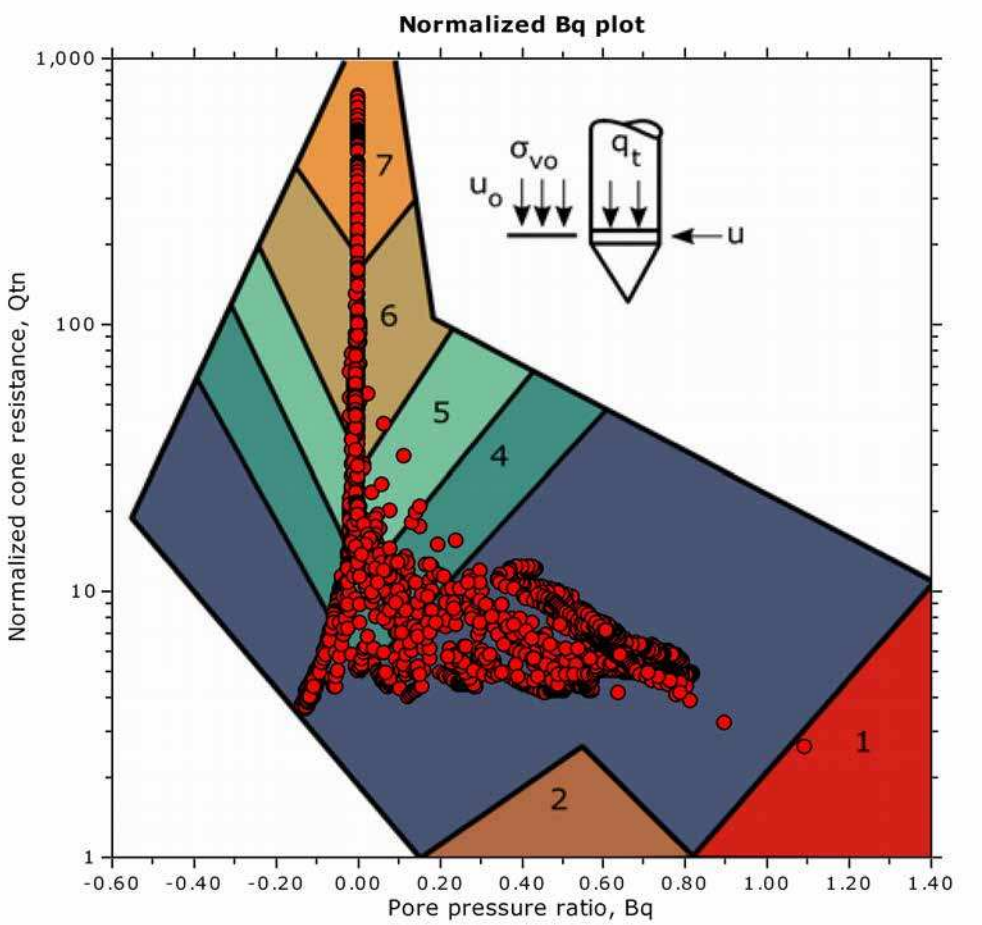




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

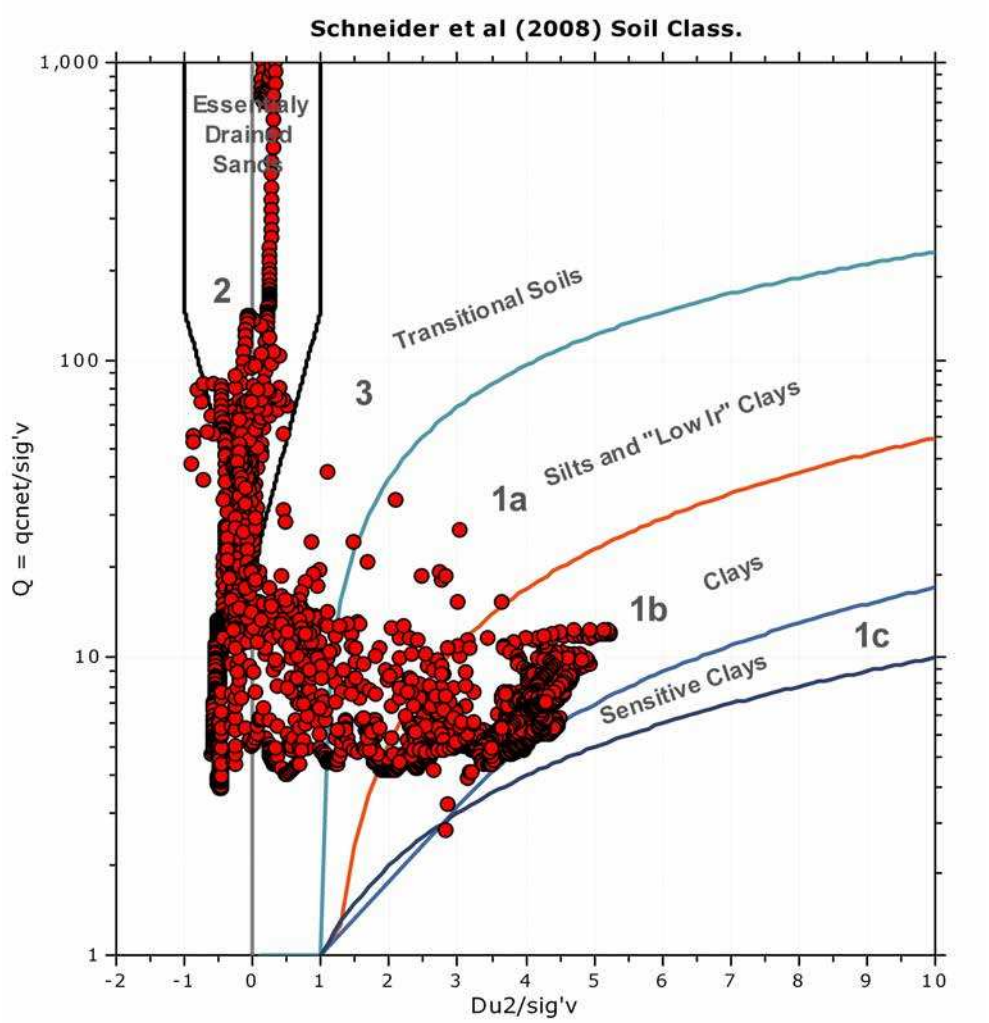


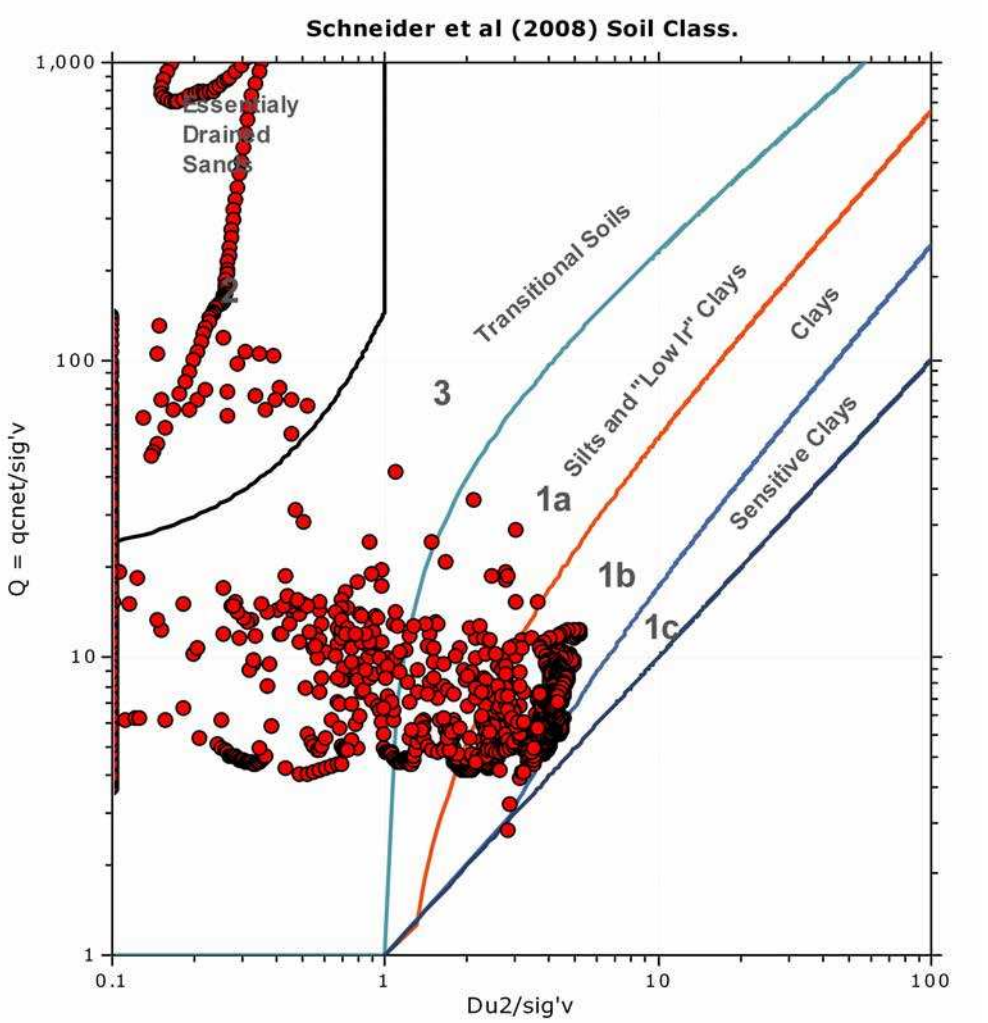



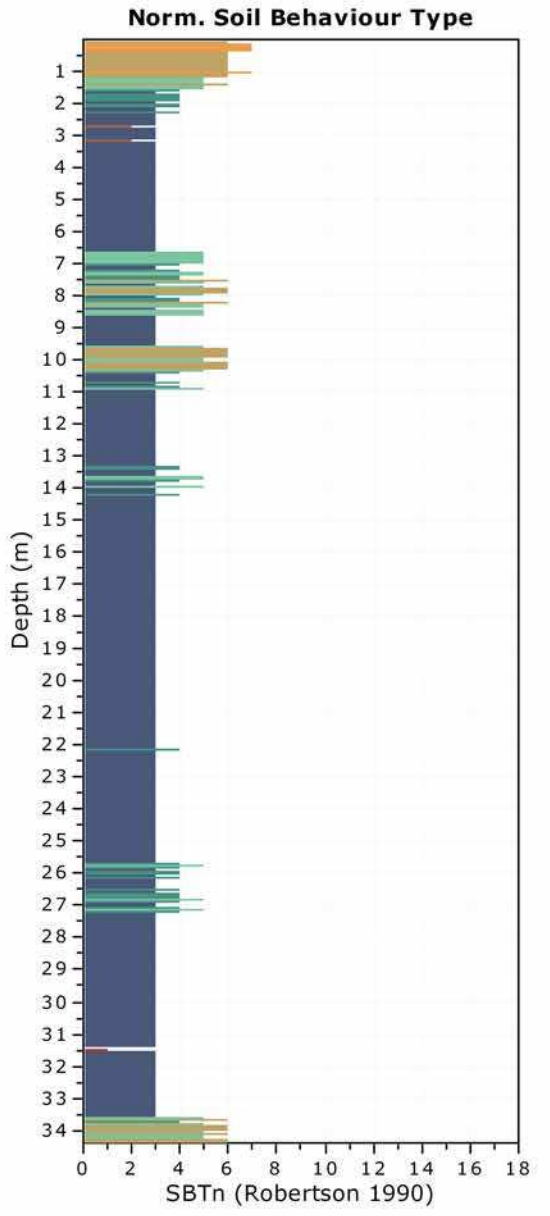

**SBTn legend**

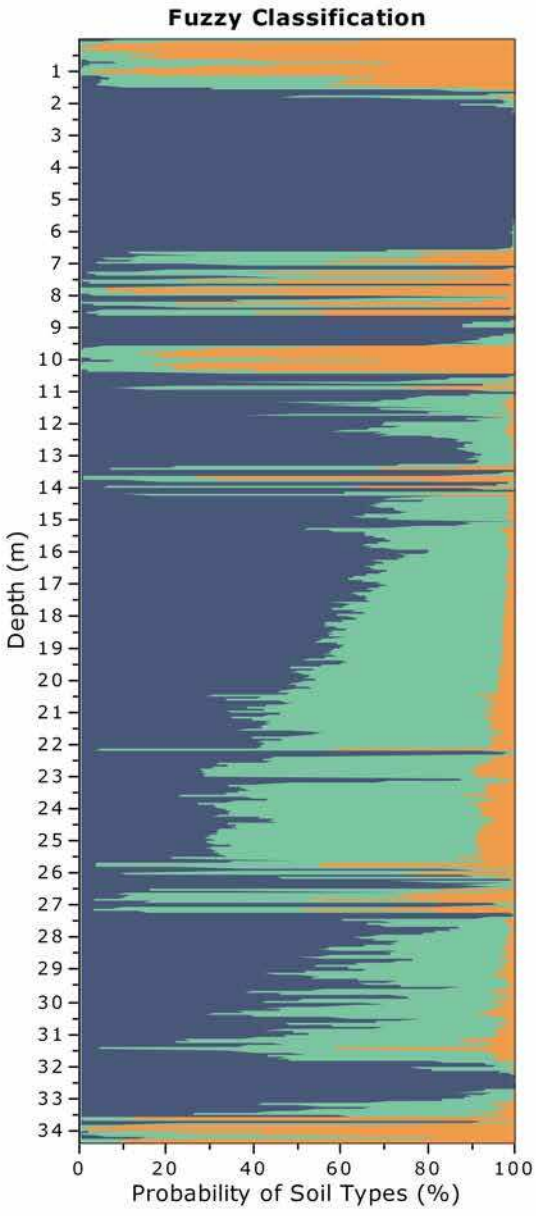
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



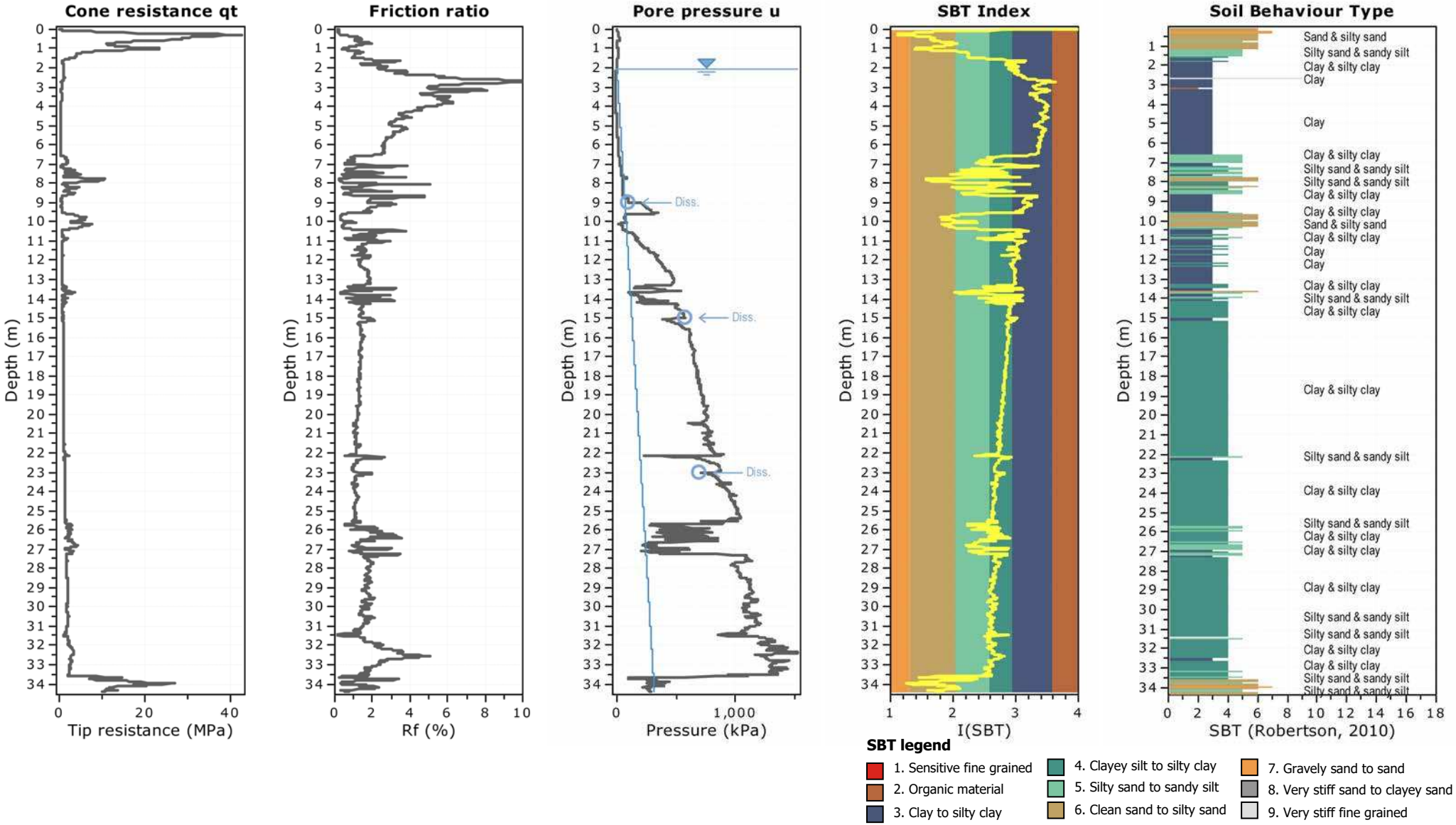



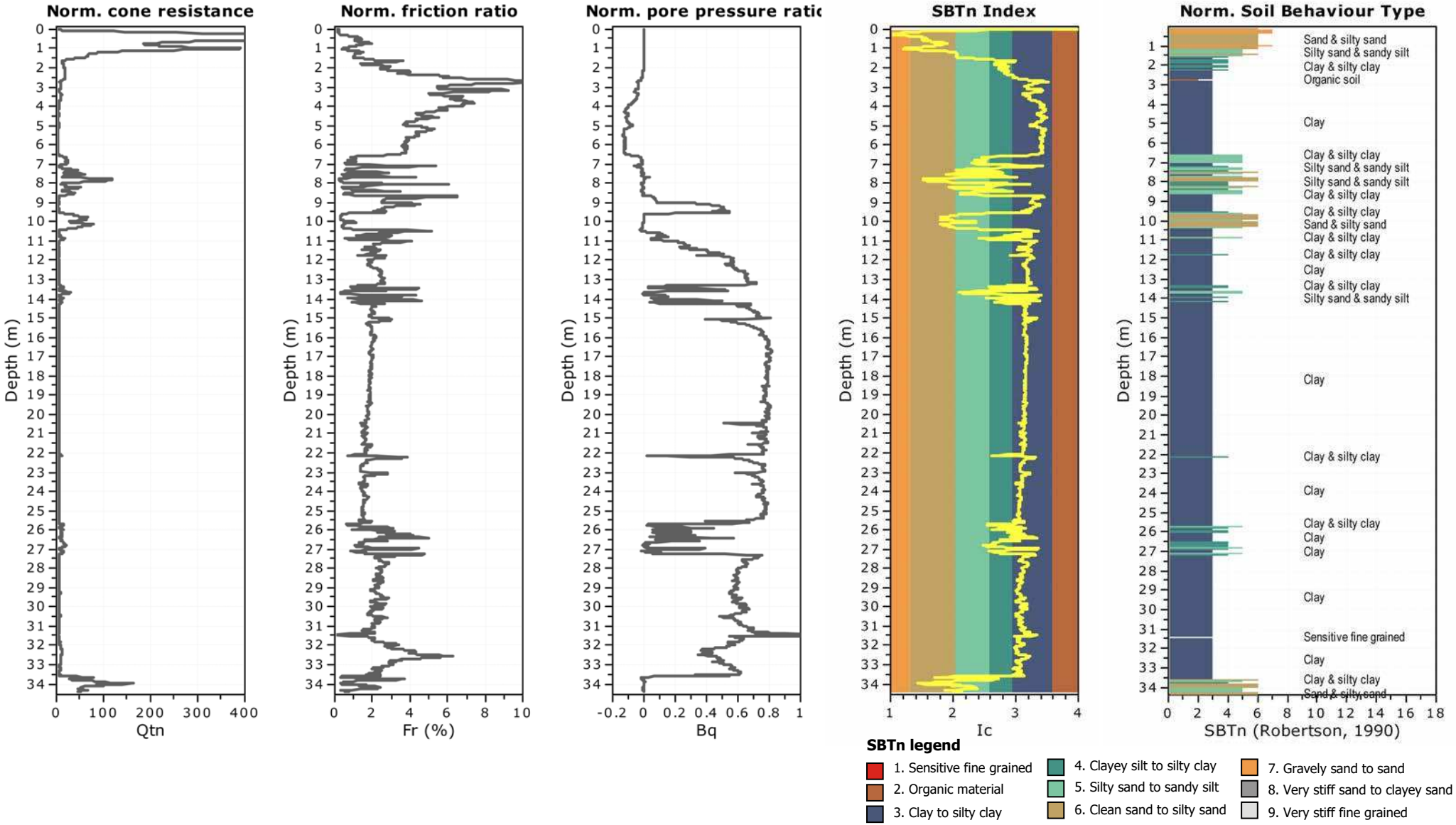


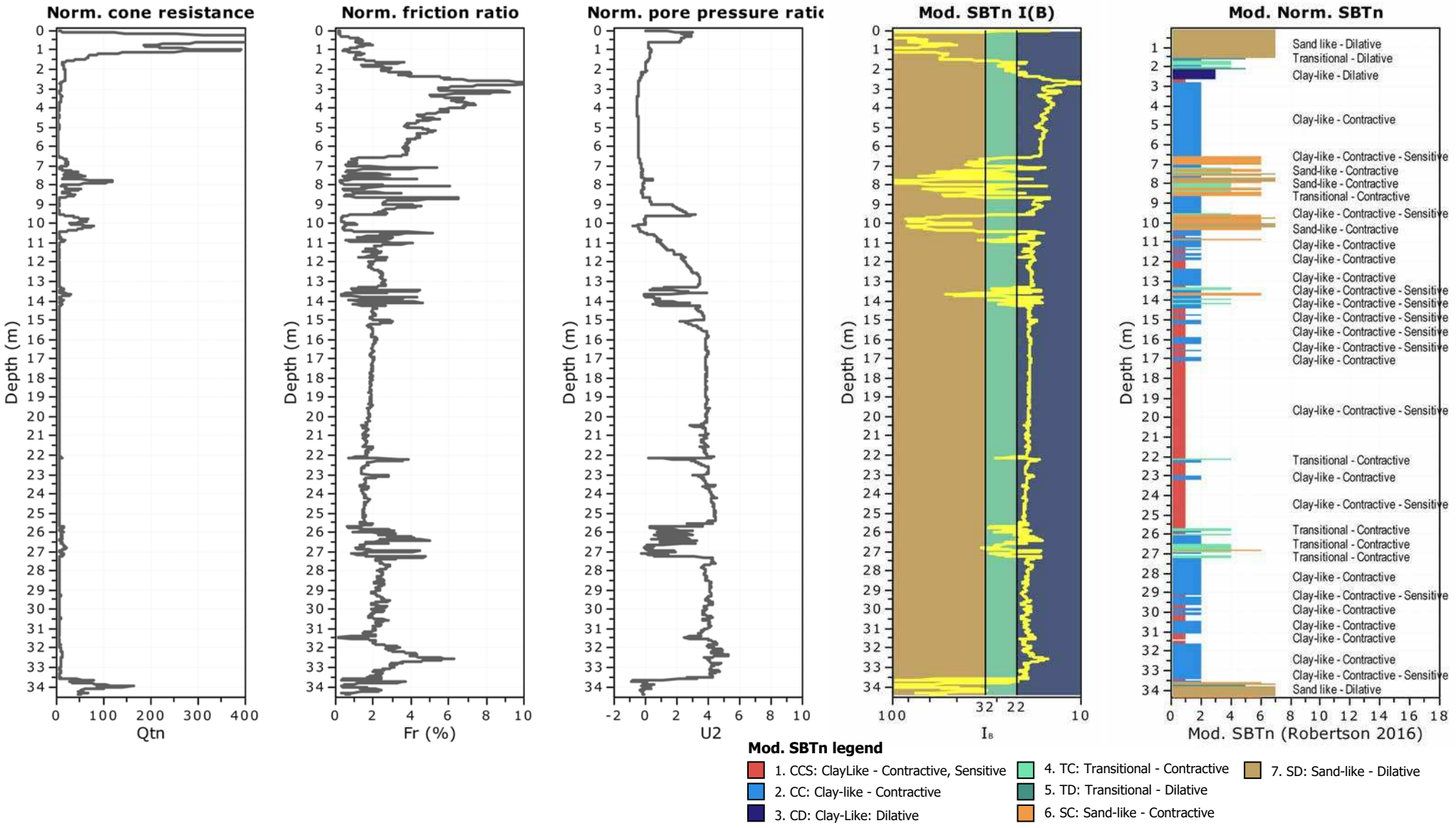




**Fuzzy classifiaction legend**

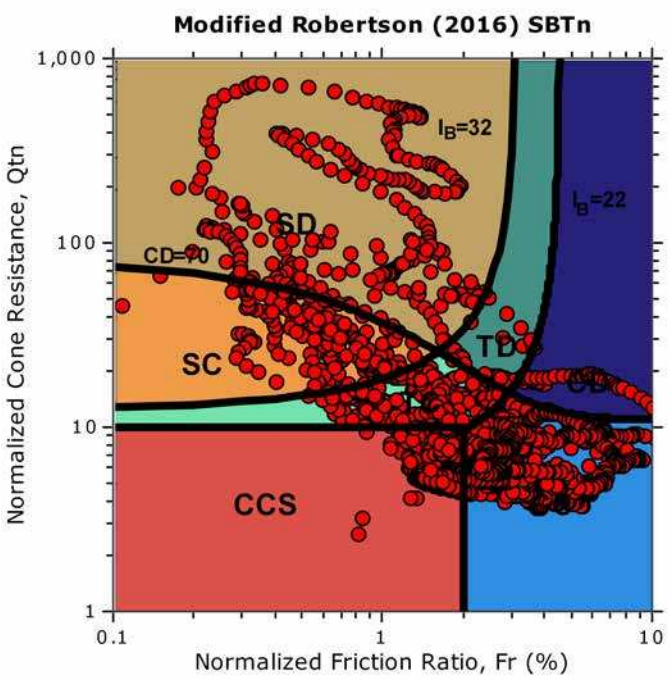
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

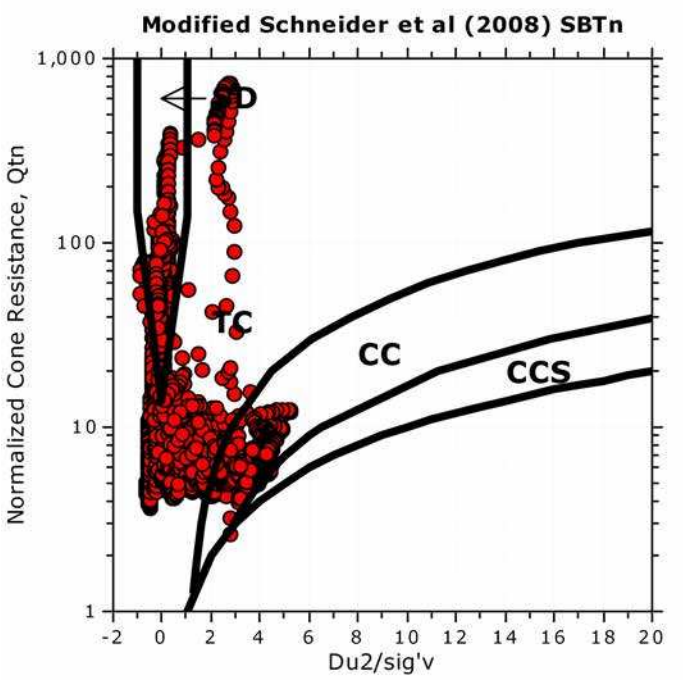

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Diss.
Diss.
Diss.
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Clay
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Sand & silty sand
Clay & silty clay
Clay
Clay
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

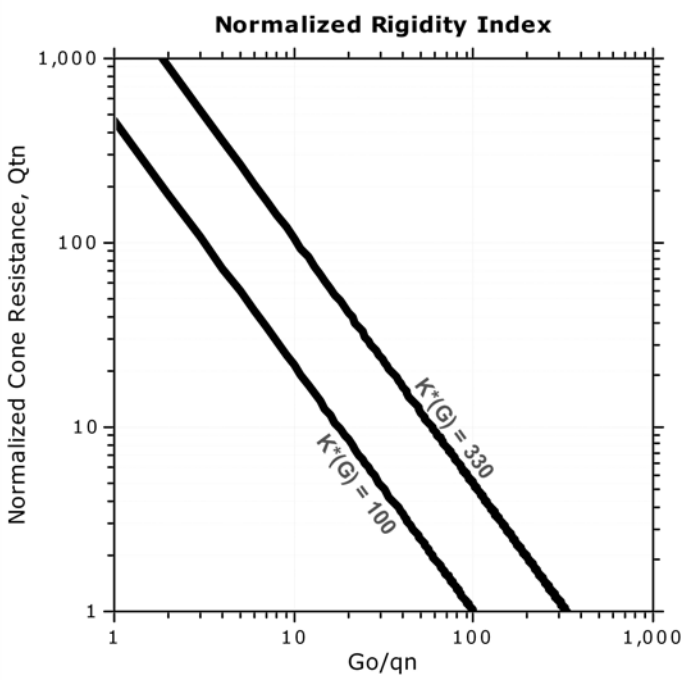

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Organic soil
Clay
Sensitive fine grained
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Iв
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Sand-like - Contractive
Transitional - Contractive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

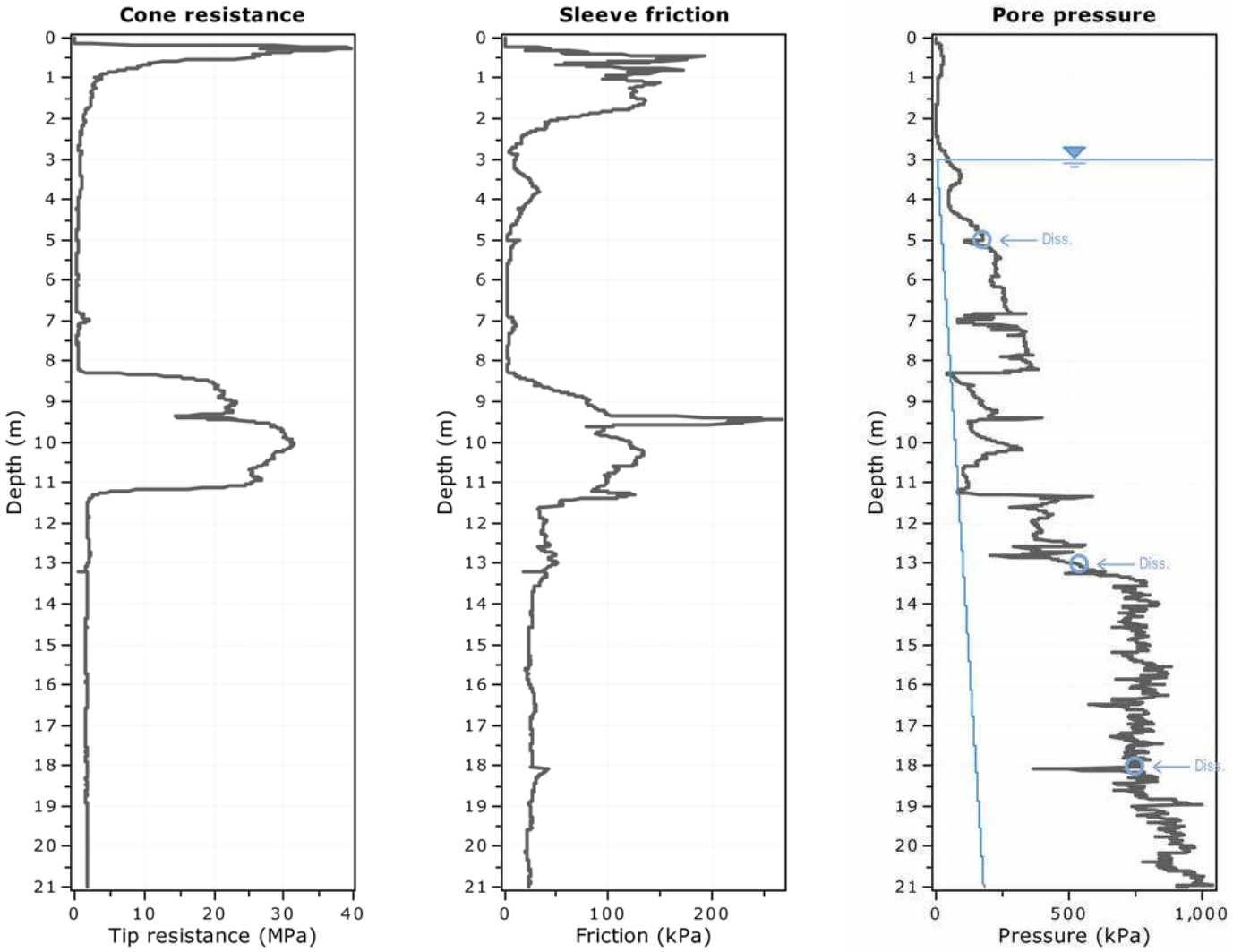


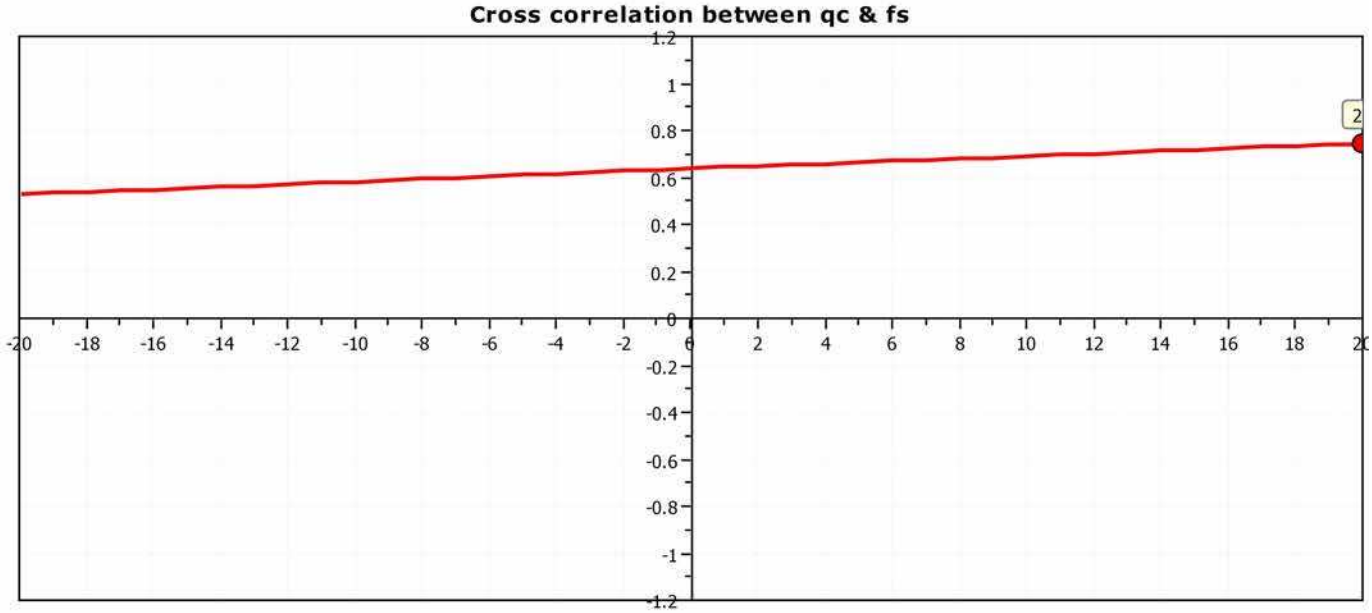




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

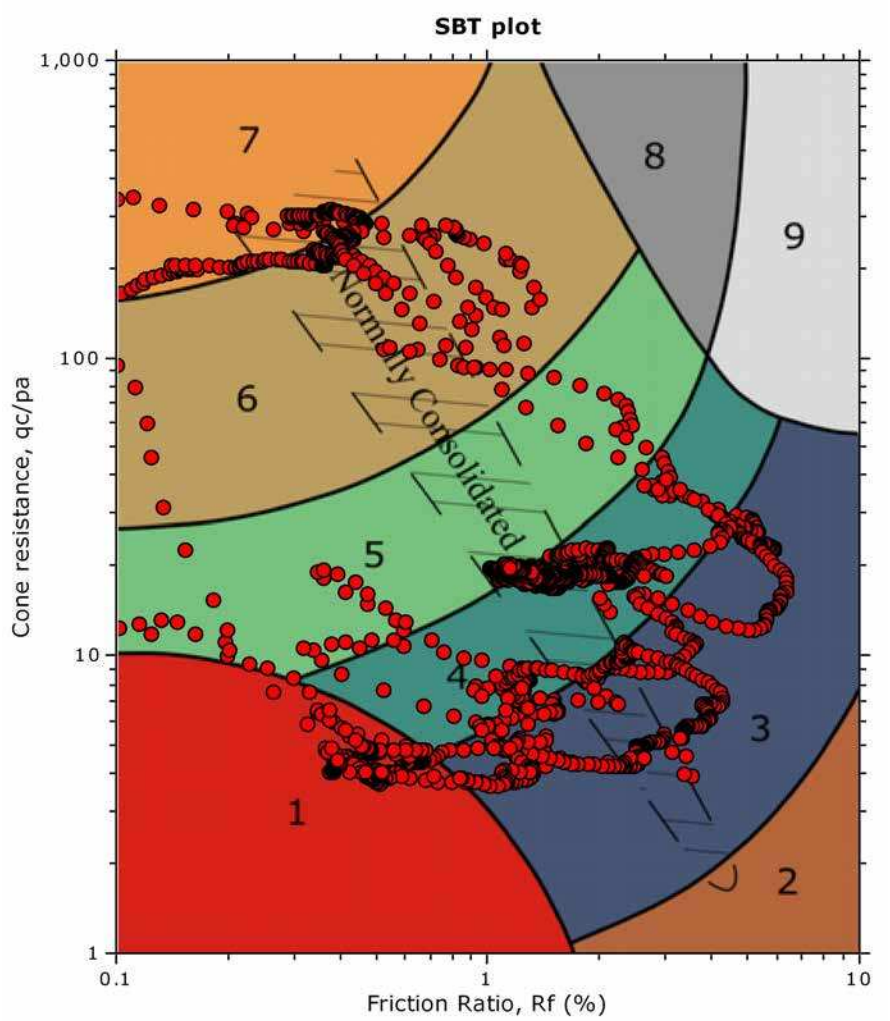
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

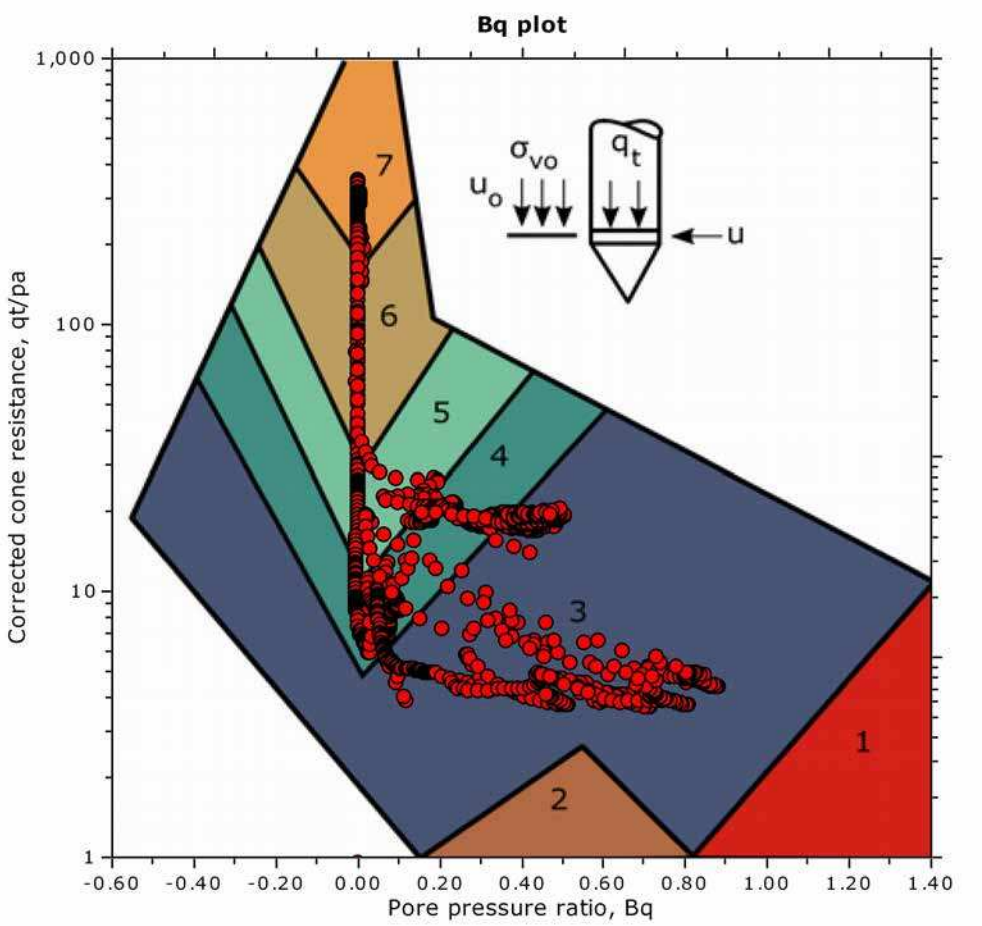



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

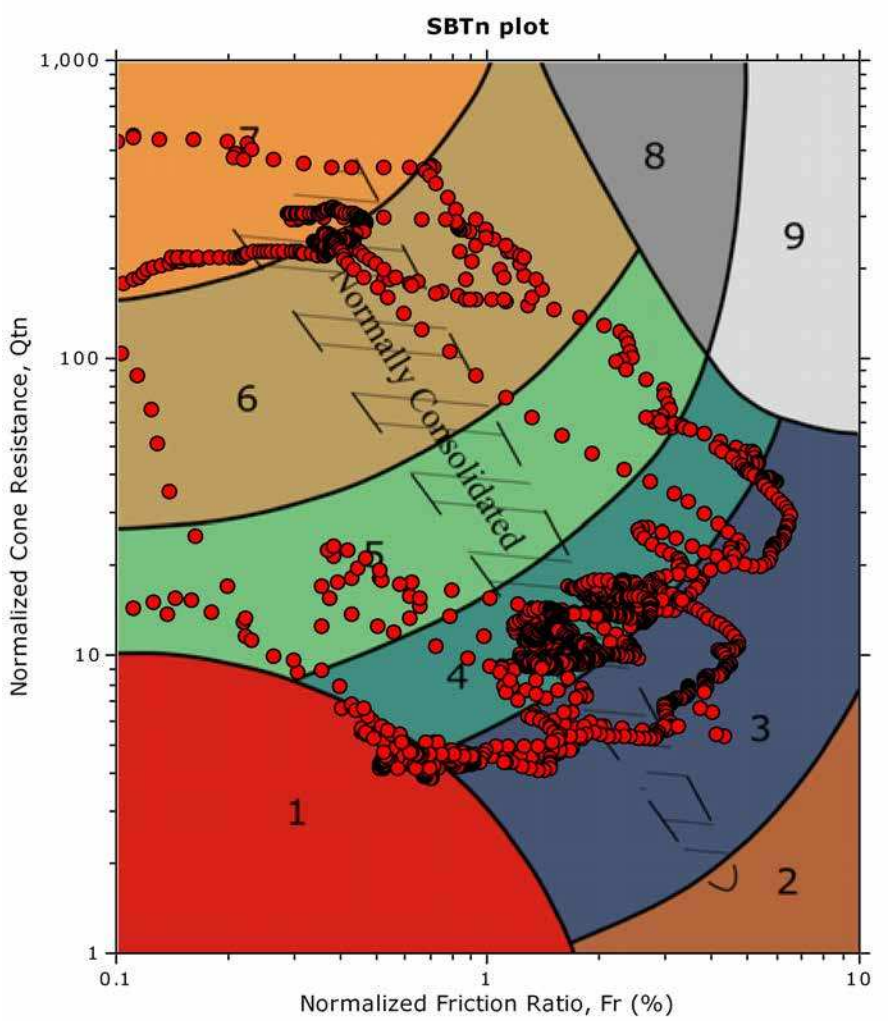


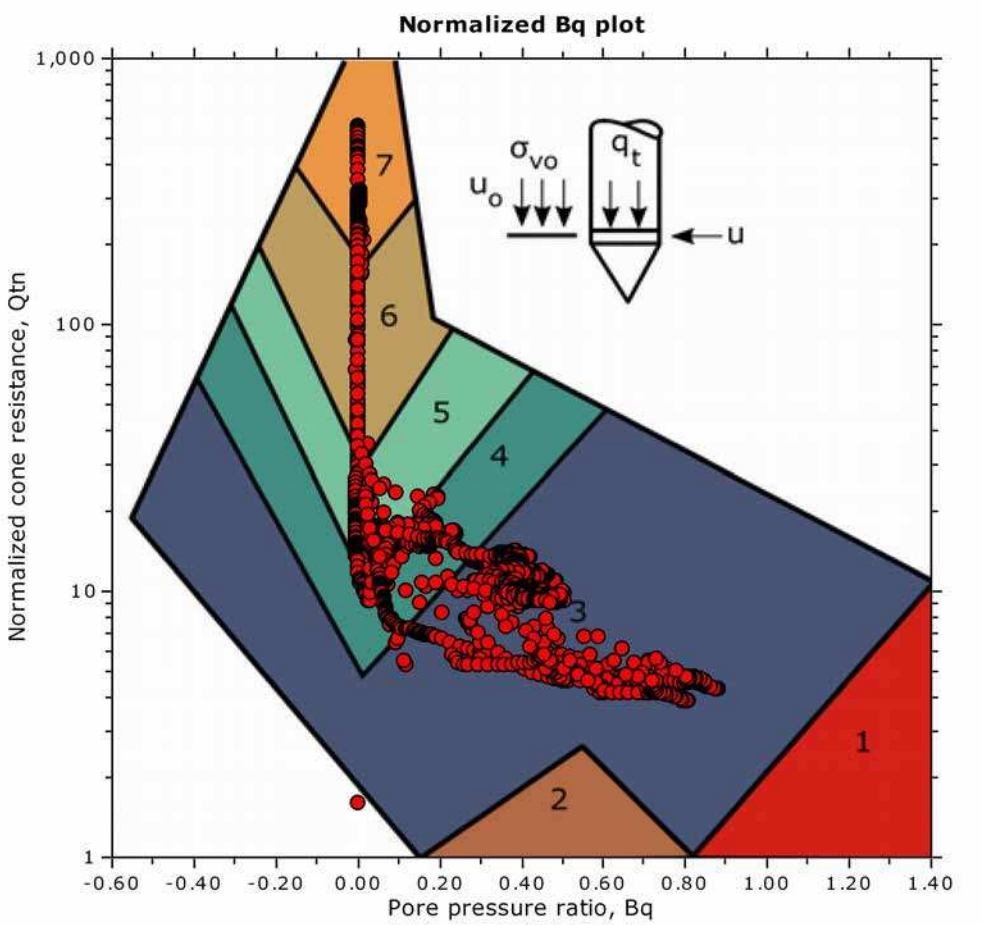




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

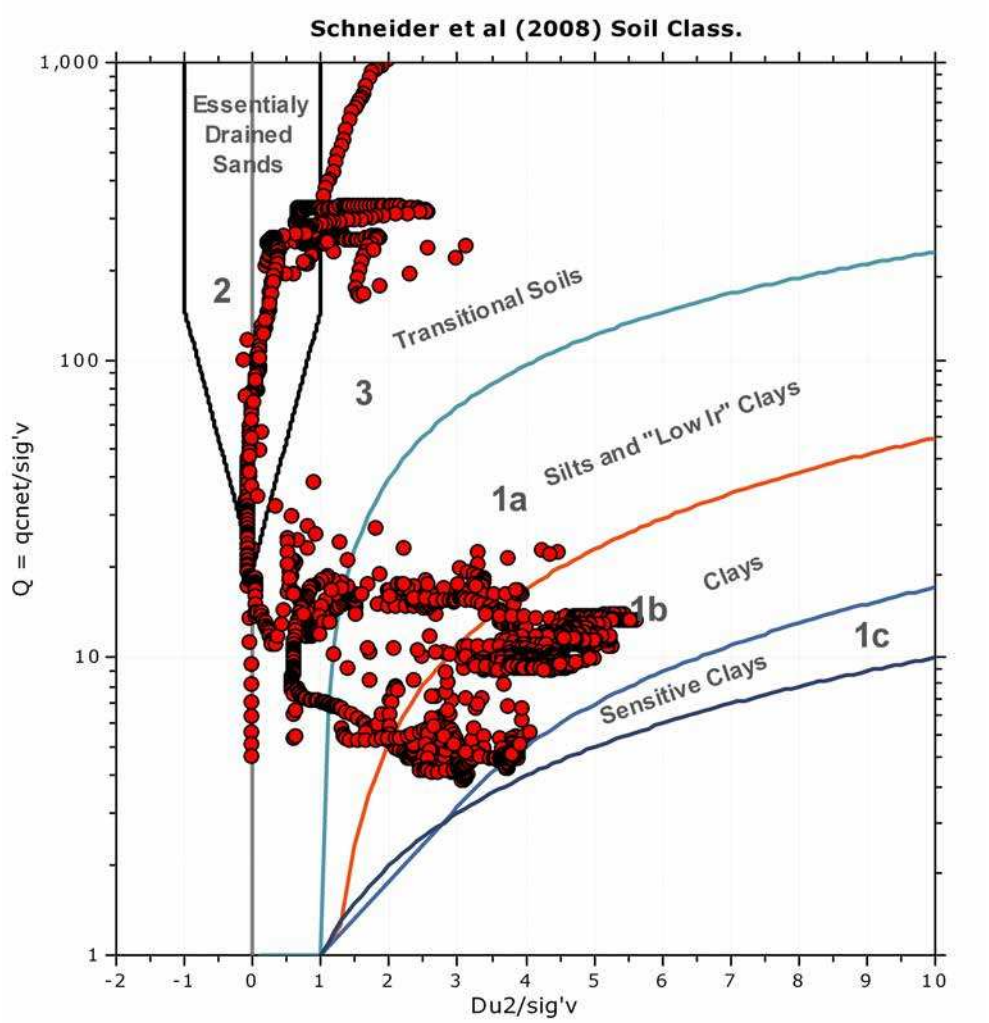


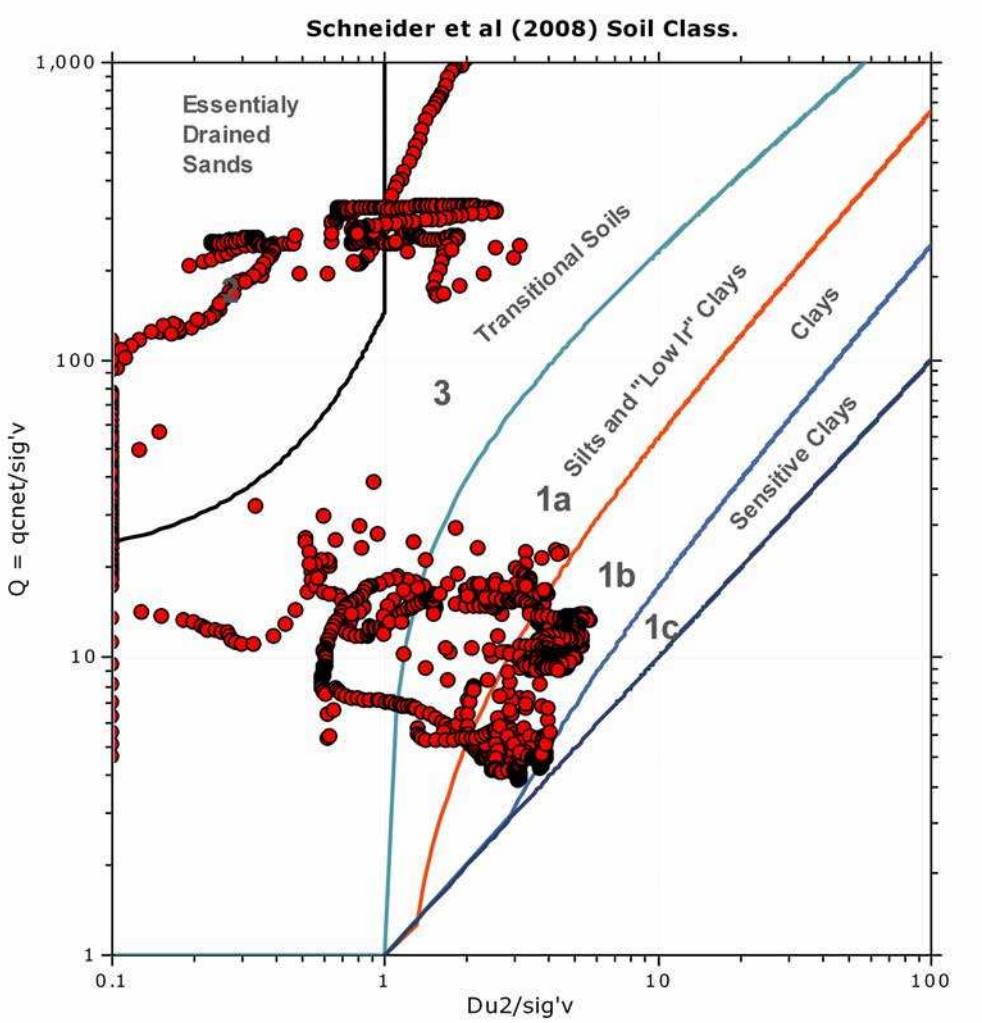



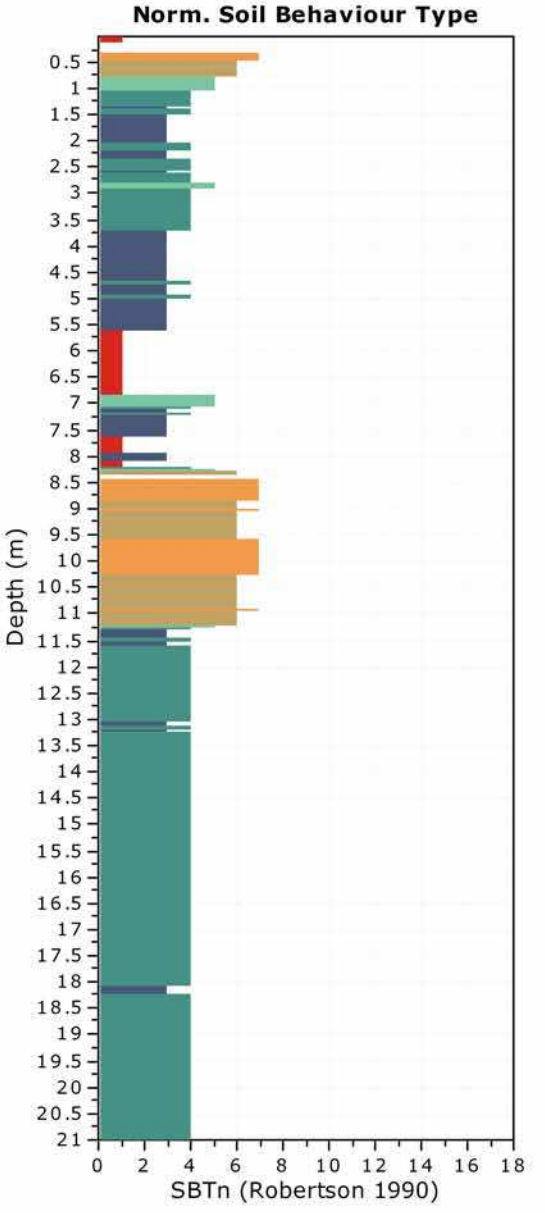

**SBTn legend**

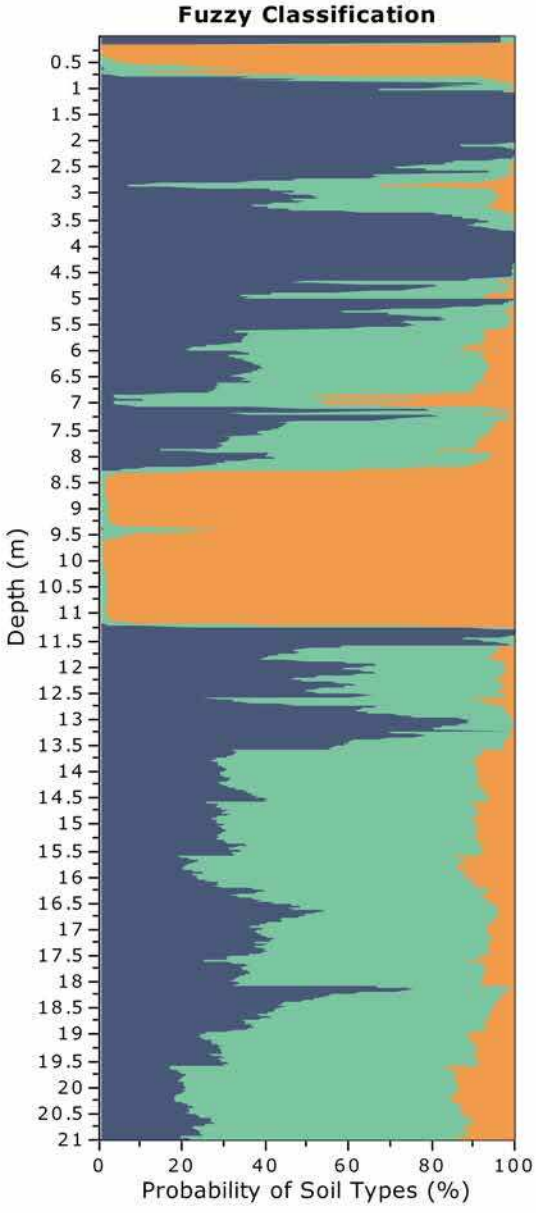
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



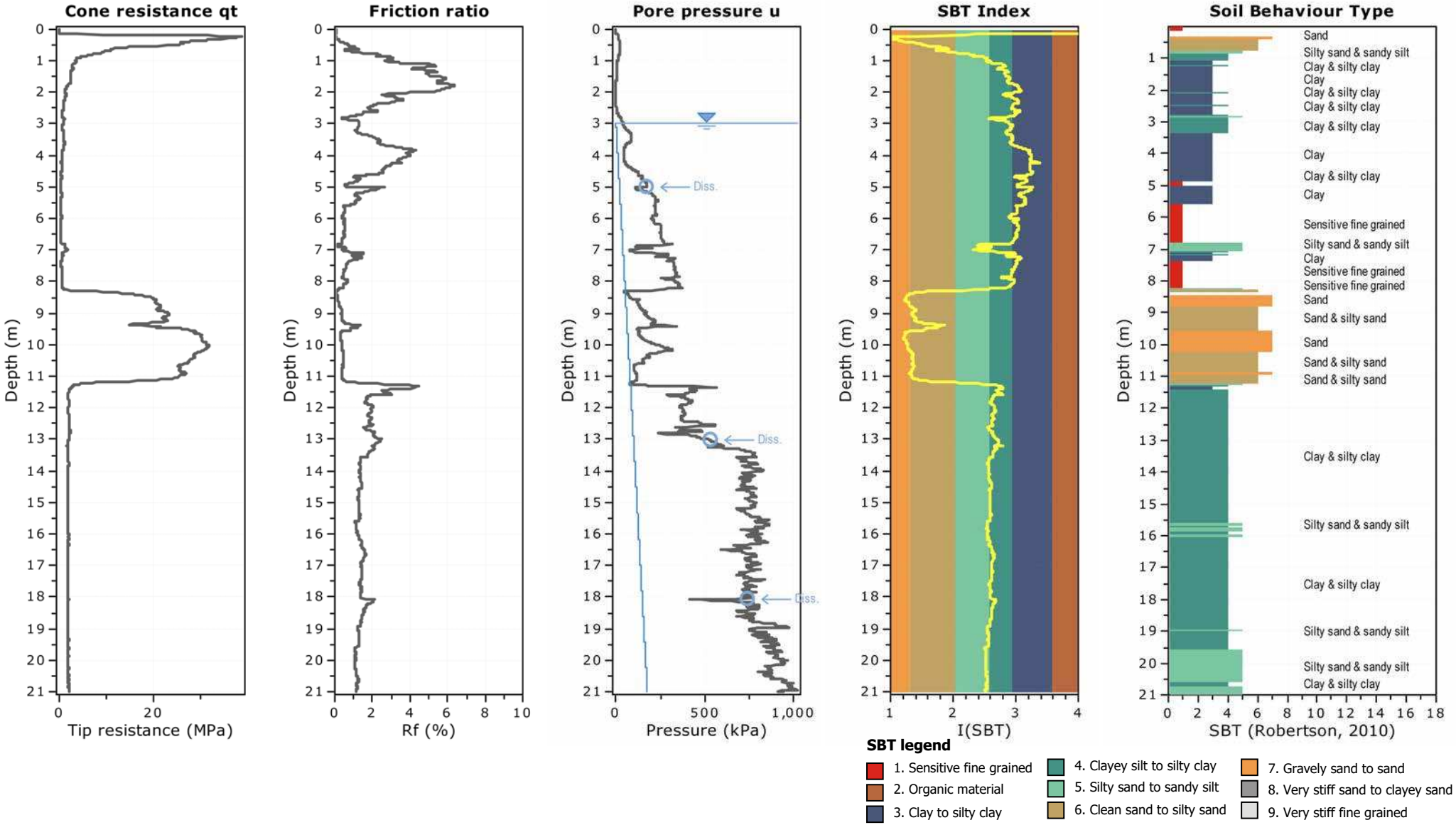



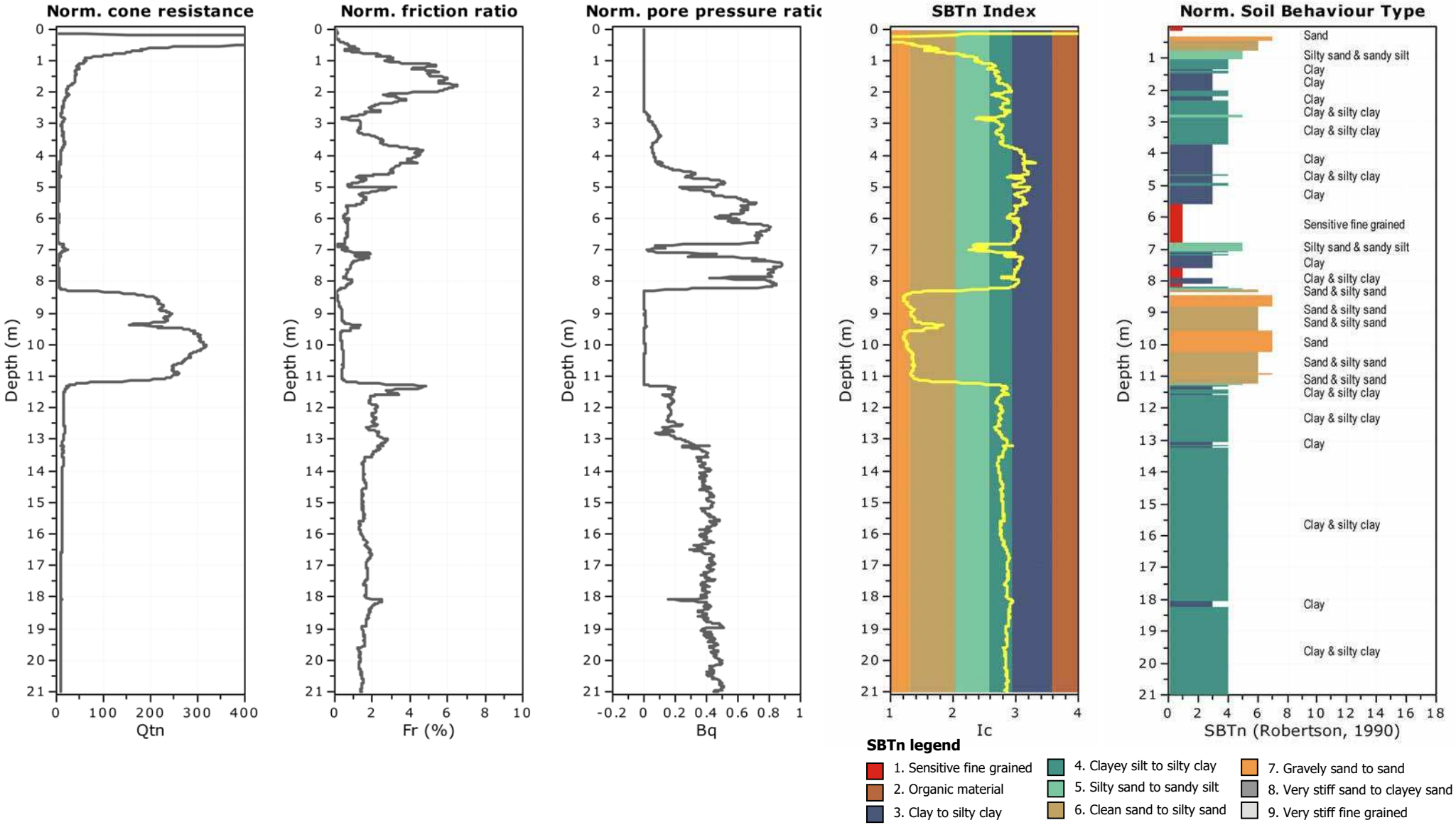


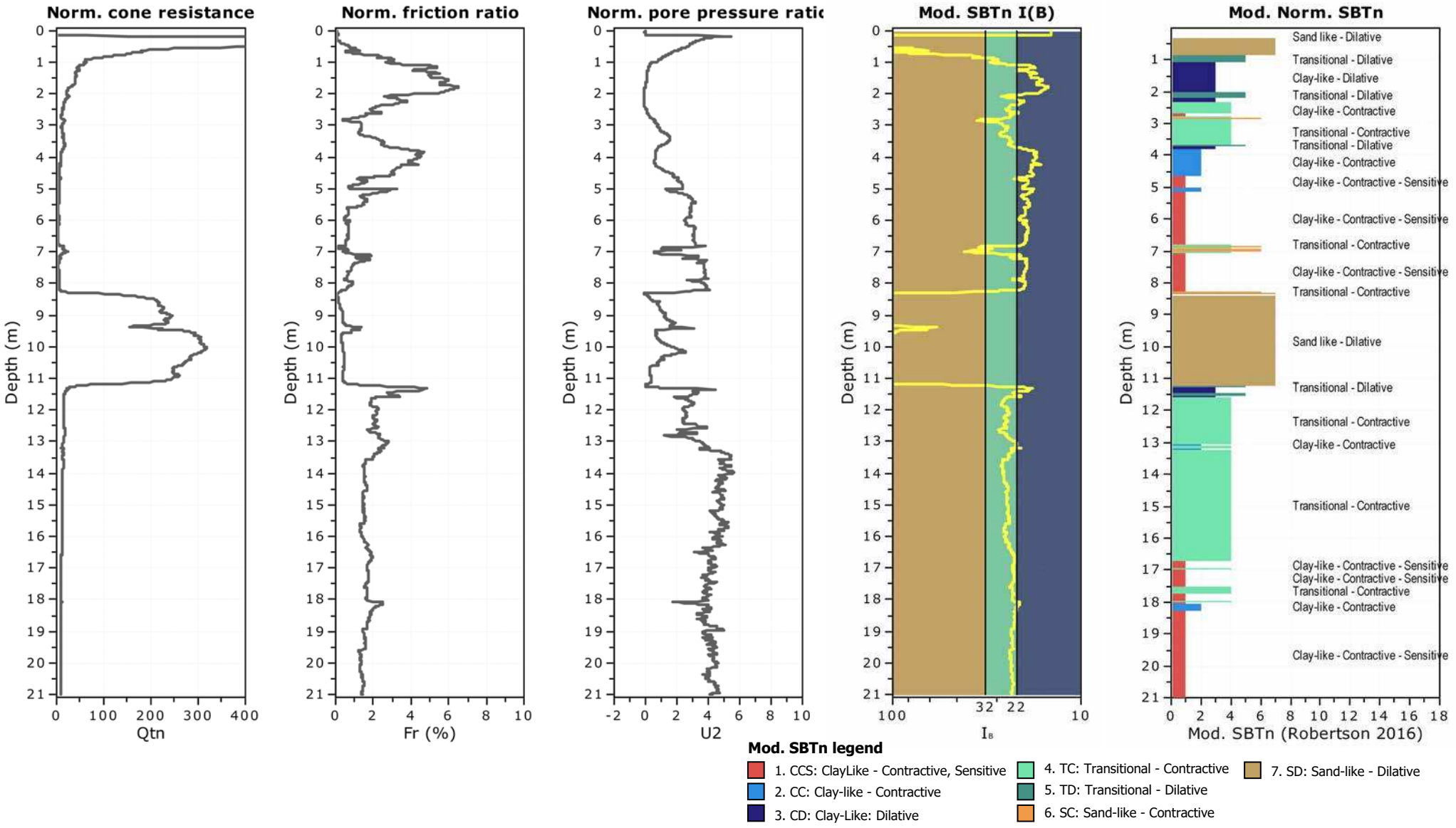




**Fuzzy classifiaction legend**

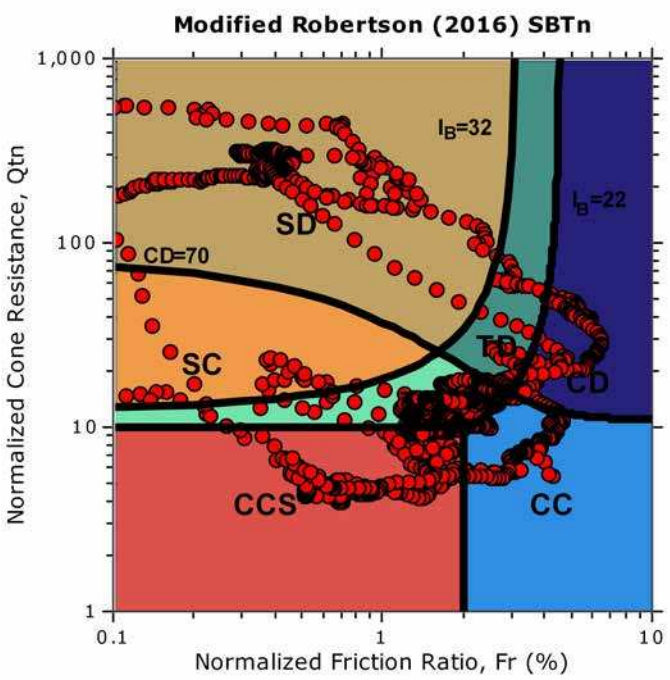
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

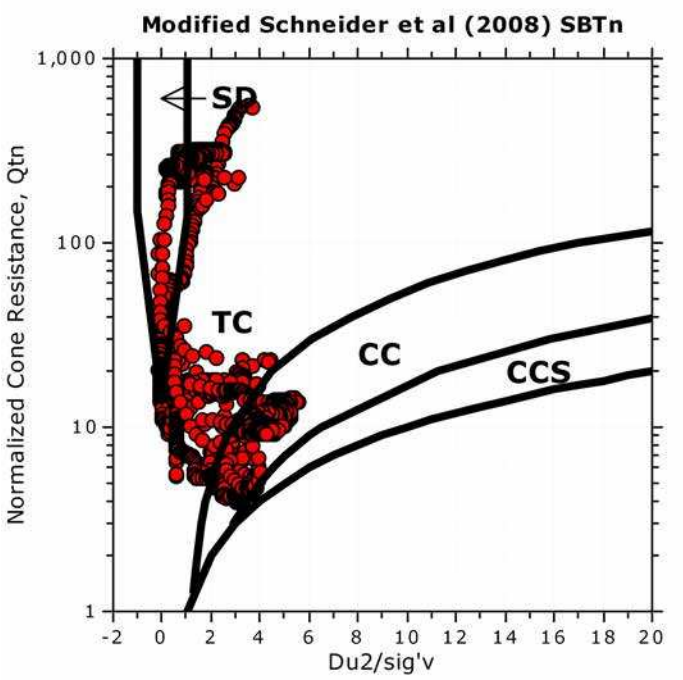

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Diss.
Diss.
Diss.
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
Sand
Silty sand & sandy silt
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Sensitive fine grained
Silty sand & sandy silt
Clay
Sensitive fine grained
Sensitive fine grained
Sand
Sand & silty sand
Sand
Sand & silty sand
Sand & silty sand
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
SBT (Robertson, 2010)
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

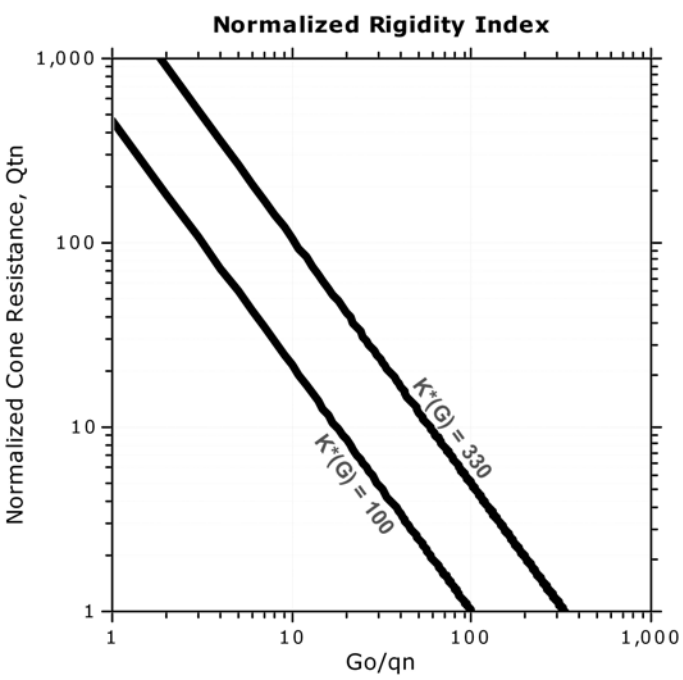

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand
Silty sand & sandy silt
Clay
Clay
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Sensitive fine grained
Silty sand & sandy silt
Clay
Clay & silty clay
Sand & silty sand
Sand & silty sand
Sand & silty sand
Sand
Sand & silty sand
Sand & silty sand
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Ic
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Transitional - Dilative
Clay-like - Contractive
Transitional - Contractive
Transitional - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Sand like - Dilative
Transitional - Dilative
Transitional - Contractive
Clay-like - Contractive
Transitional - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

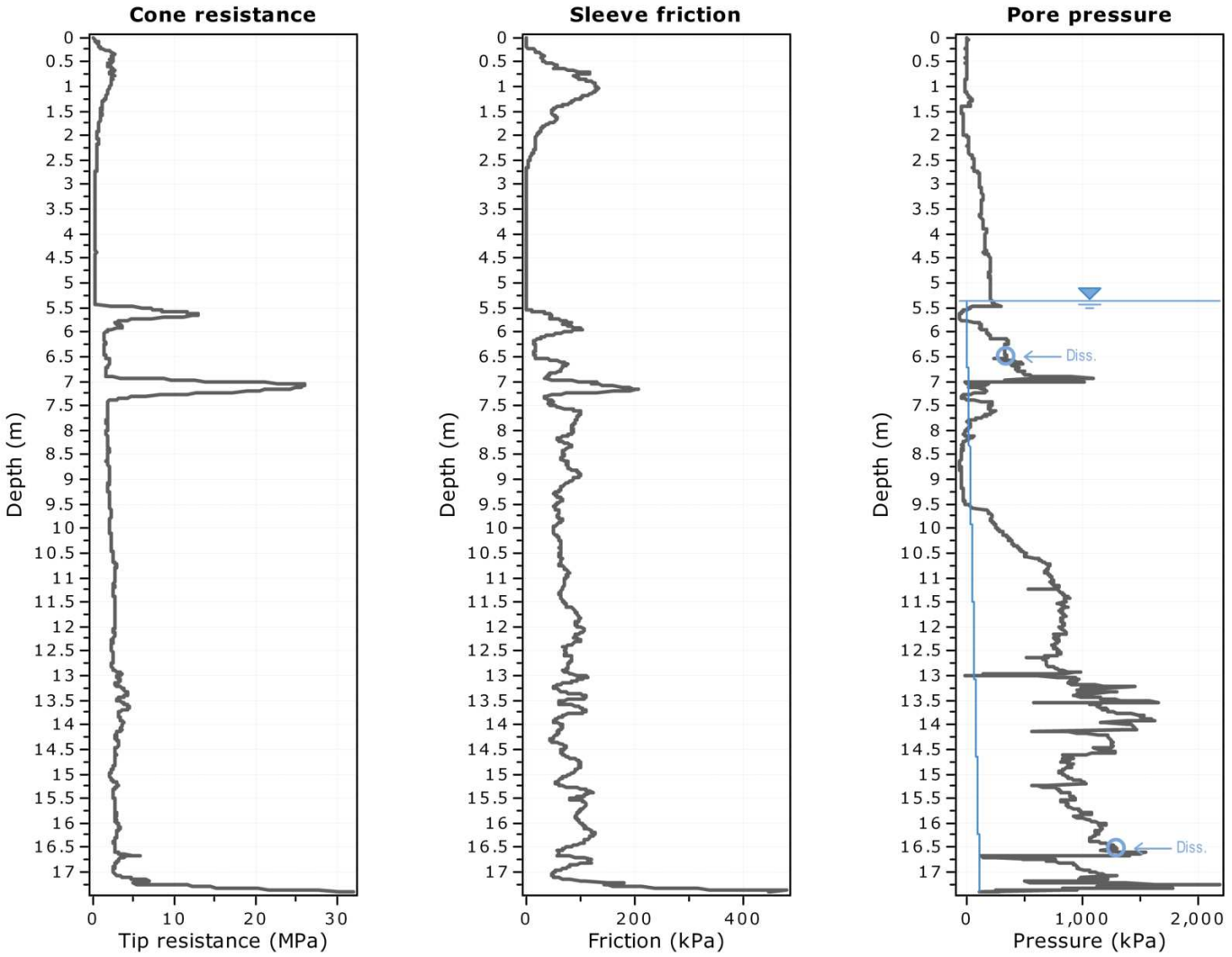


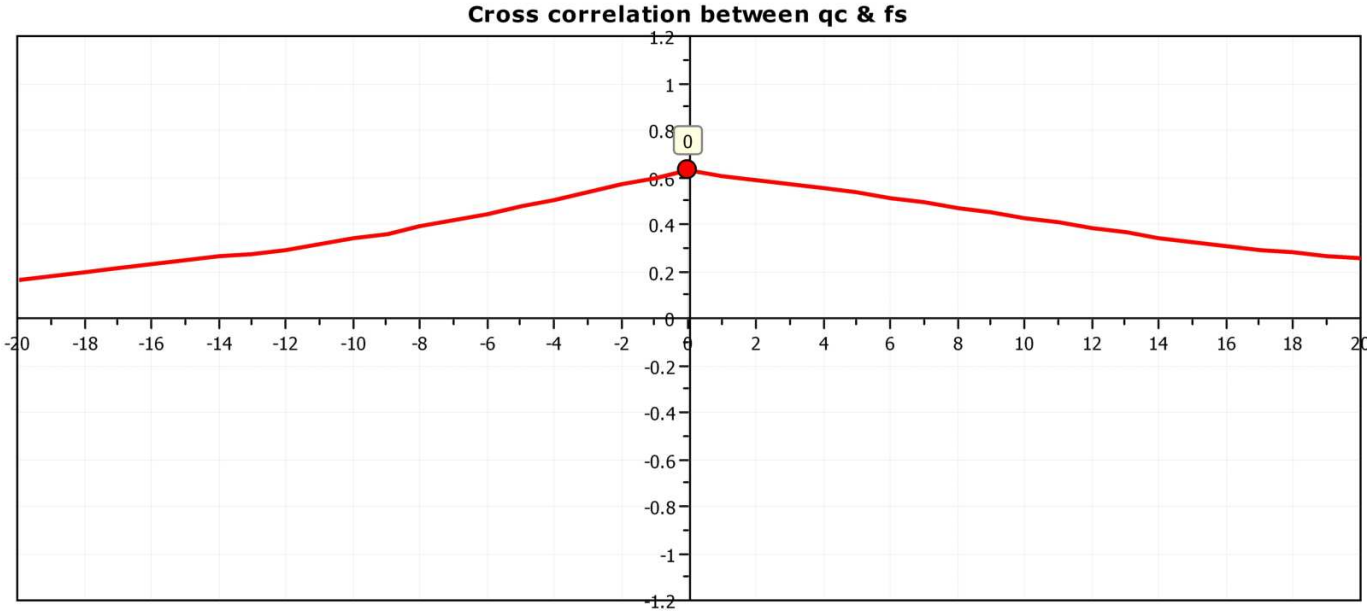




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

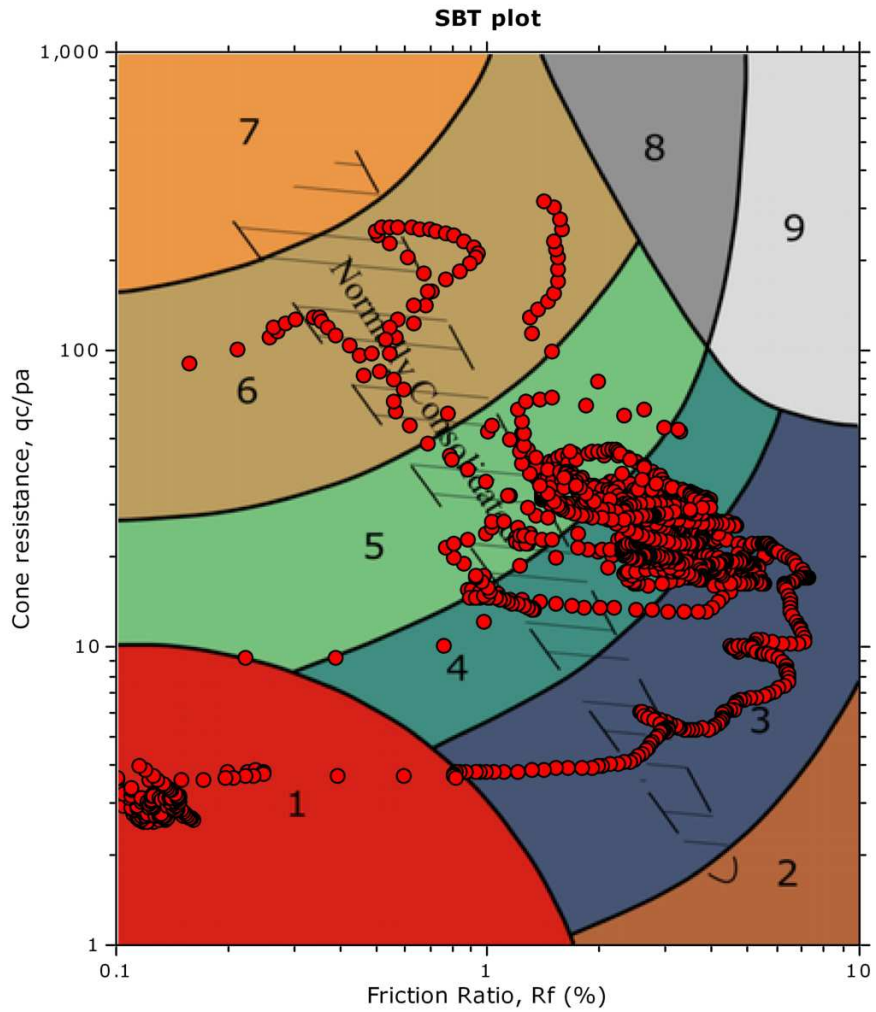
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

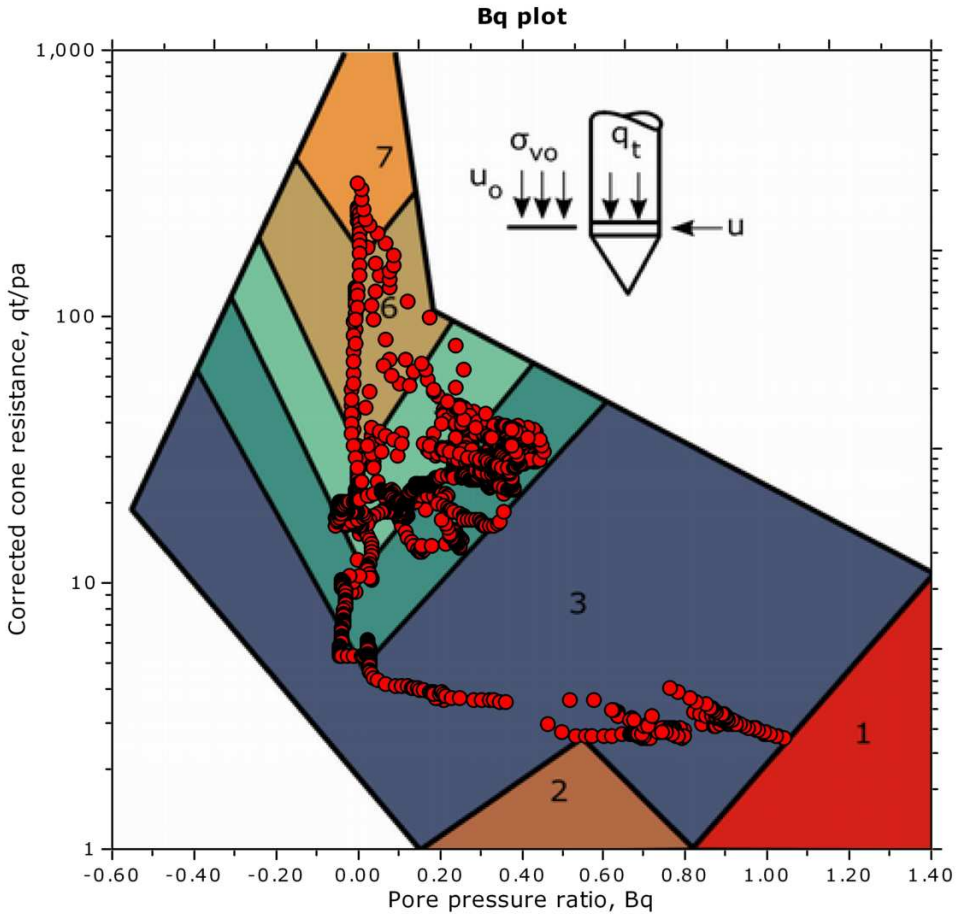



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

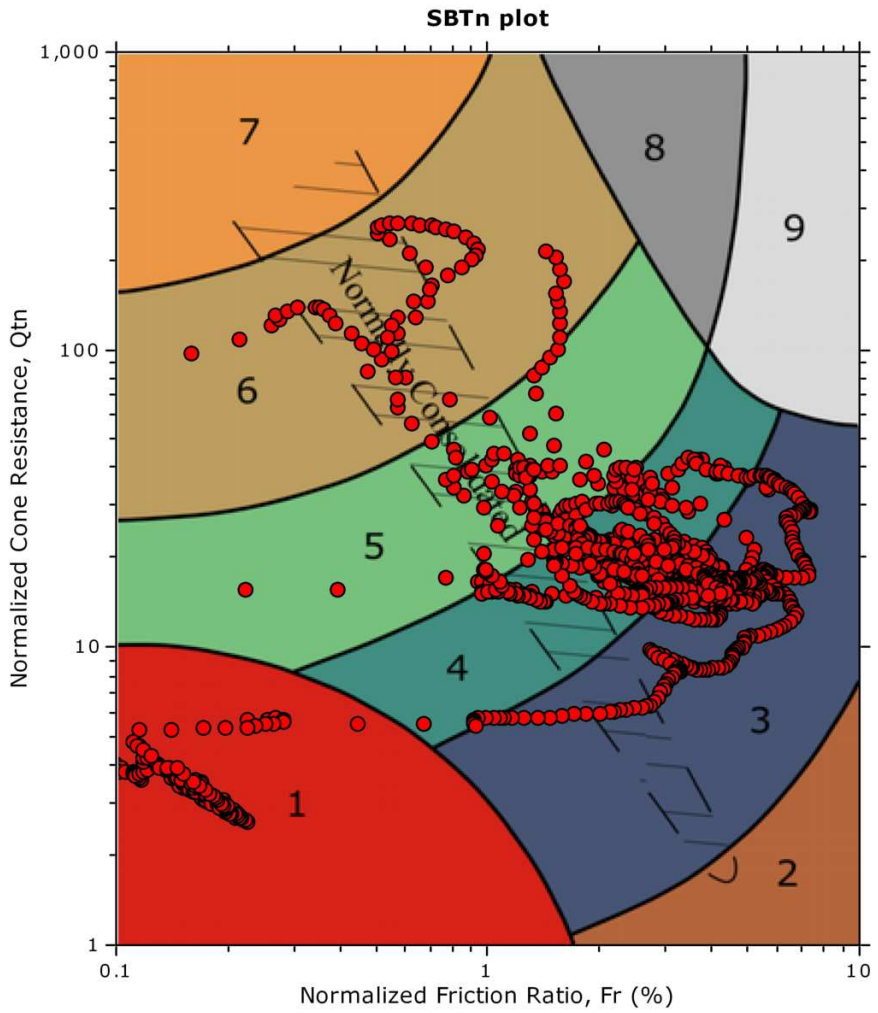


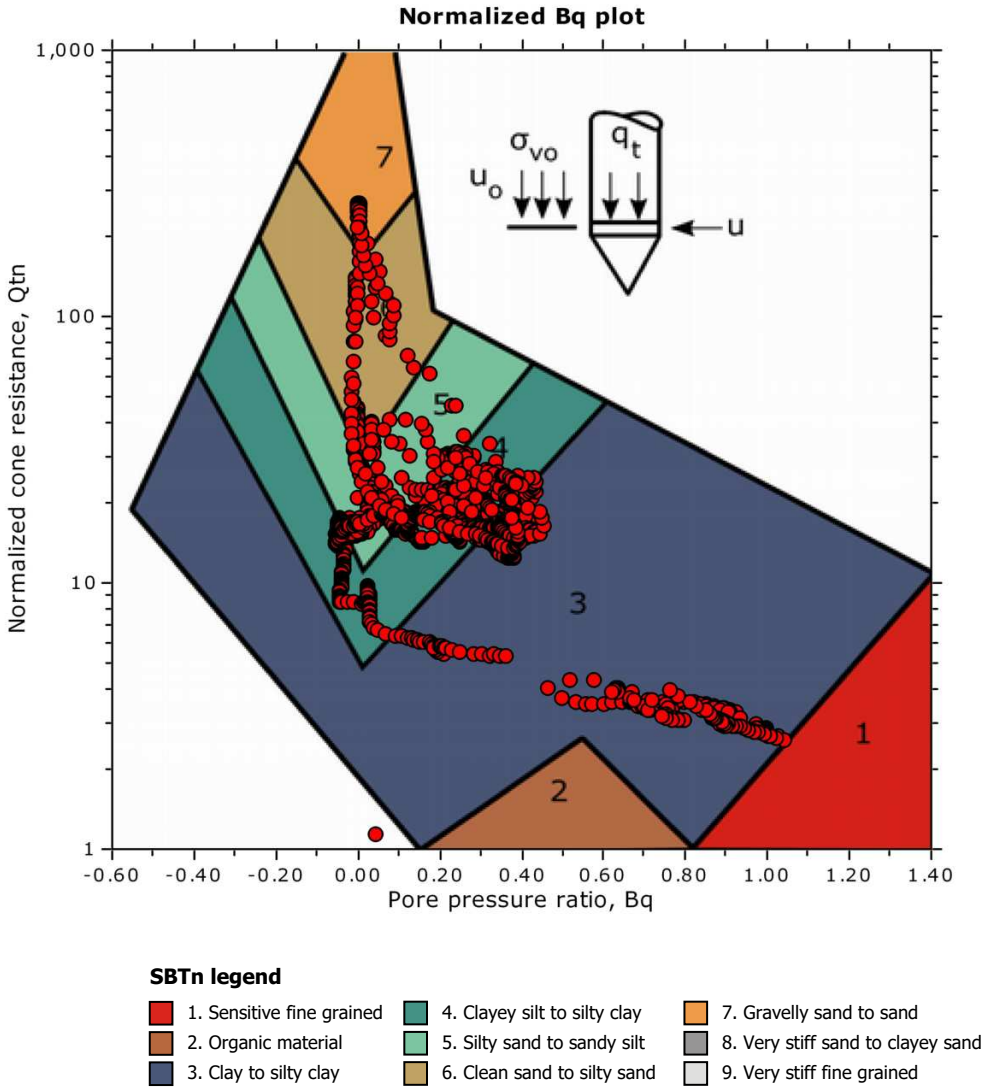




**SBT legend**

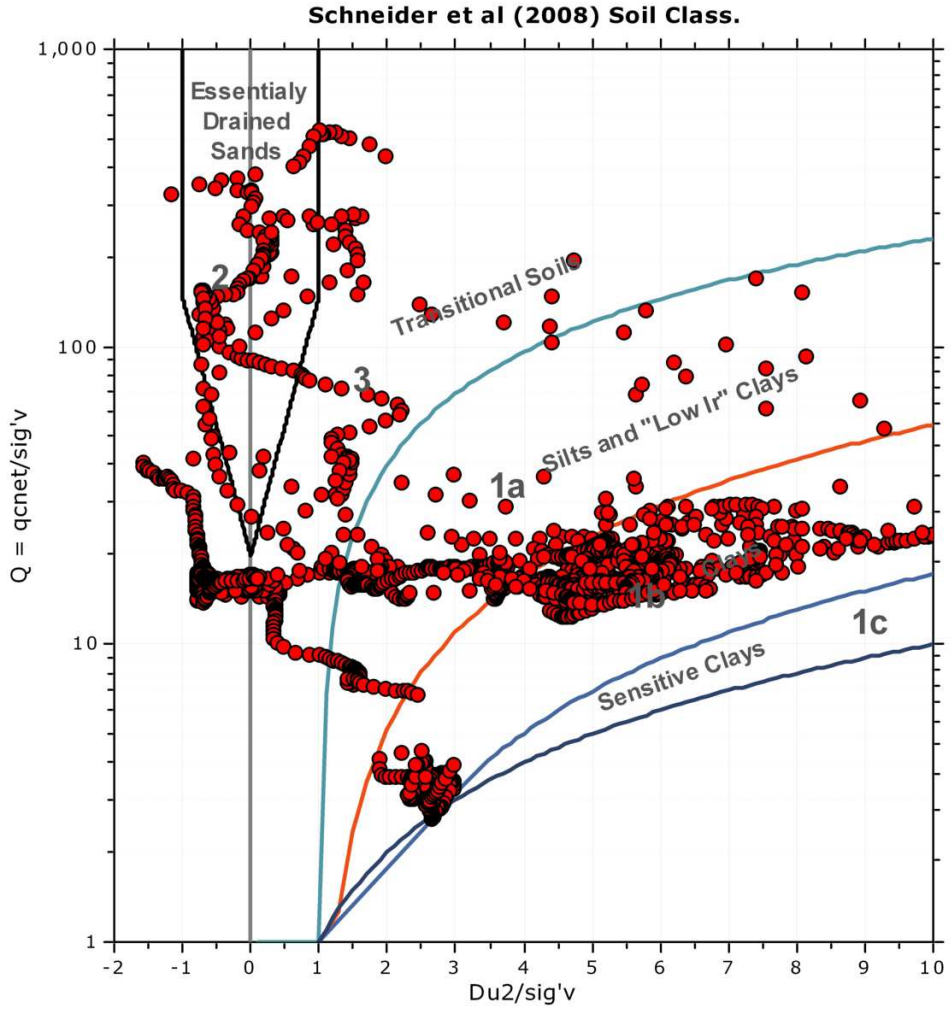
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

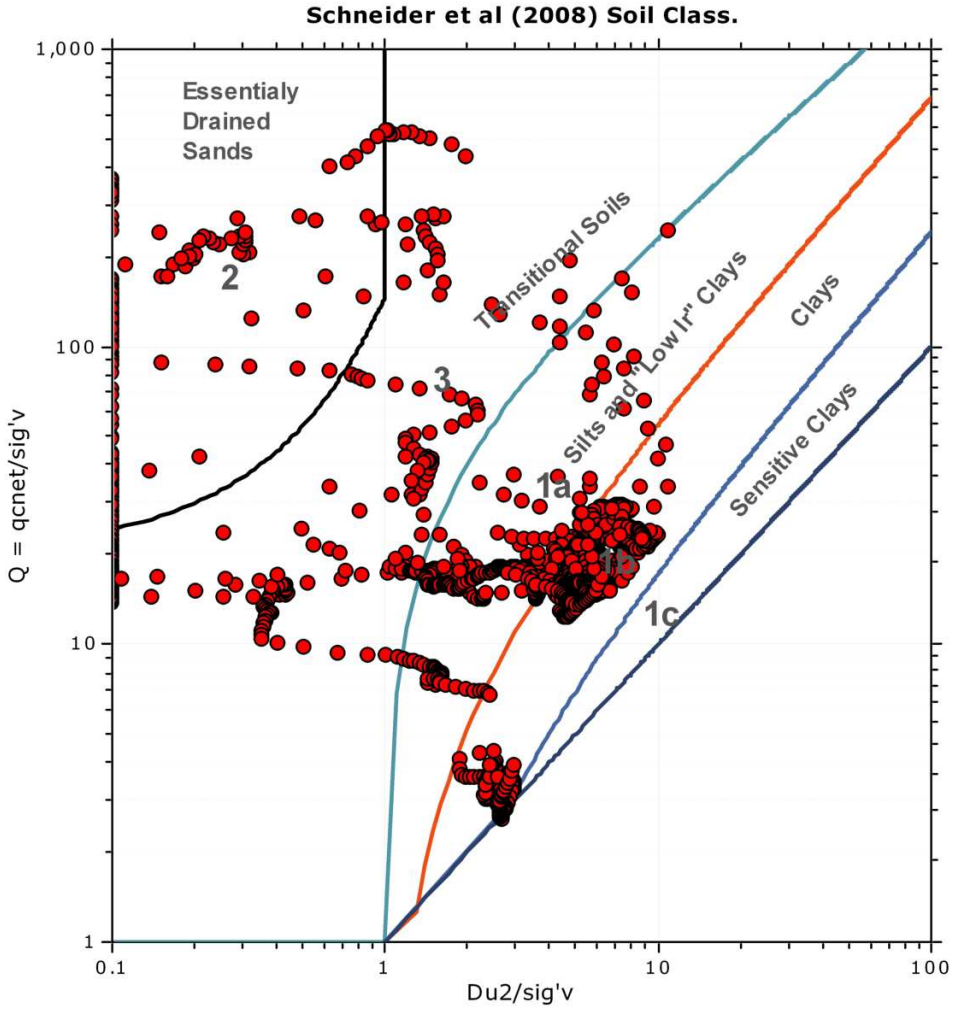
## SBT - Bq plots (normalized)

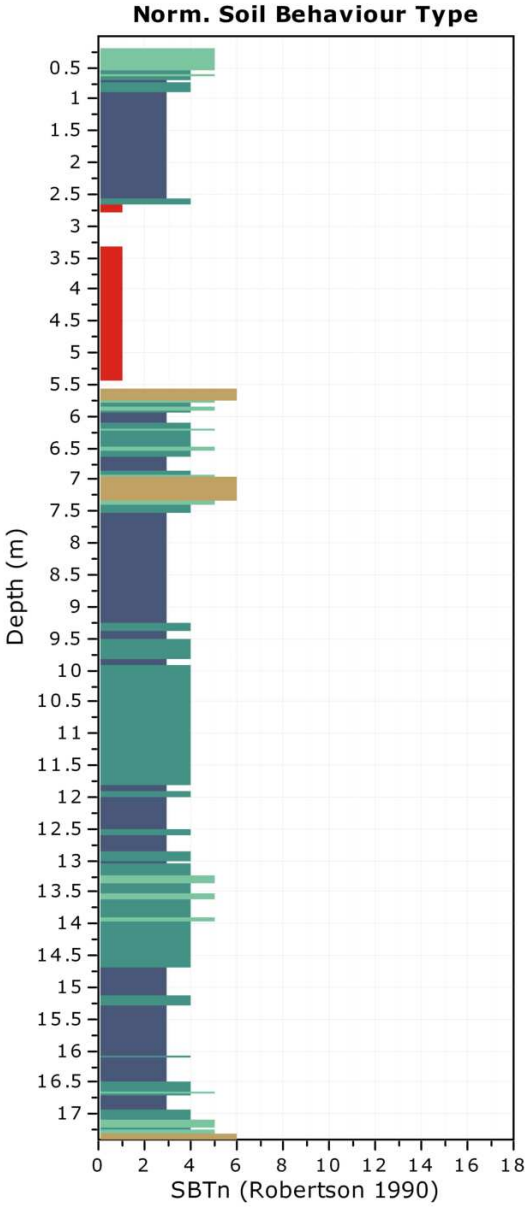


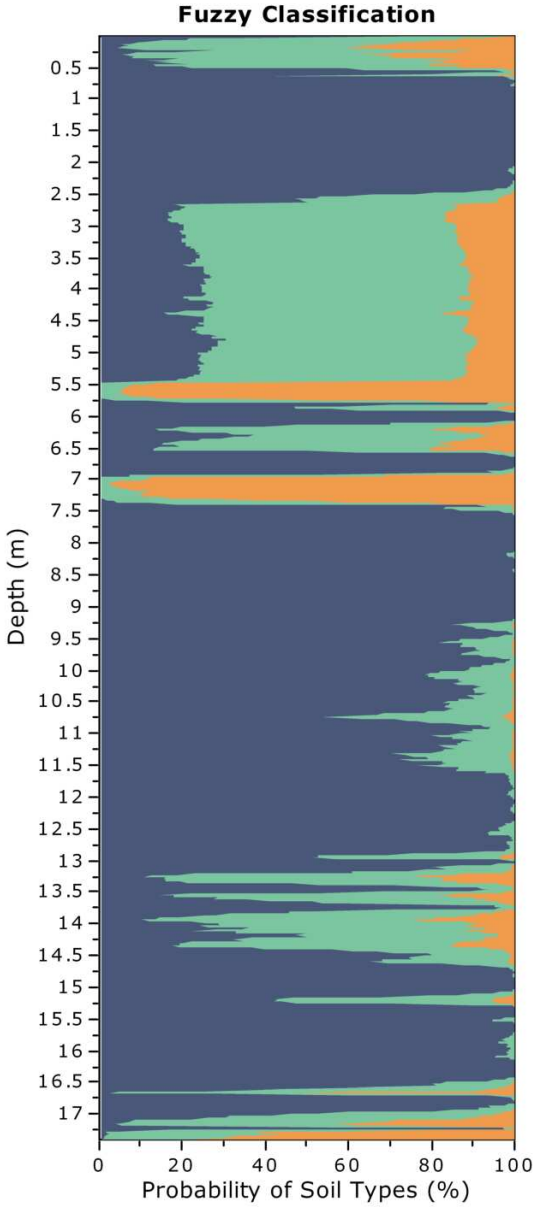



## Bq plots (Schneider)



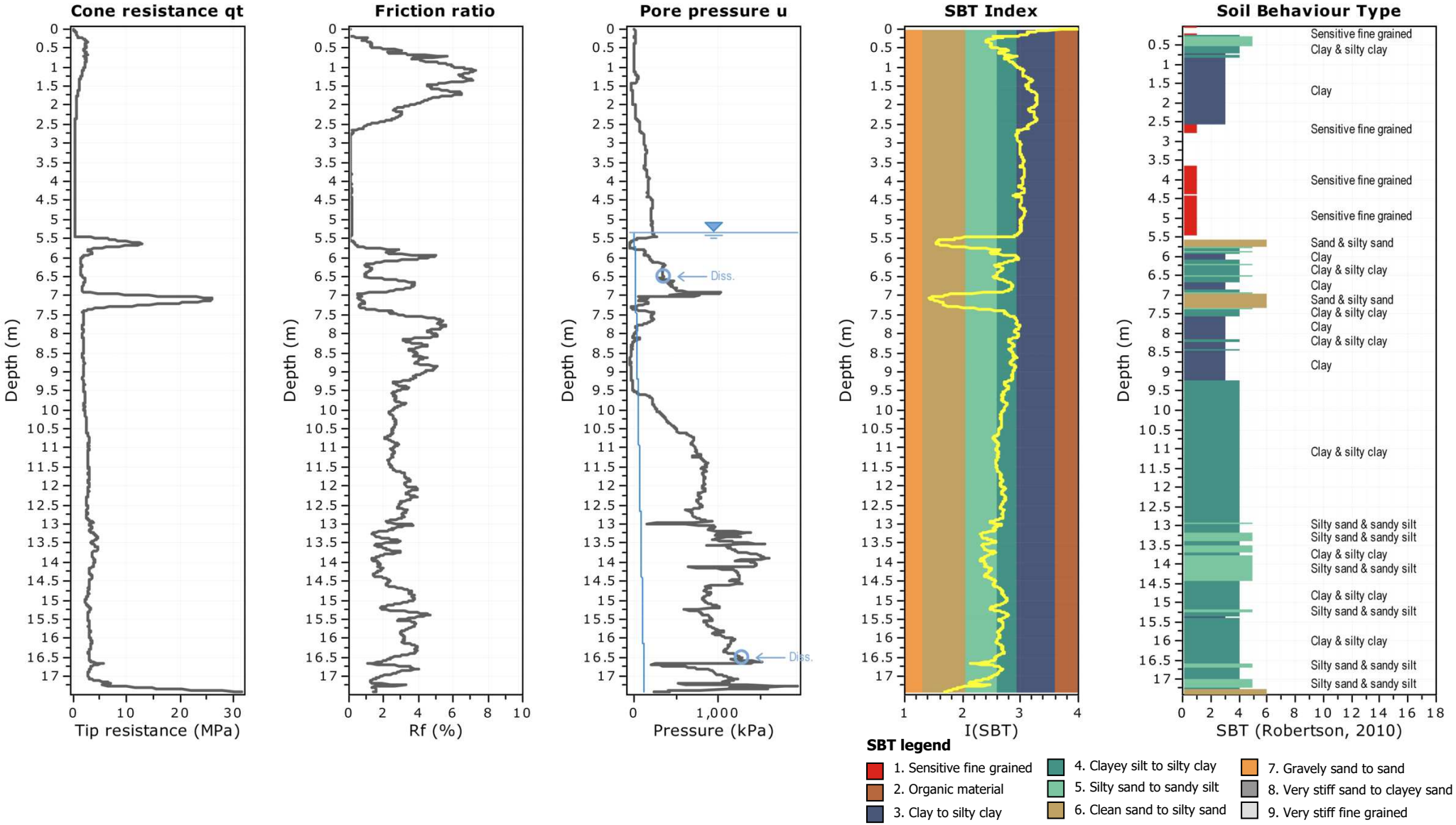



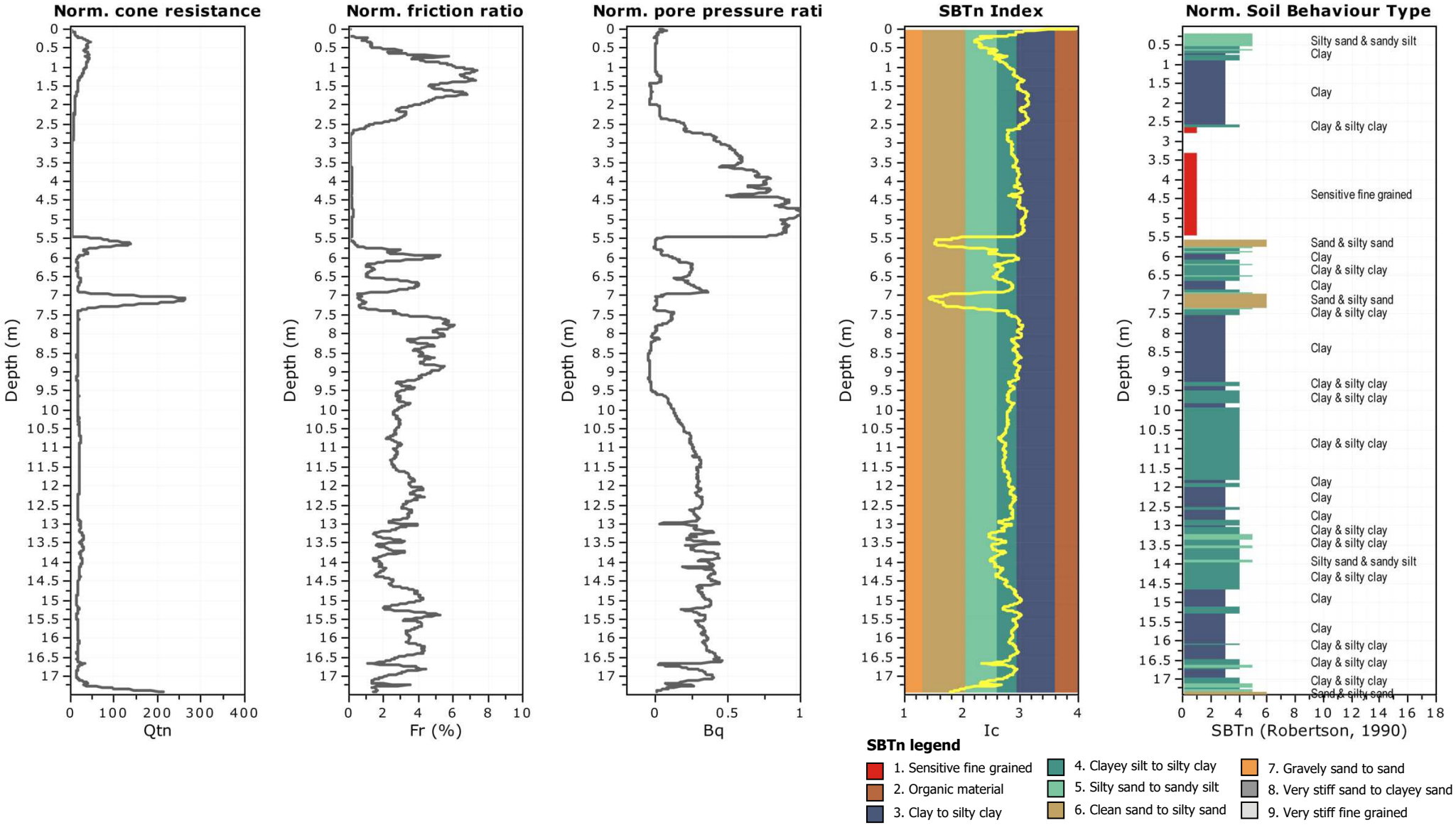


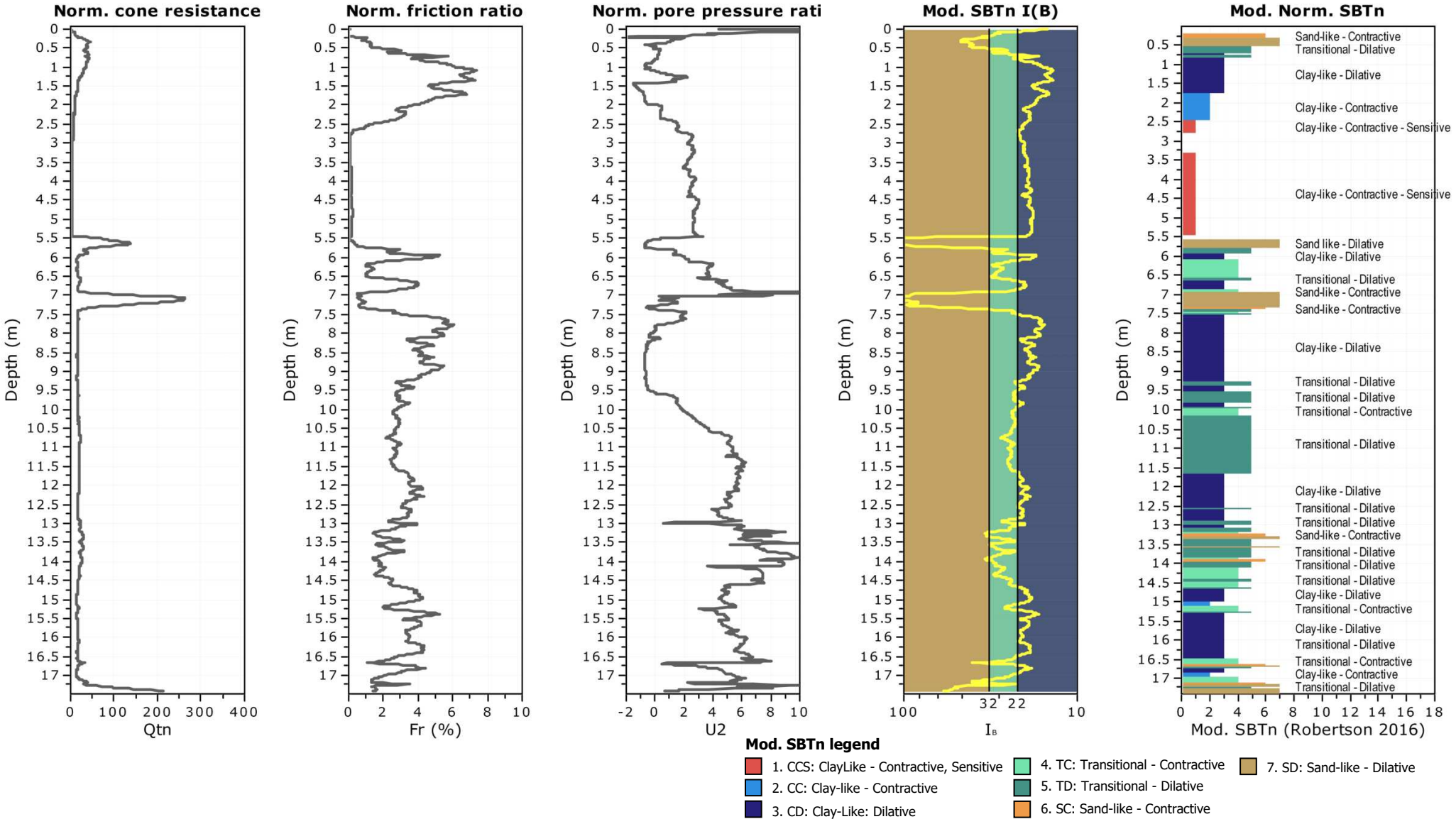




**Fuzzy classifiaction legend**

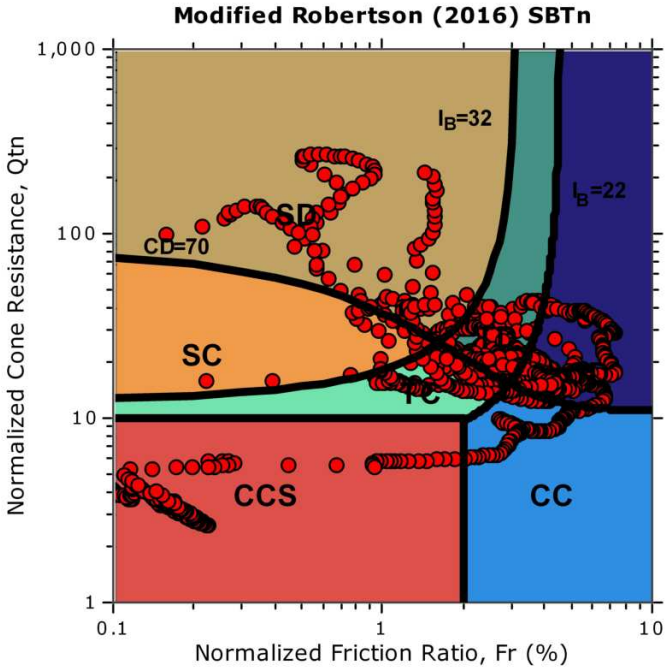
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

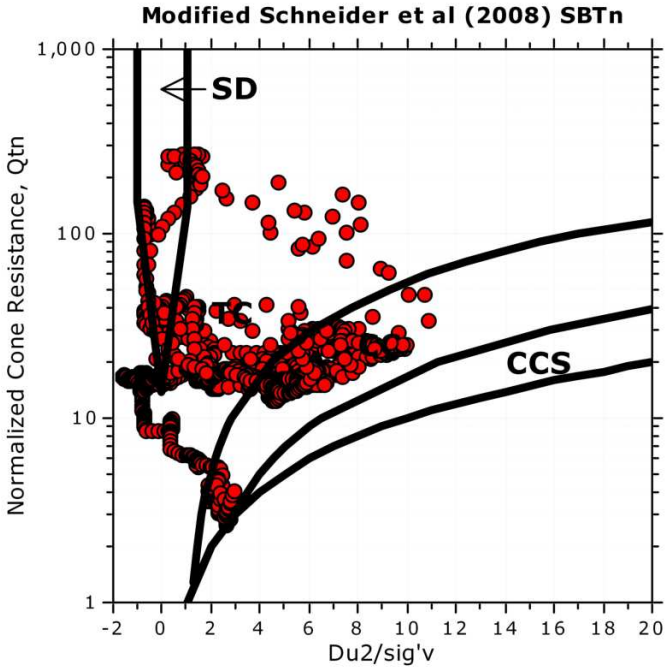

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Diss.
Diss.
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
Sensitive fine grained
Clay & silty clay
Clay
Sensitive fine grained
Sensitive fine grained
Sensitive fine grained
Sand & silty sand
Clay
Clay & silty clay
Clay
Sand & silty sand
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
SBT (Robertson, 2010)
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

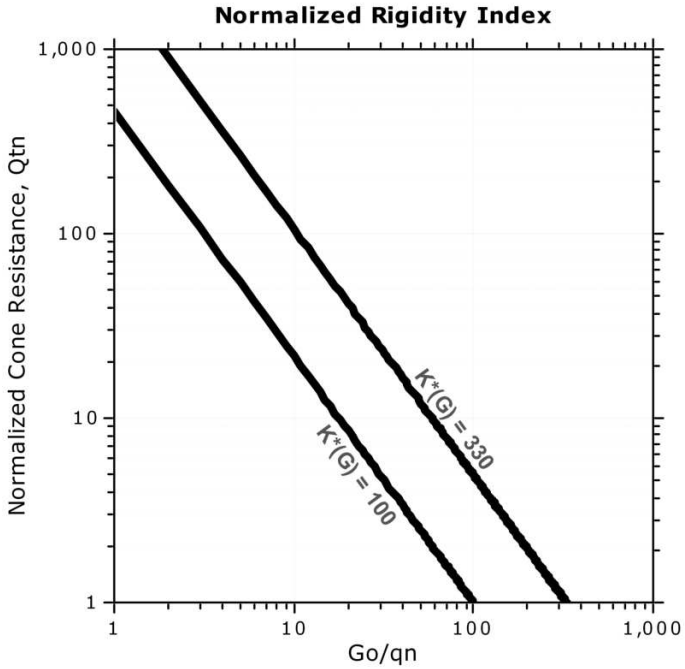

Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Depth (m)
Silty sand & sandy silt
Clay
Clay & silty clay
Sensitive fine grained
Sand & silty sand
Clay & silty clay
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

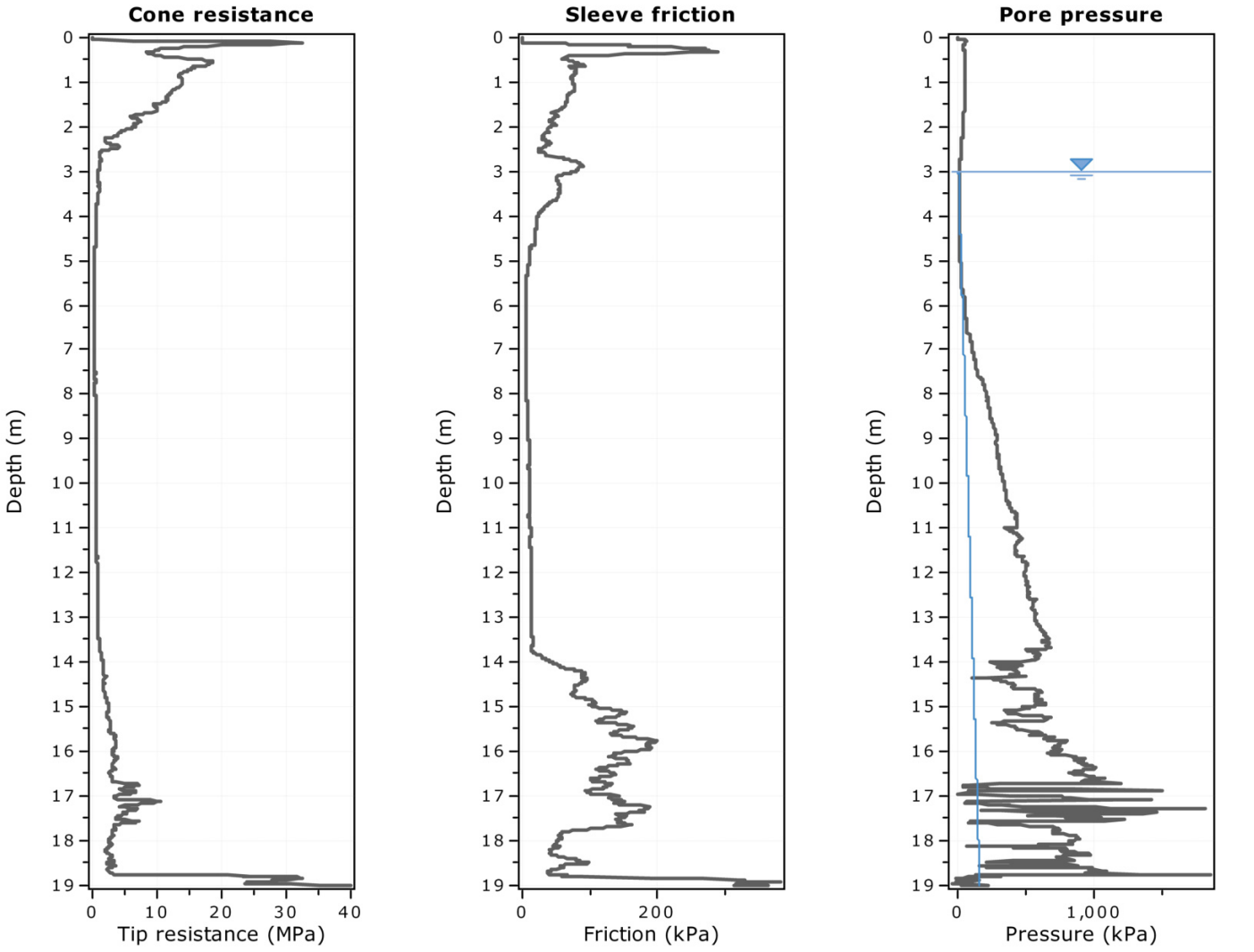


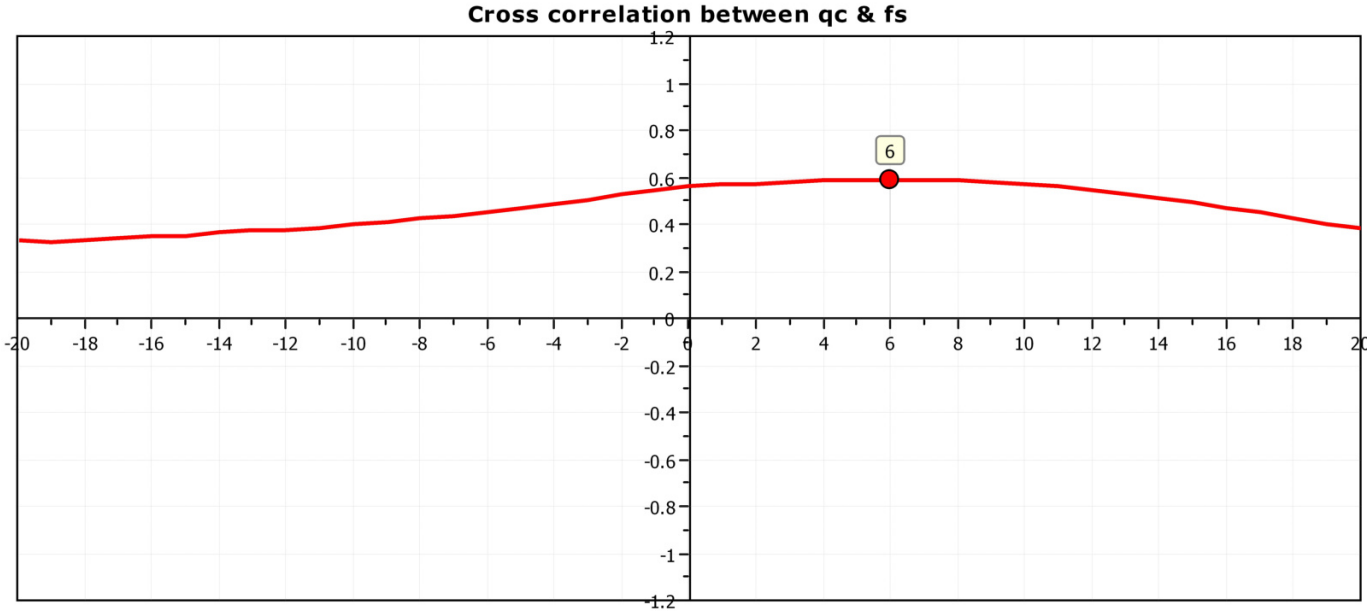




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

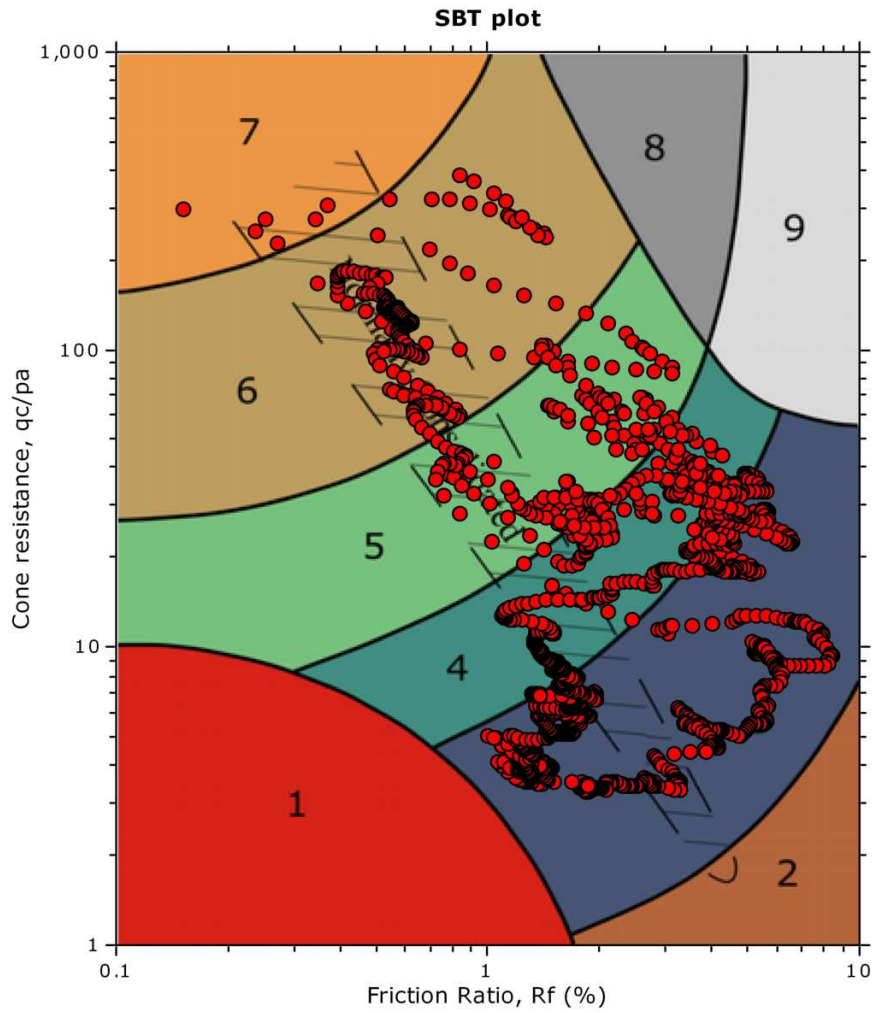
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

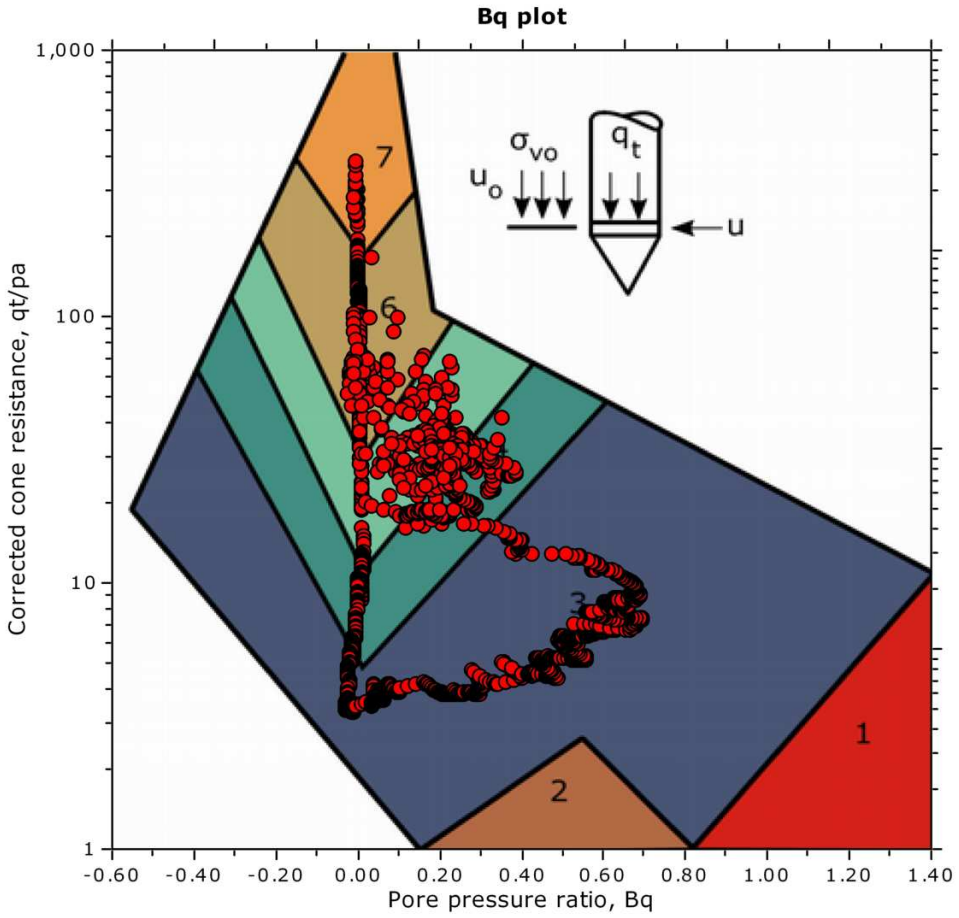



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

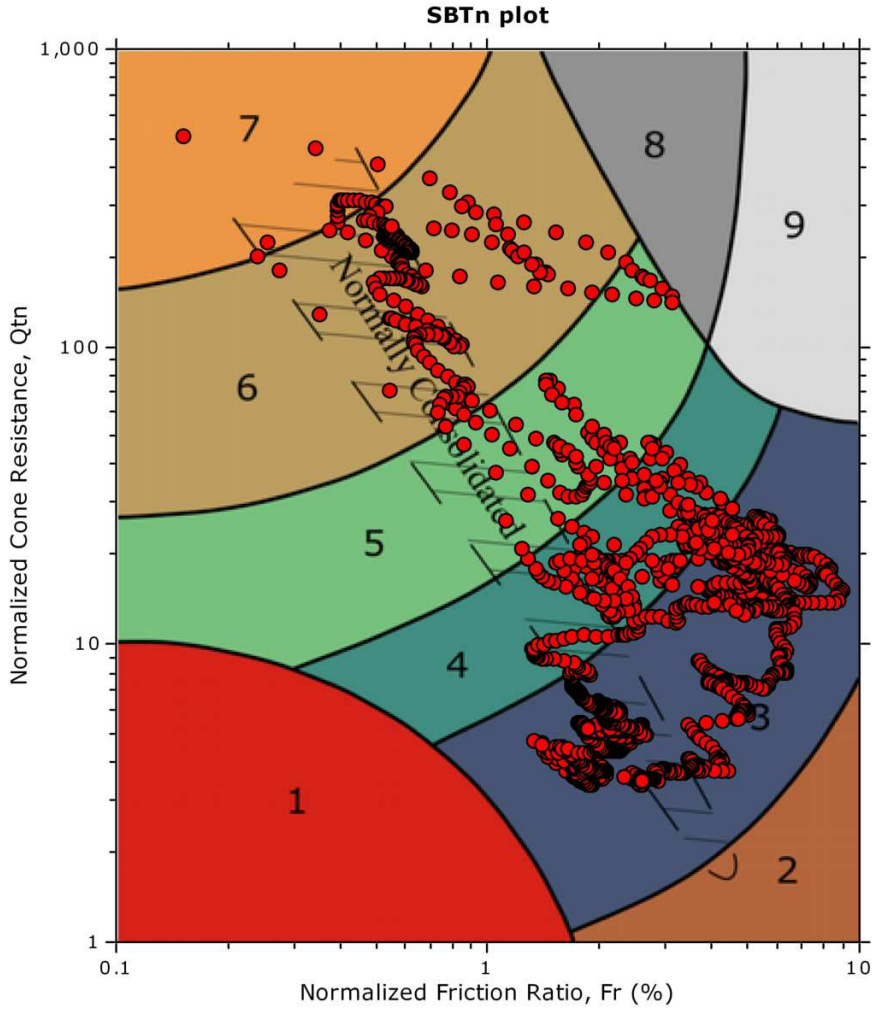


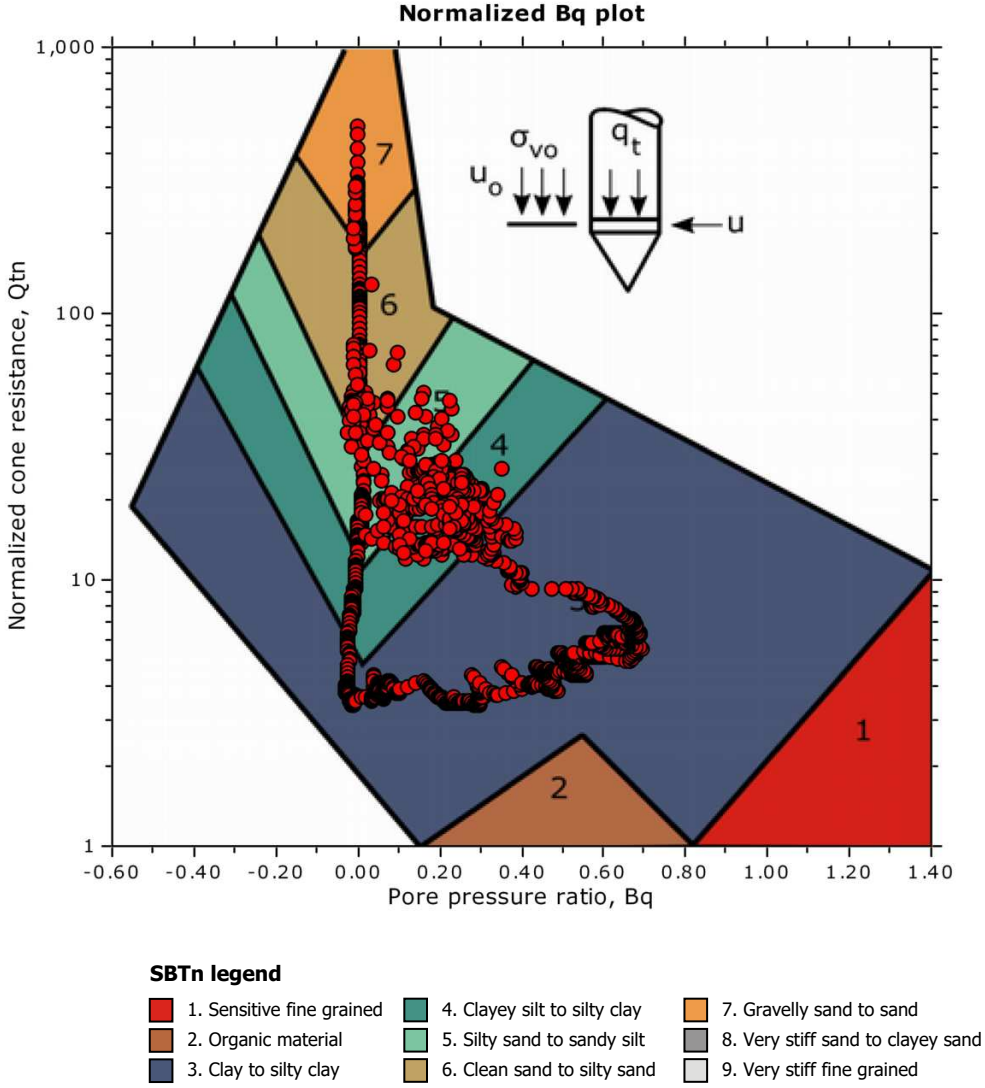




**SBT legend**

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

## SBT - Bq plots (normalized)

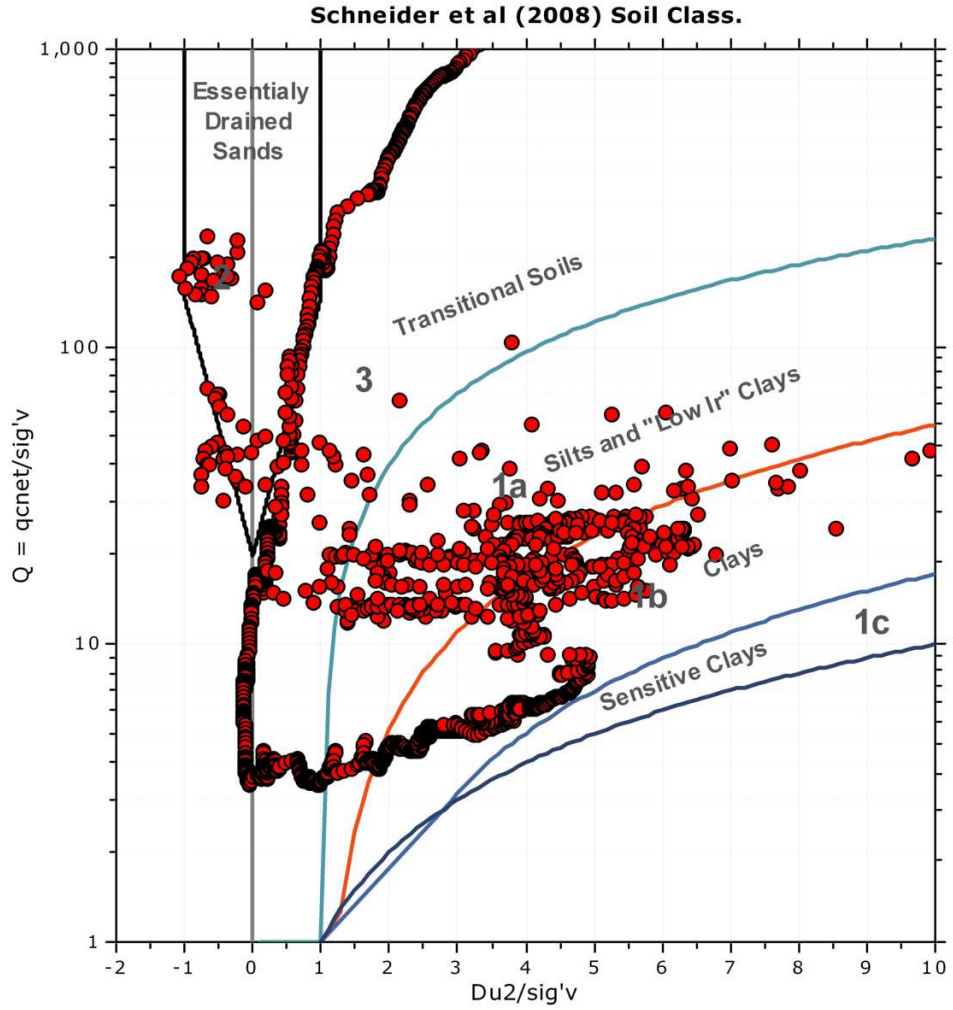


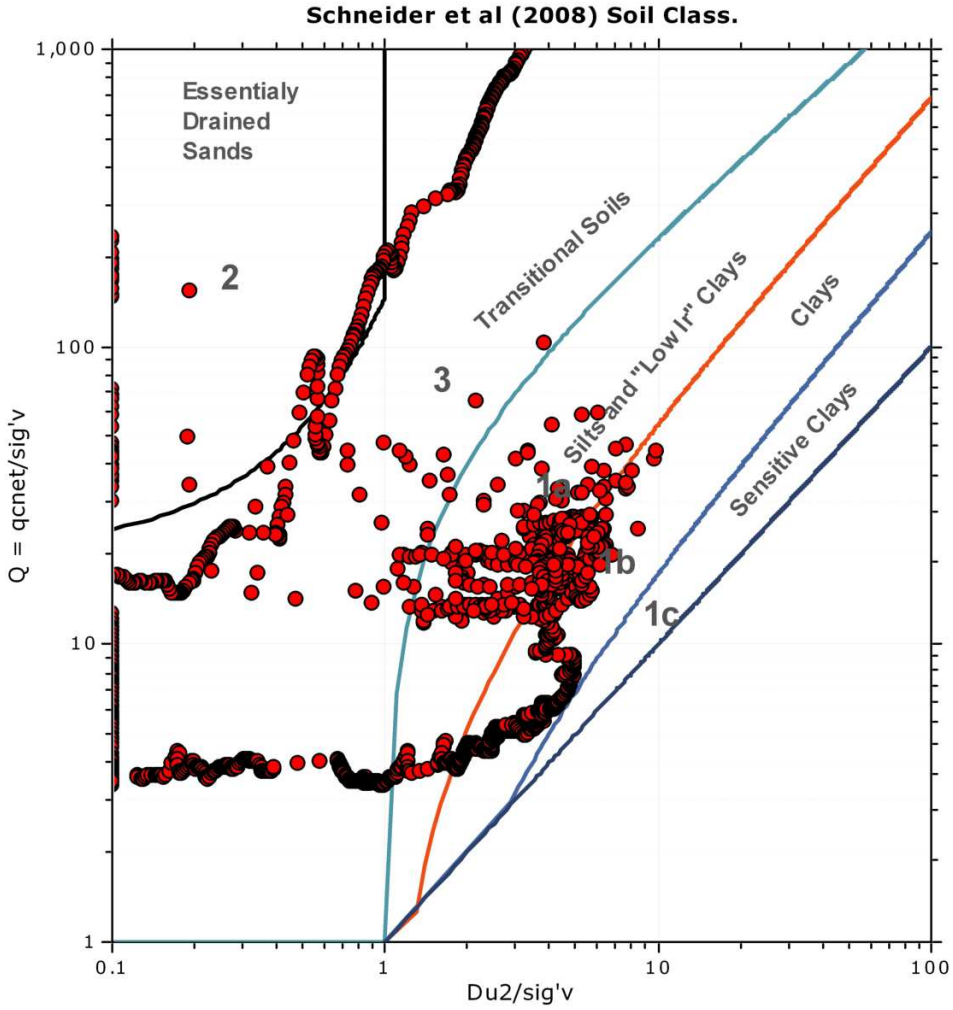



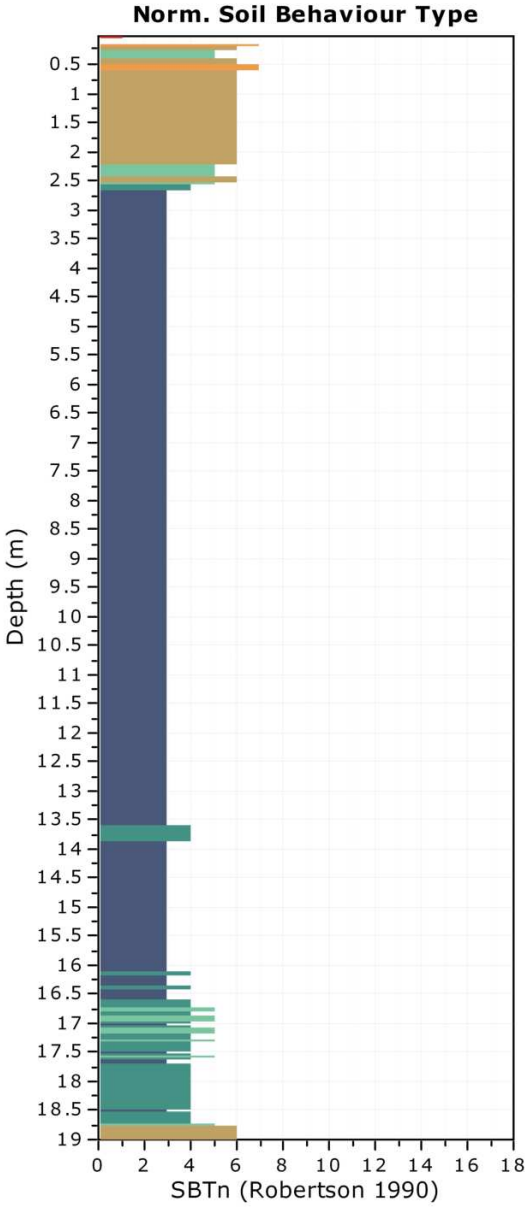

**SBTn legend**

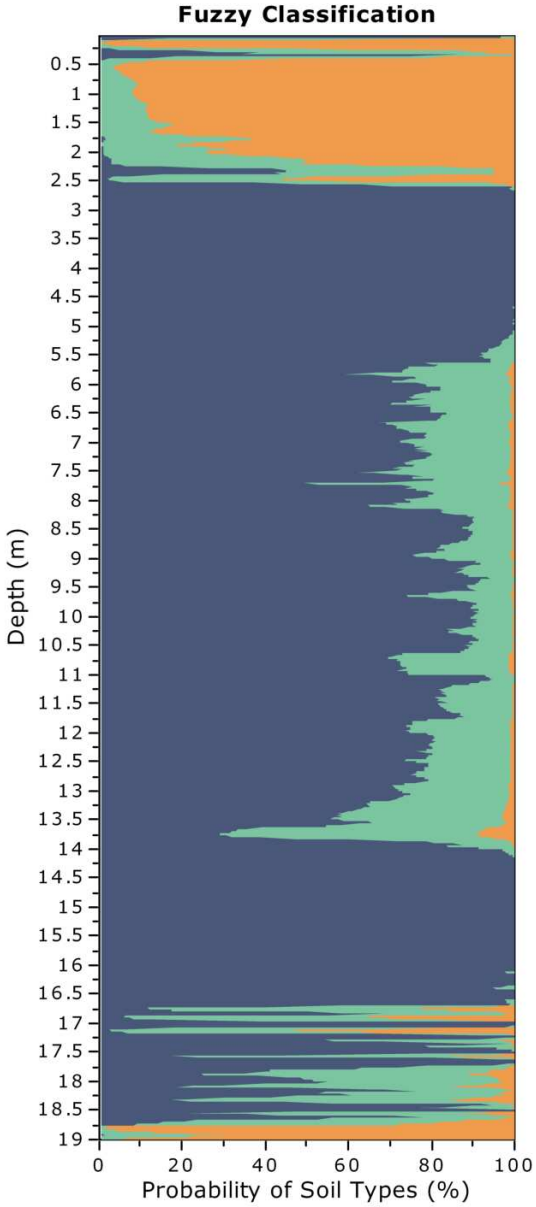
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



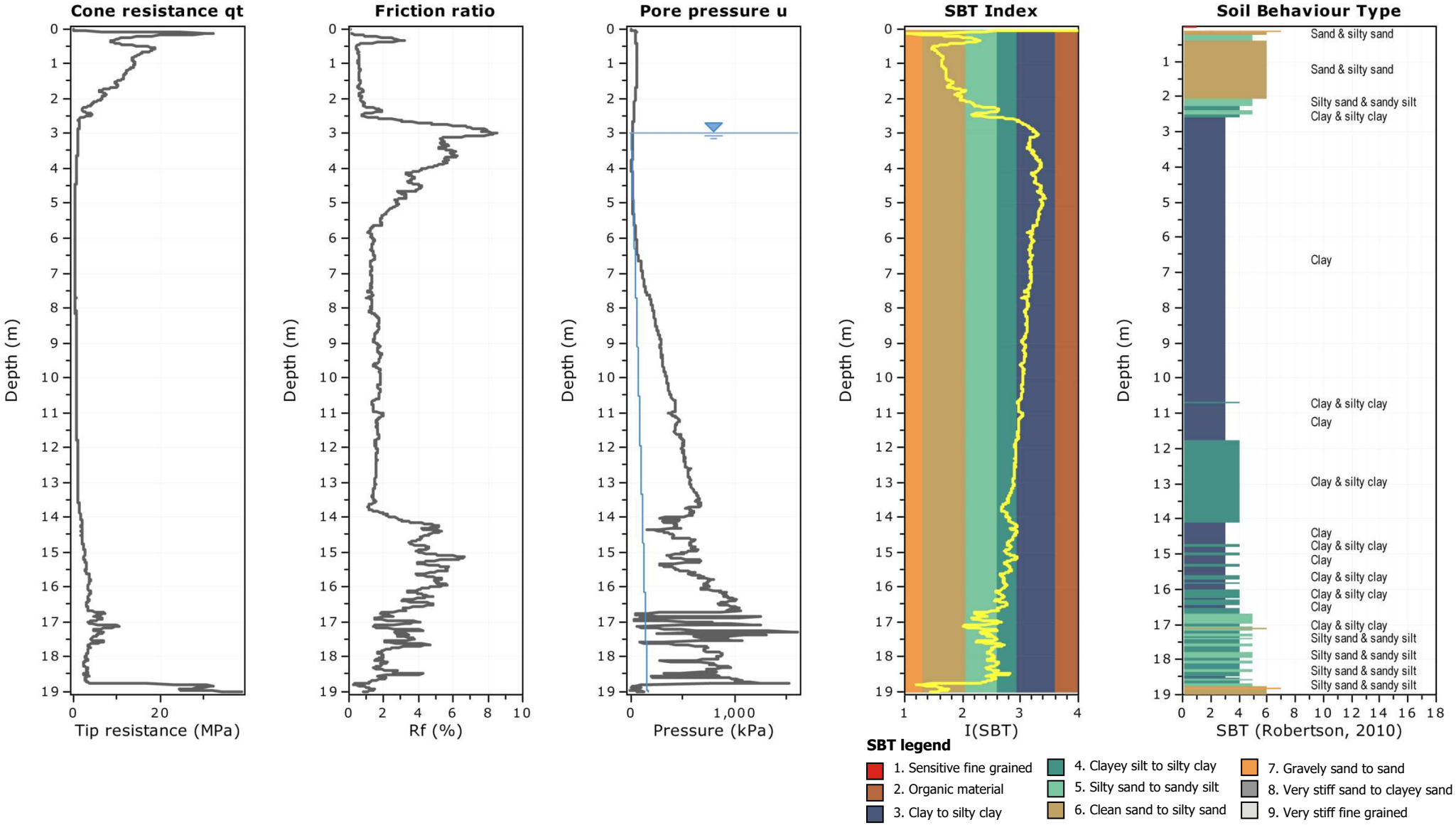



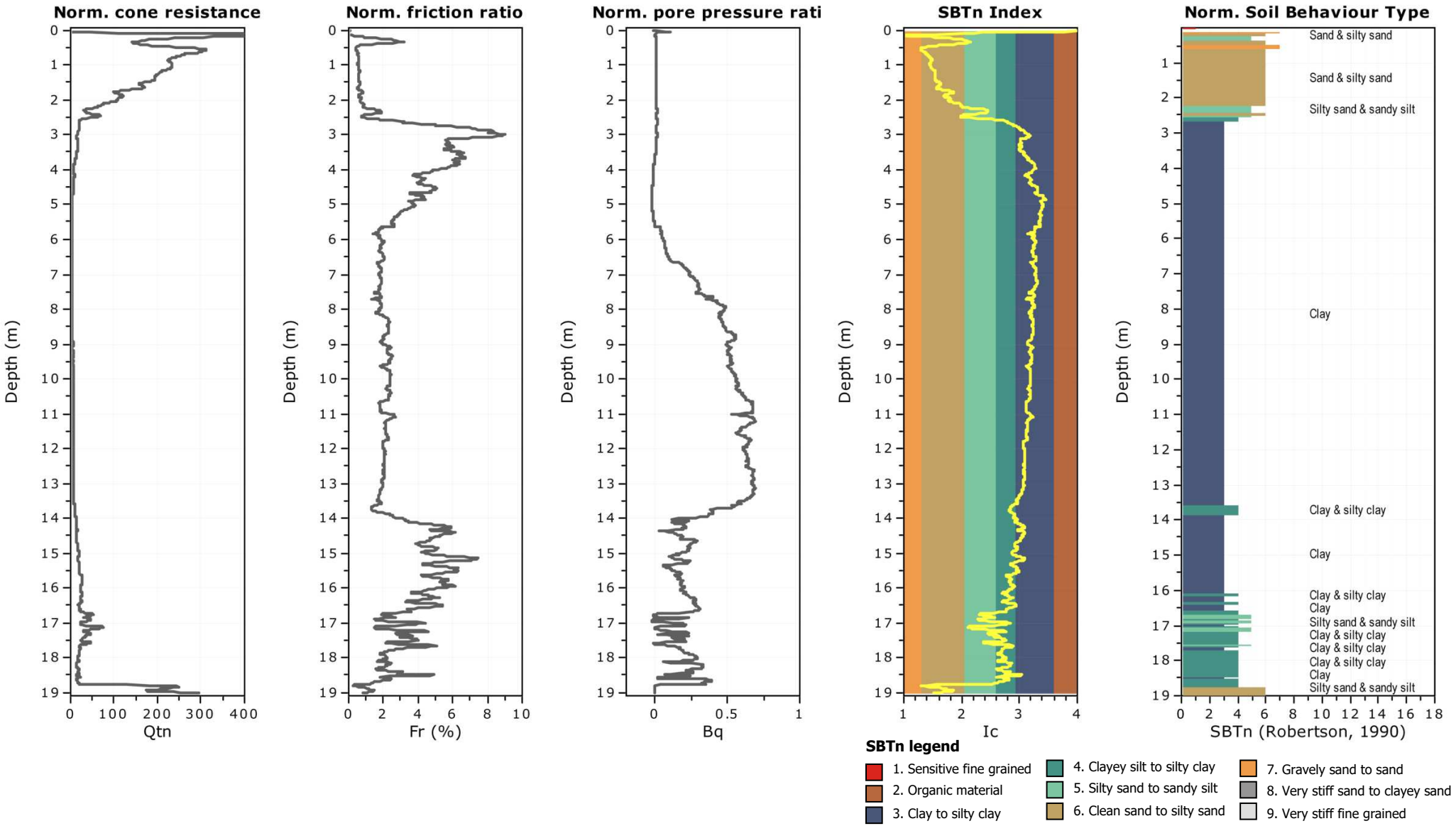


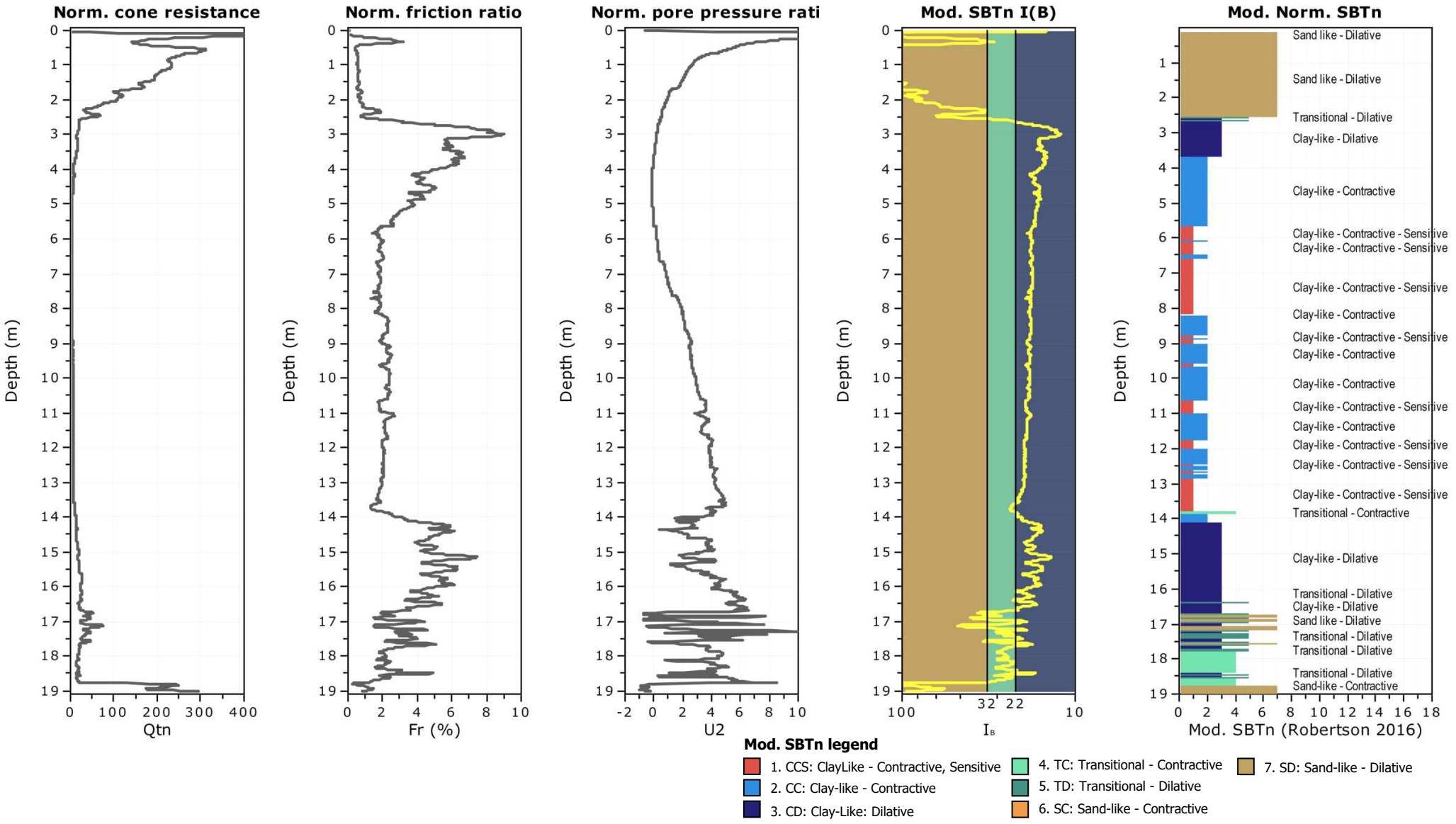




**Fuzzy classifiaction legend**

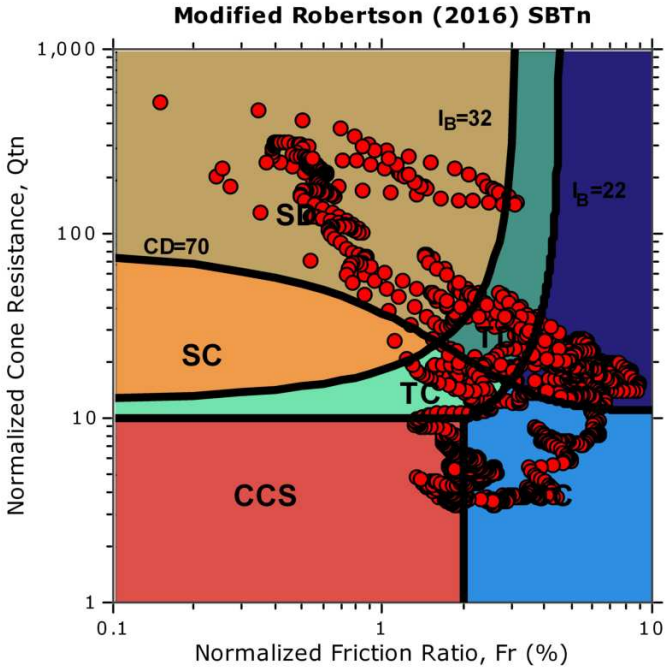
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

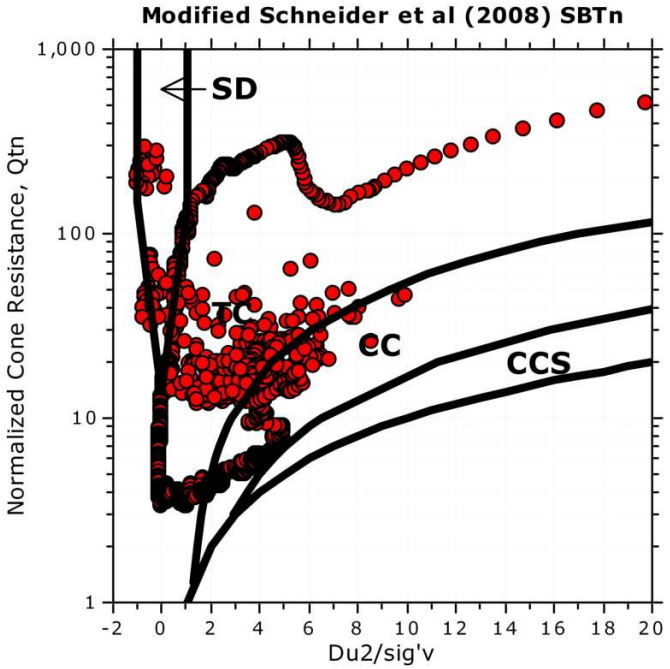

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
Silty sand & sandy silt
Silty sand & sandy silt
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

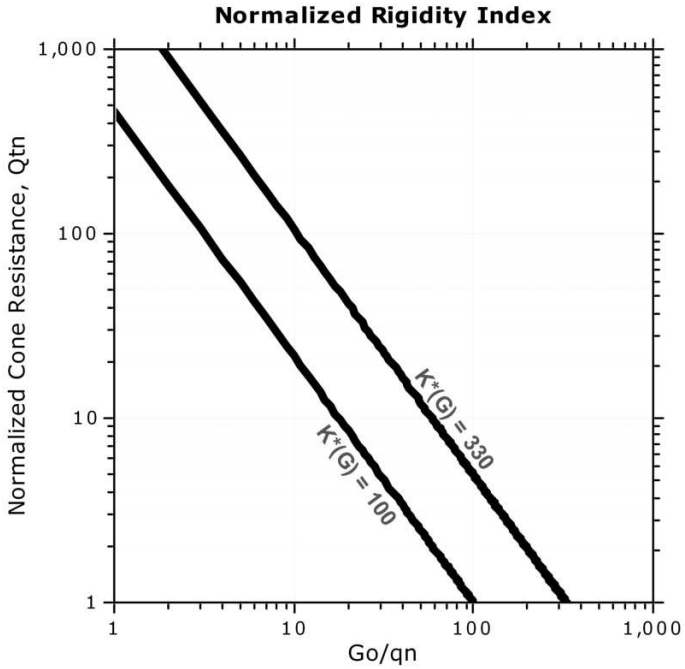

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Clay & silty clay
Clay
Silty sand & sandy silt
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Sand-like - Contractive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

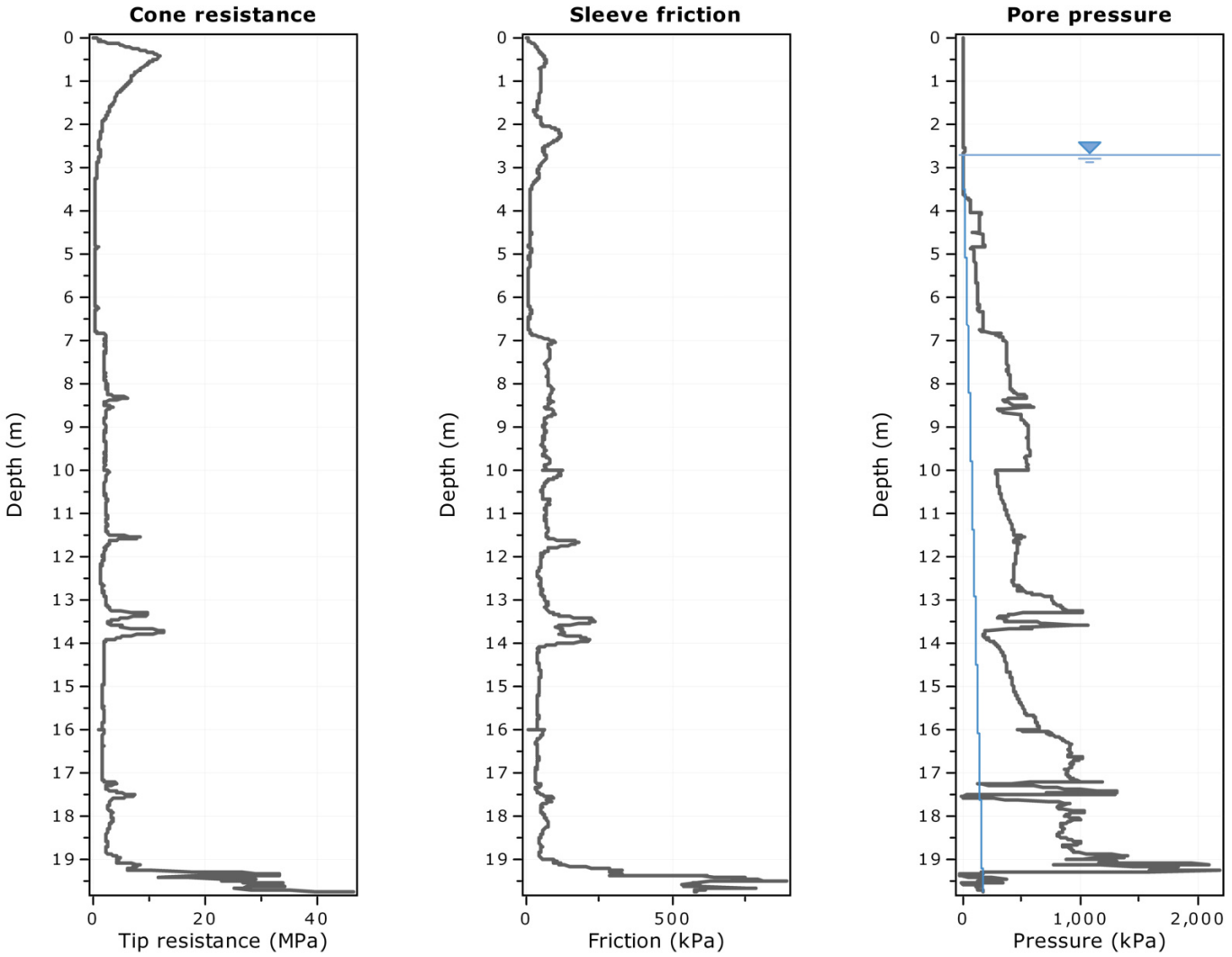


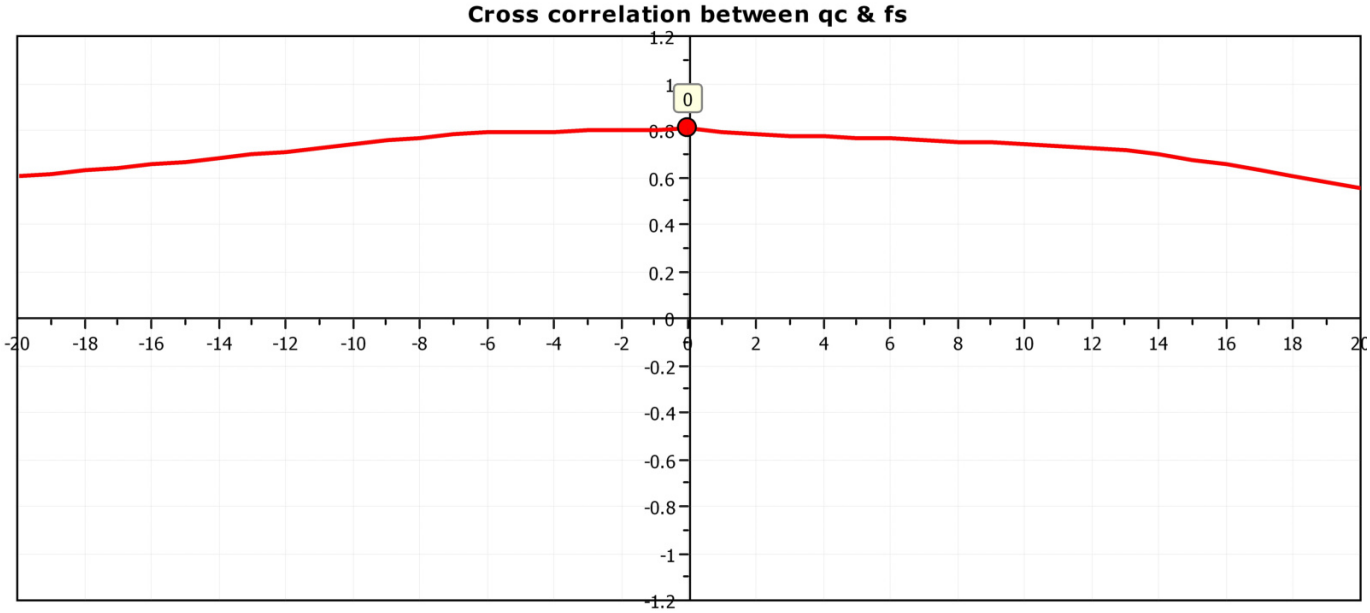




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

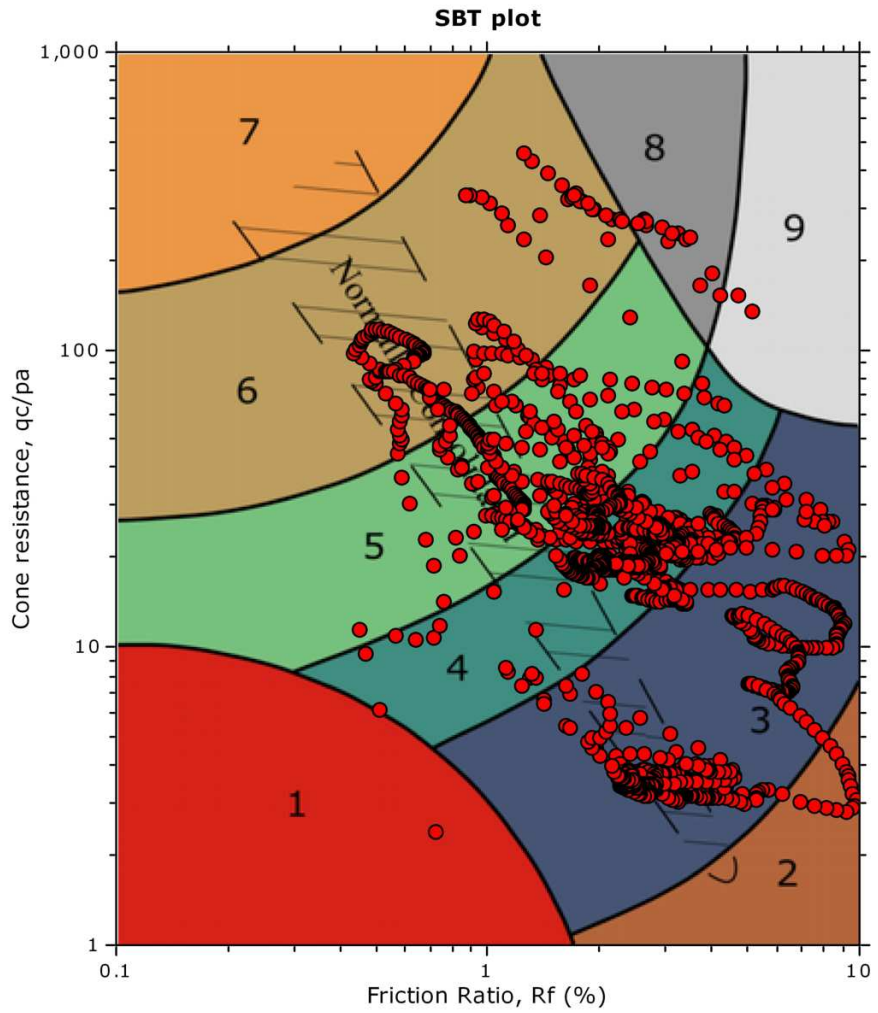
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

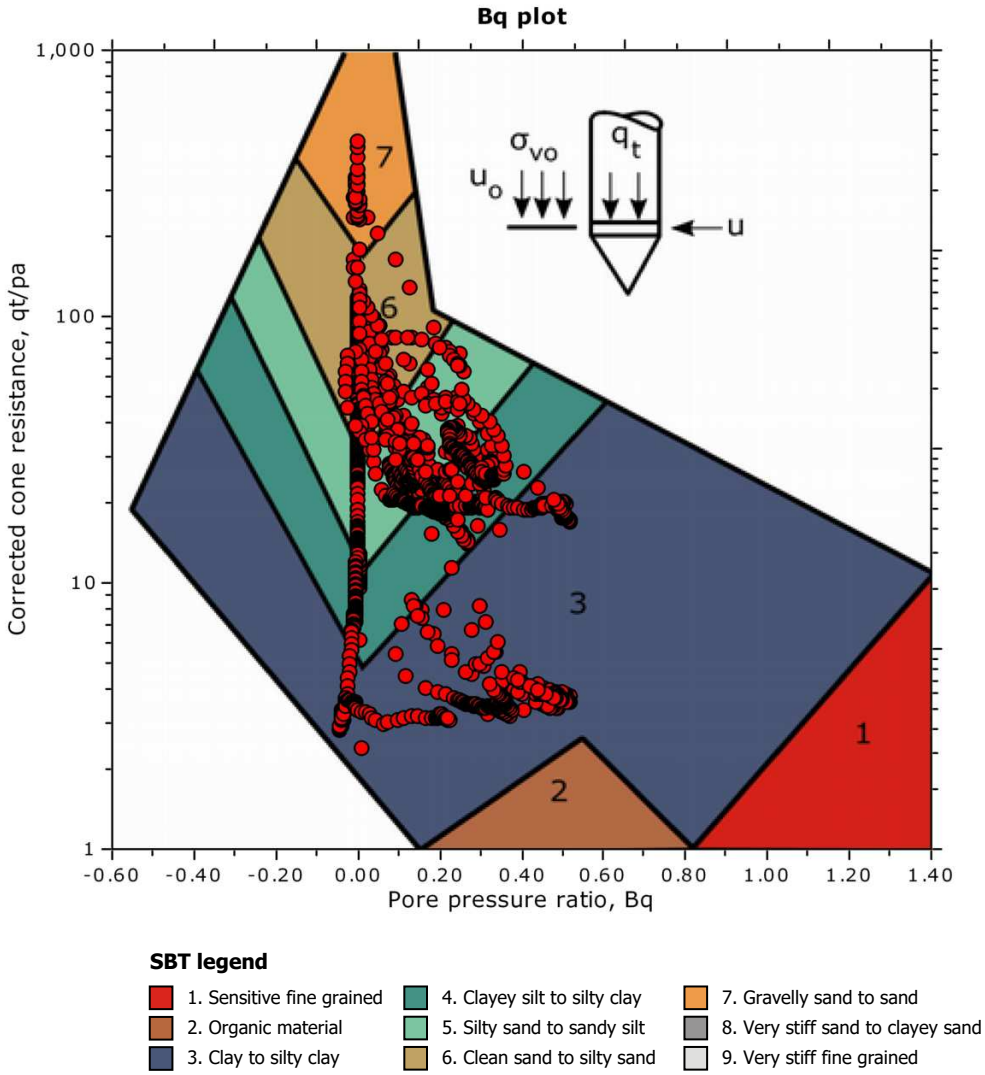



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

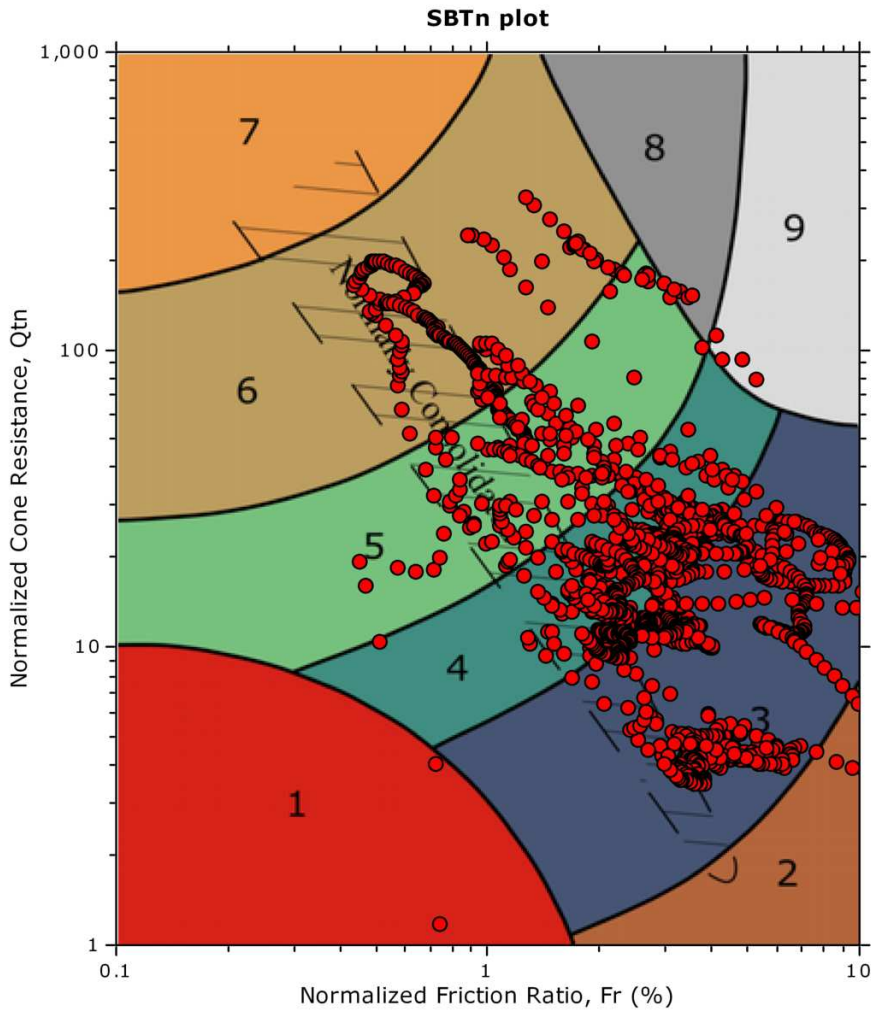


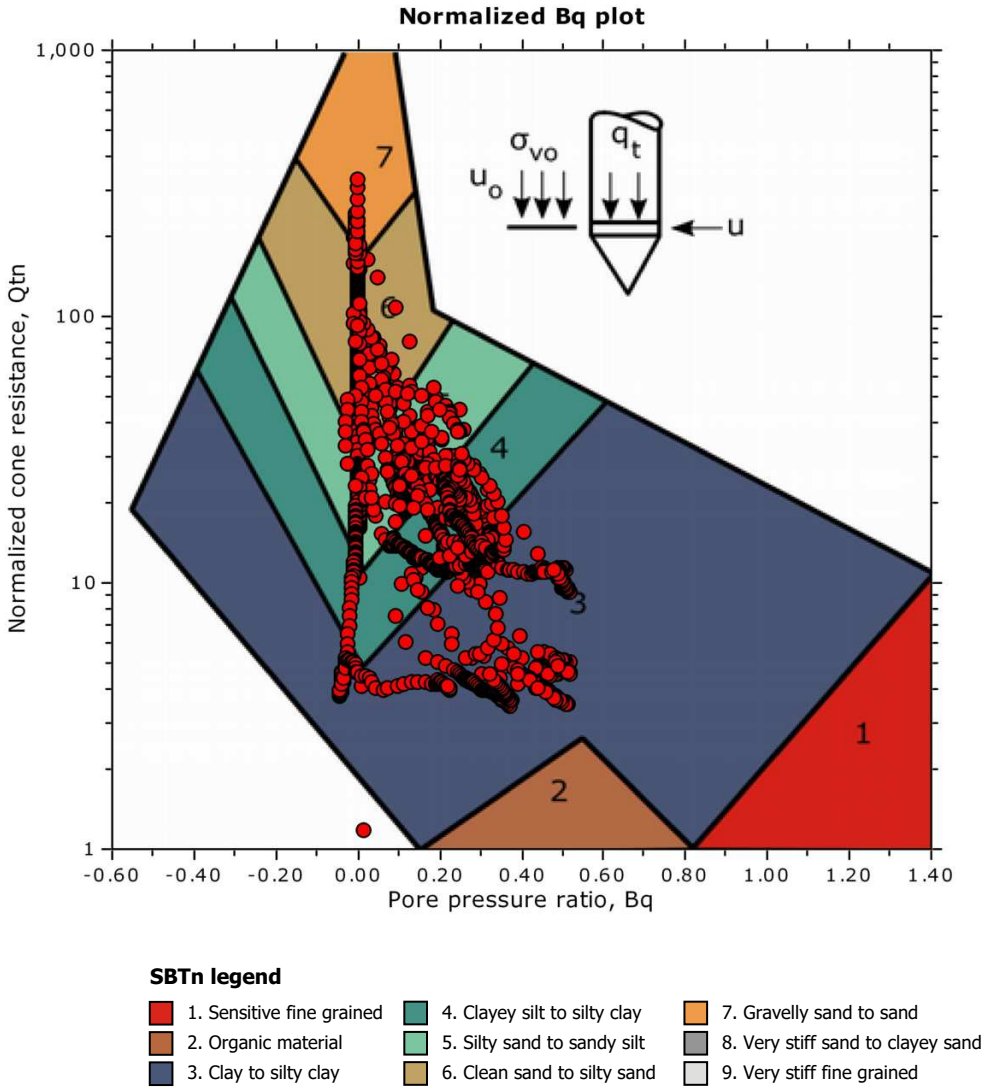
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
Normally consolidated
1
2
3
4
5
6
7
8
9

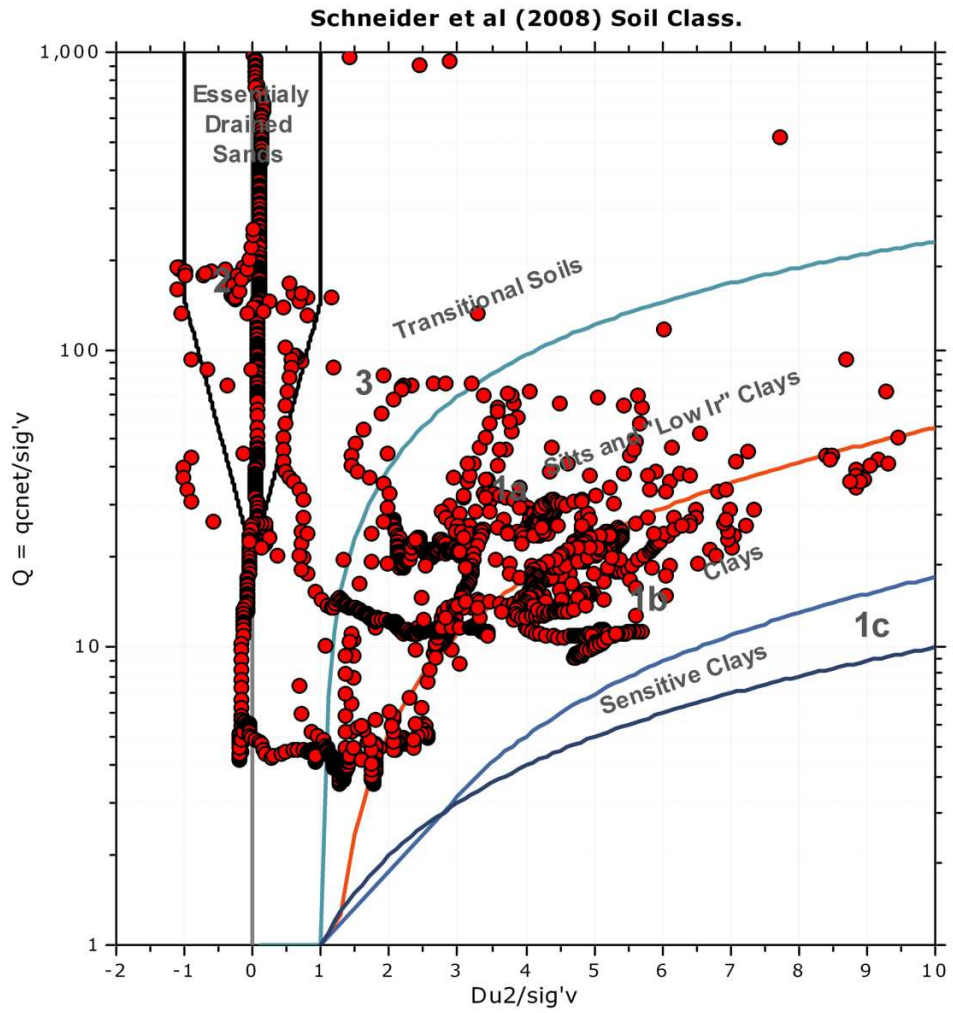

Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
3
6
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

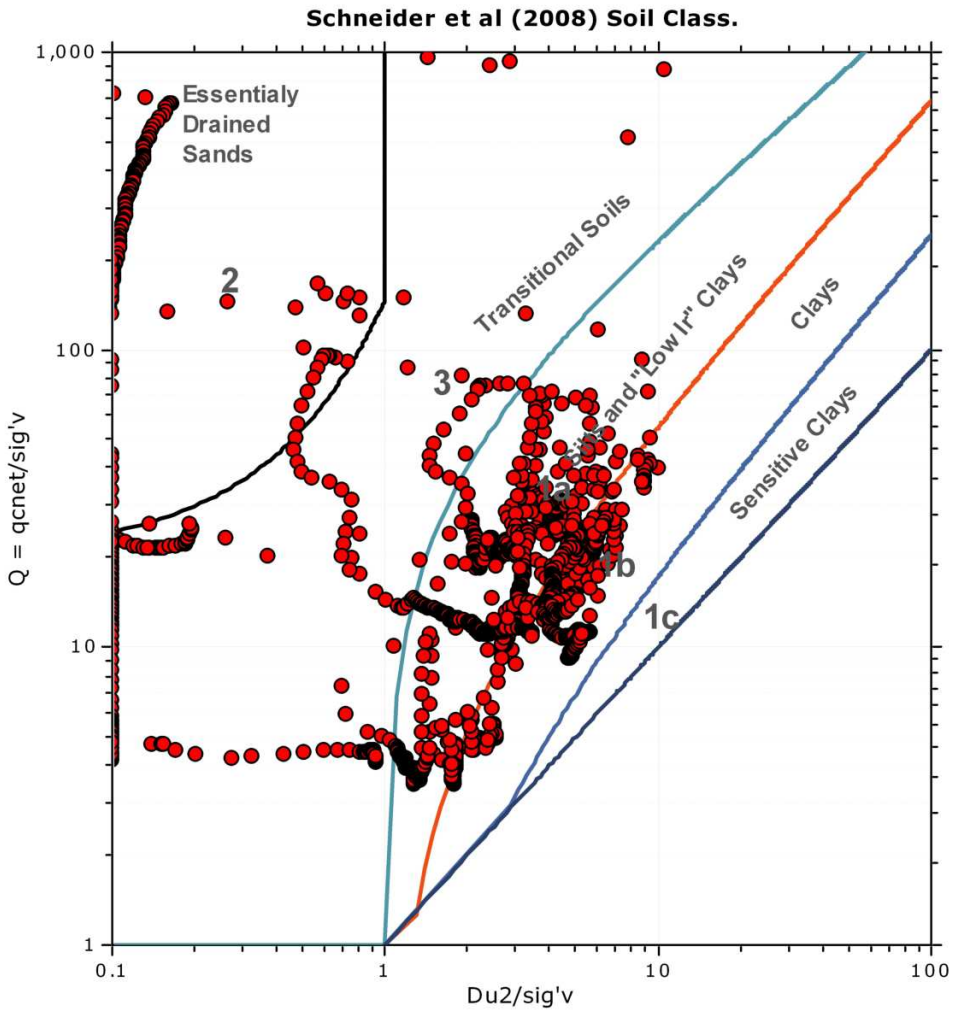
## SBT - Bq plots (normalized)

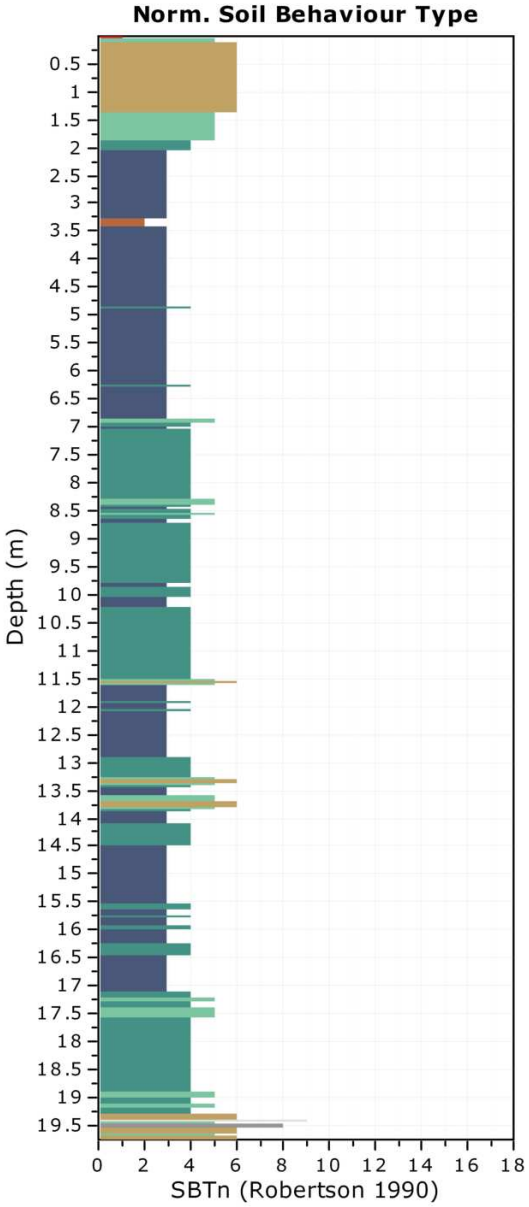


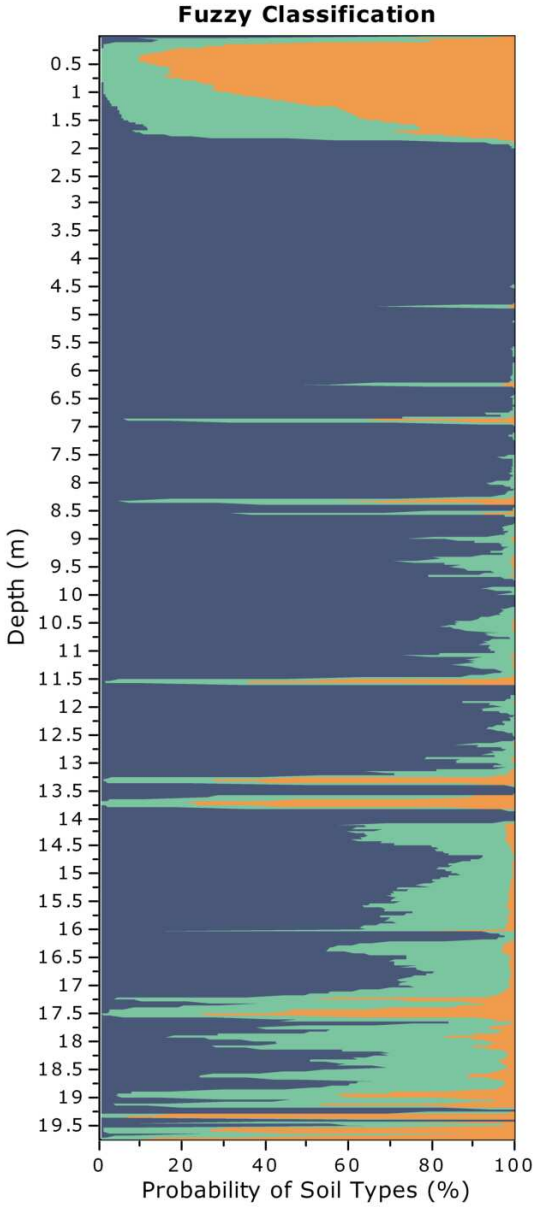



## Bq plots (Schneider)



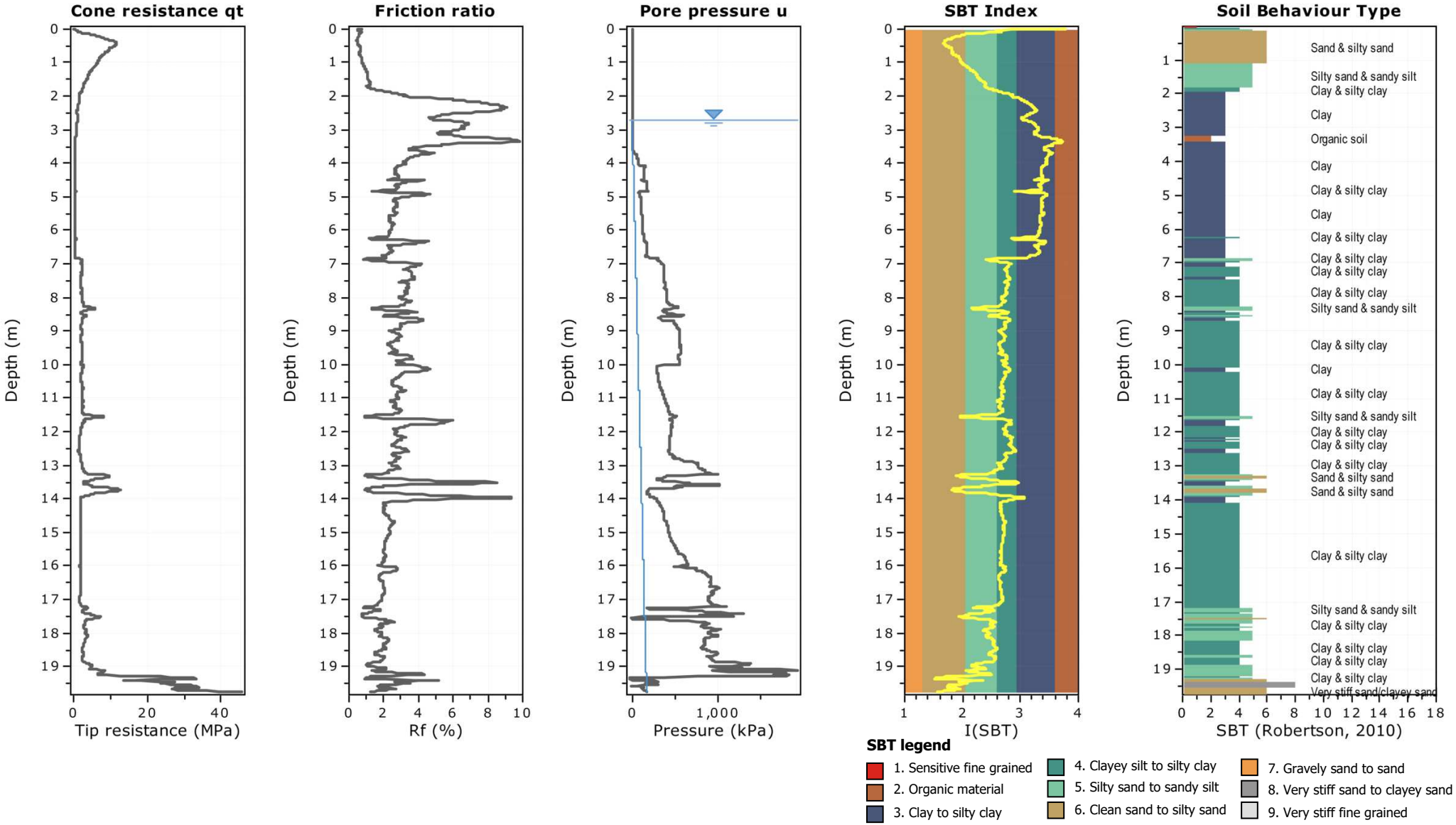



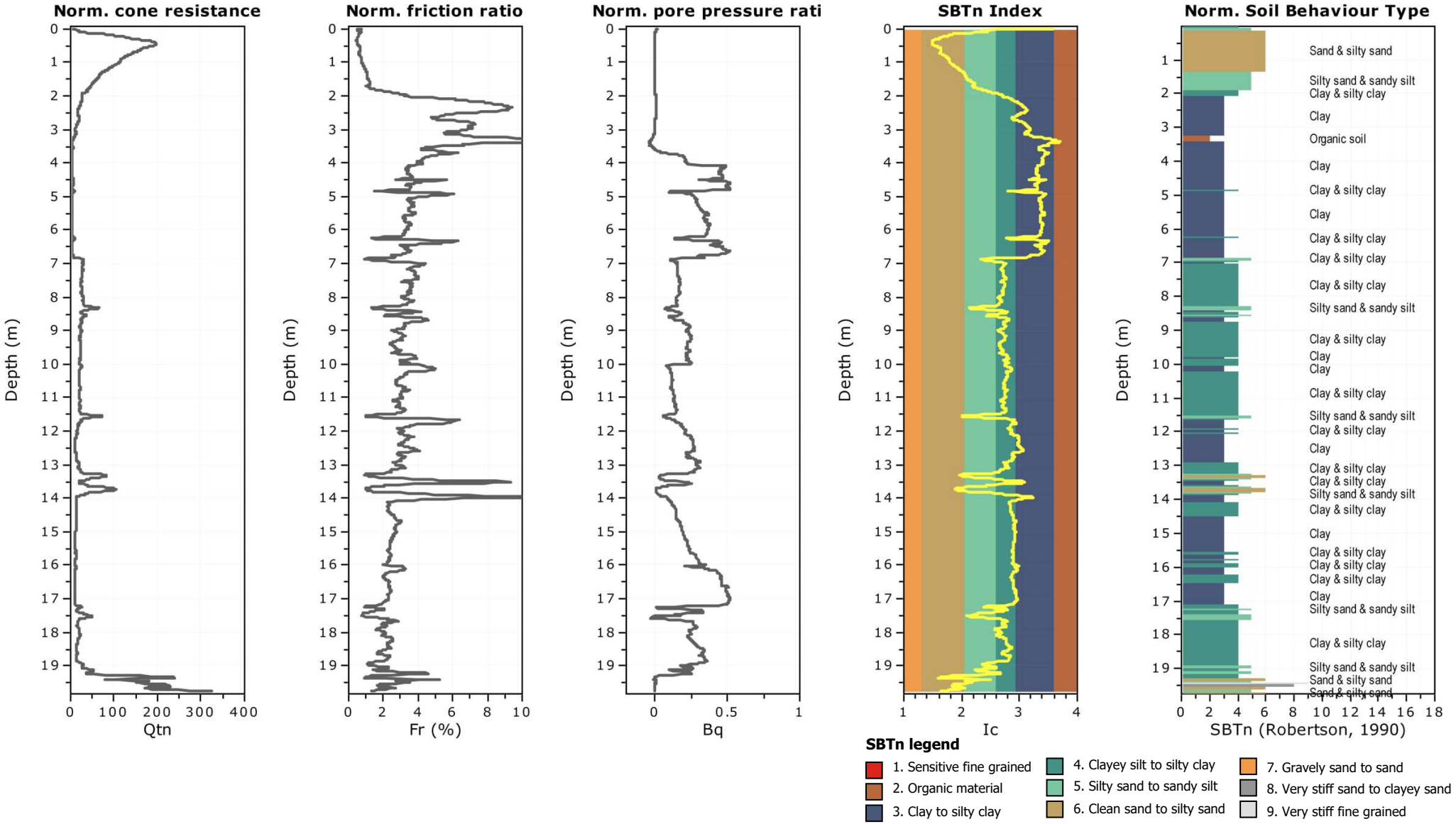


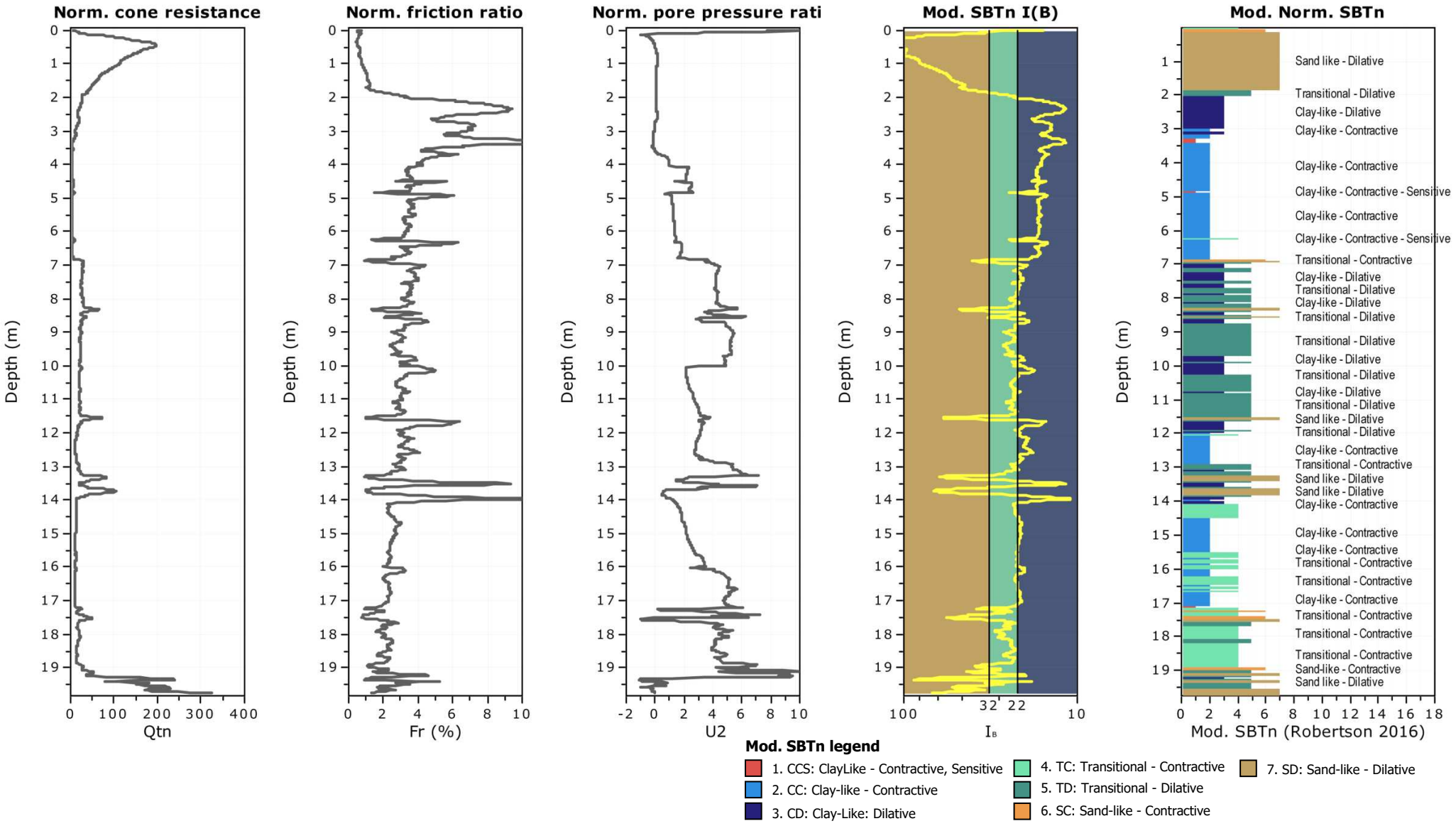




**Fuzzy classifiaction legend**

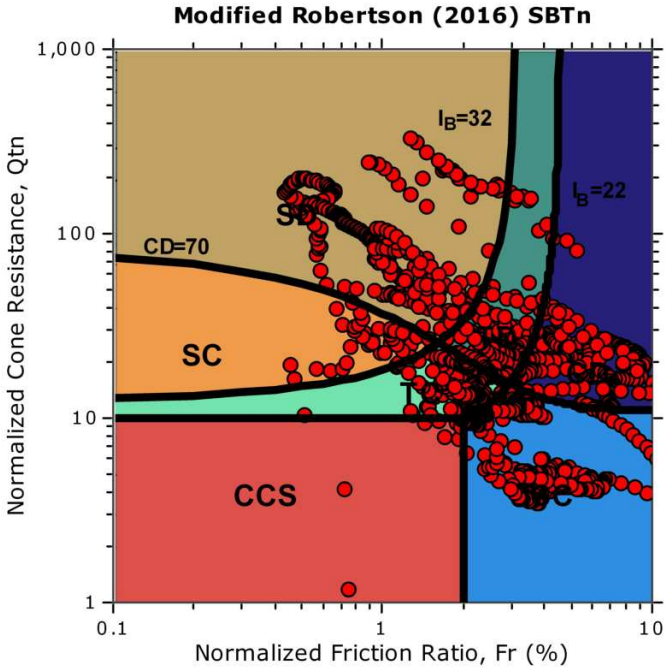
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

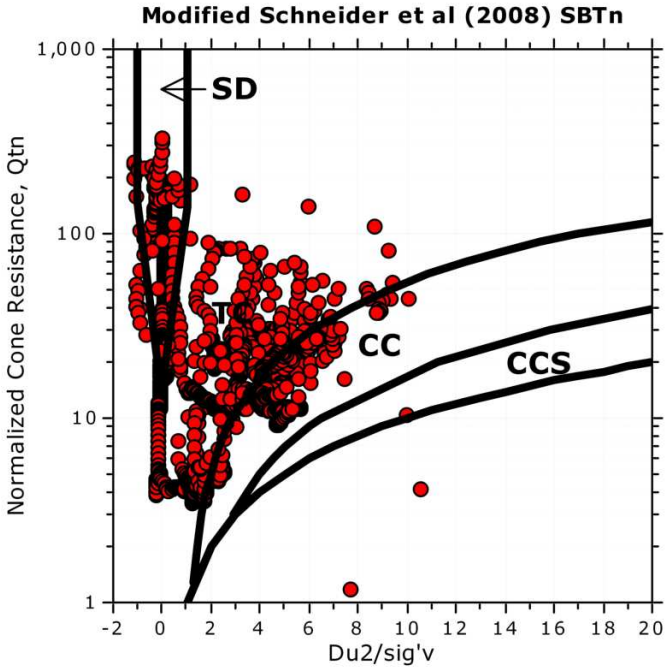

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Organic soil
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

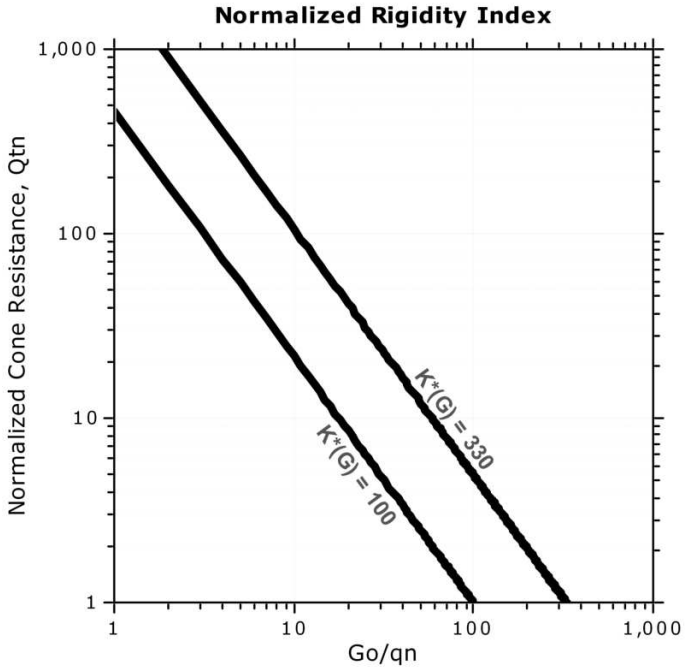

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Organic soil
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Sand-like - Contractive
Sand like - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

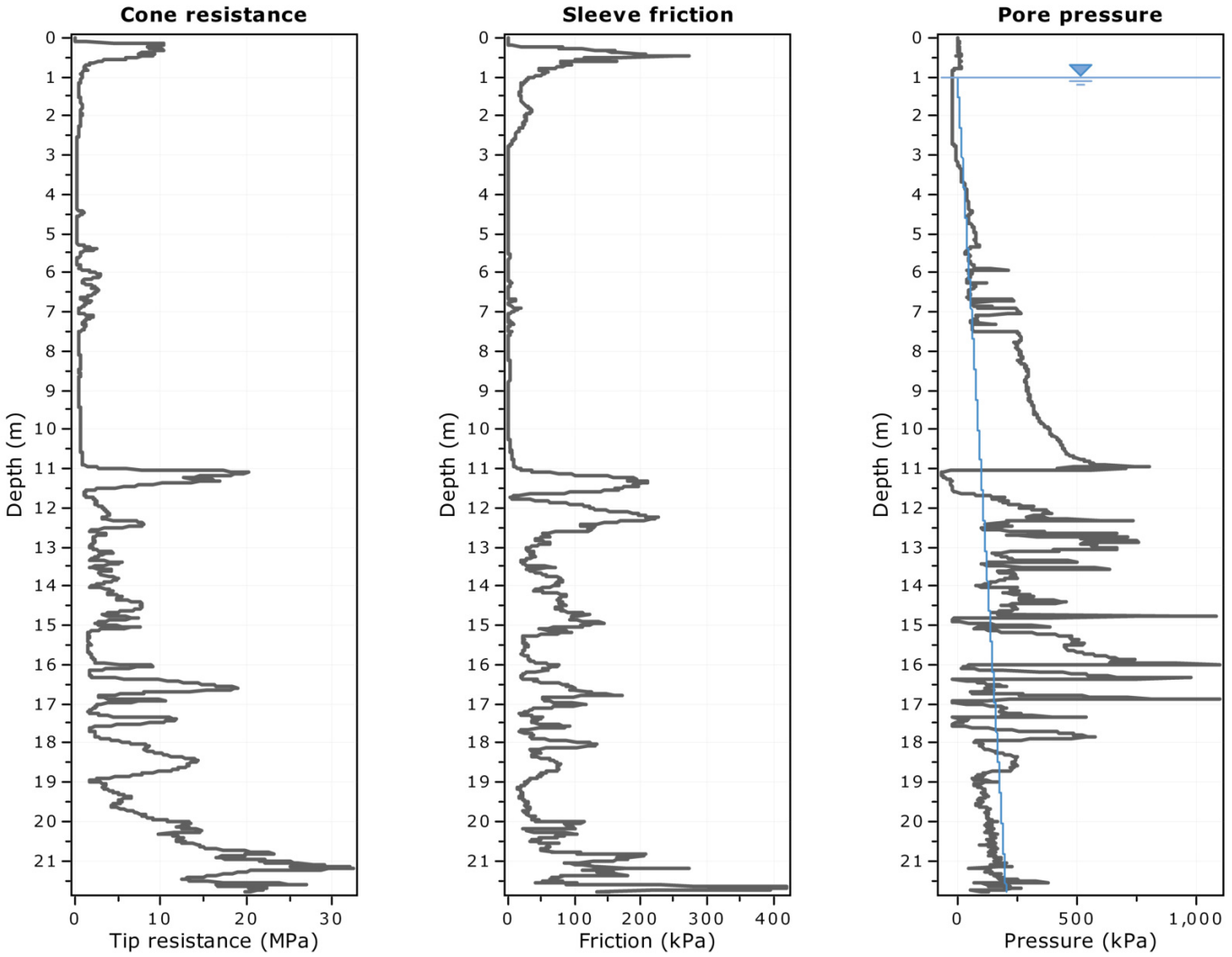


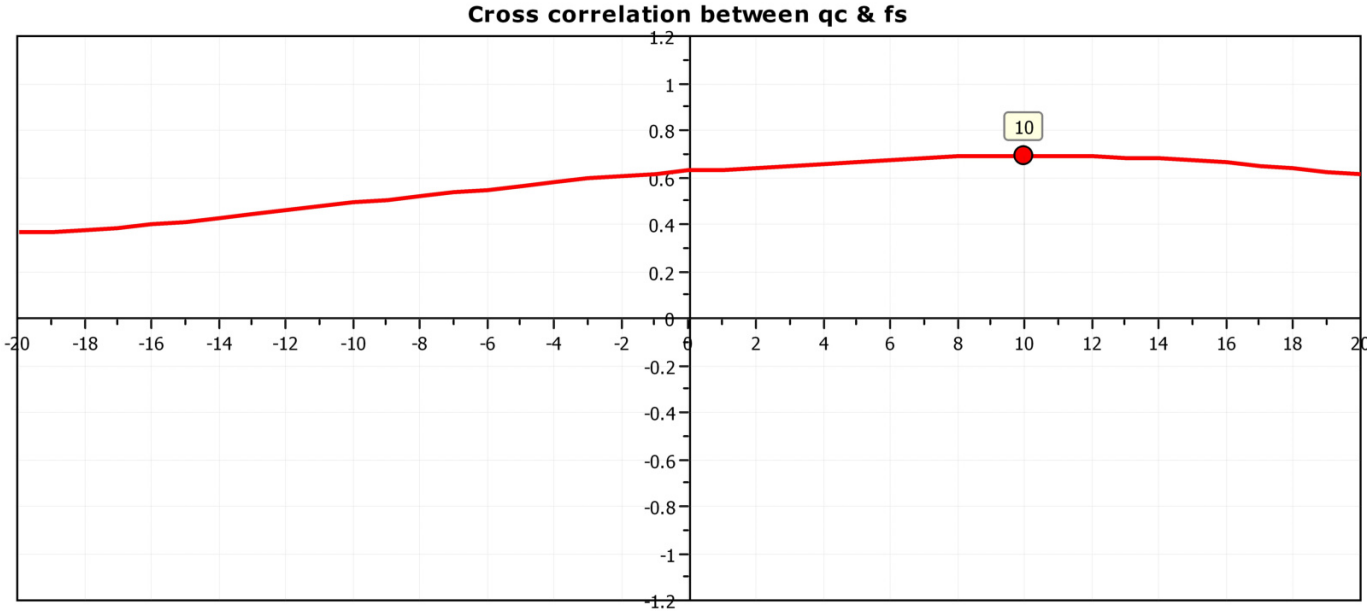




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

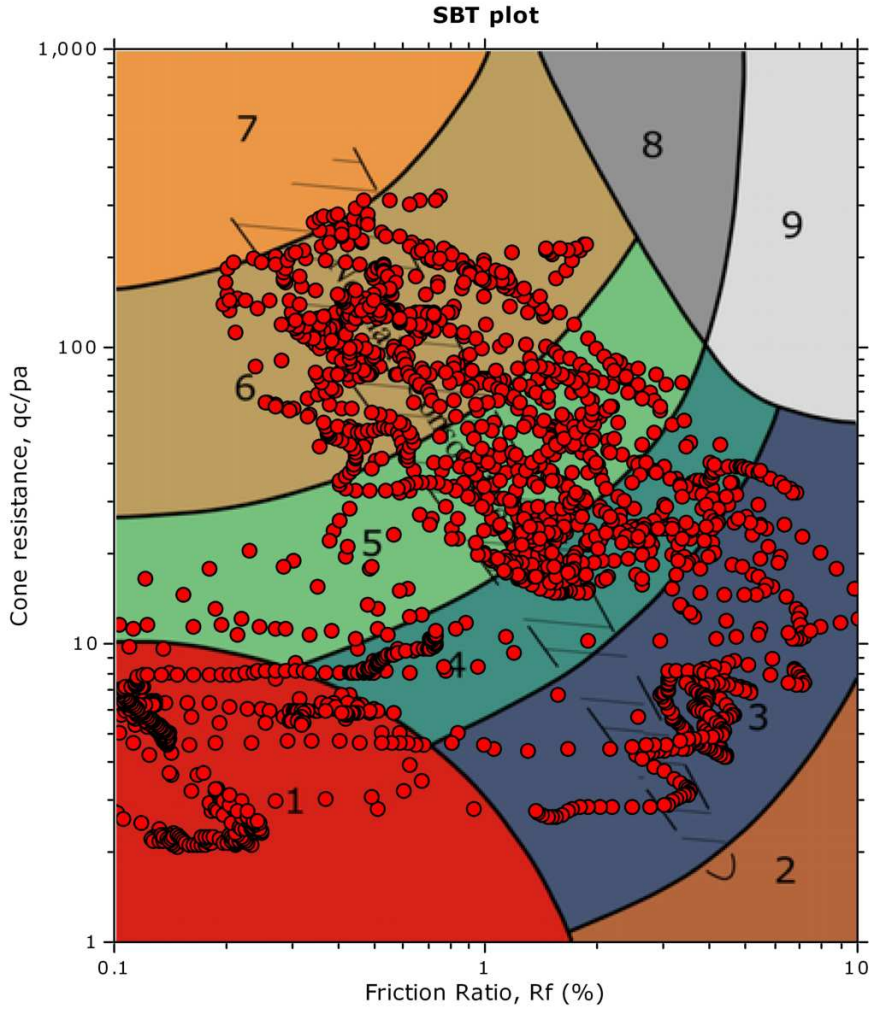
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

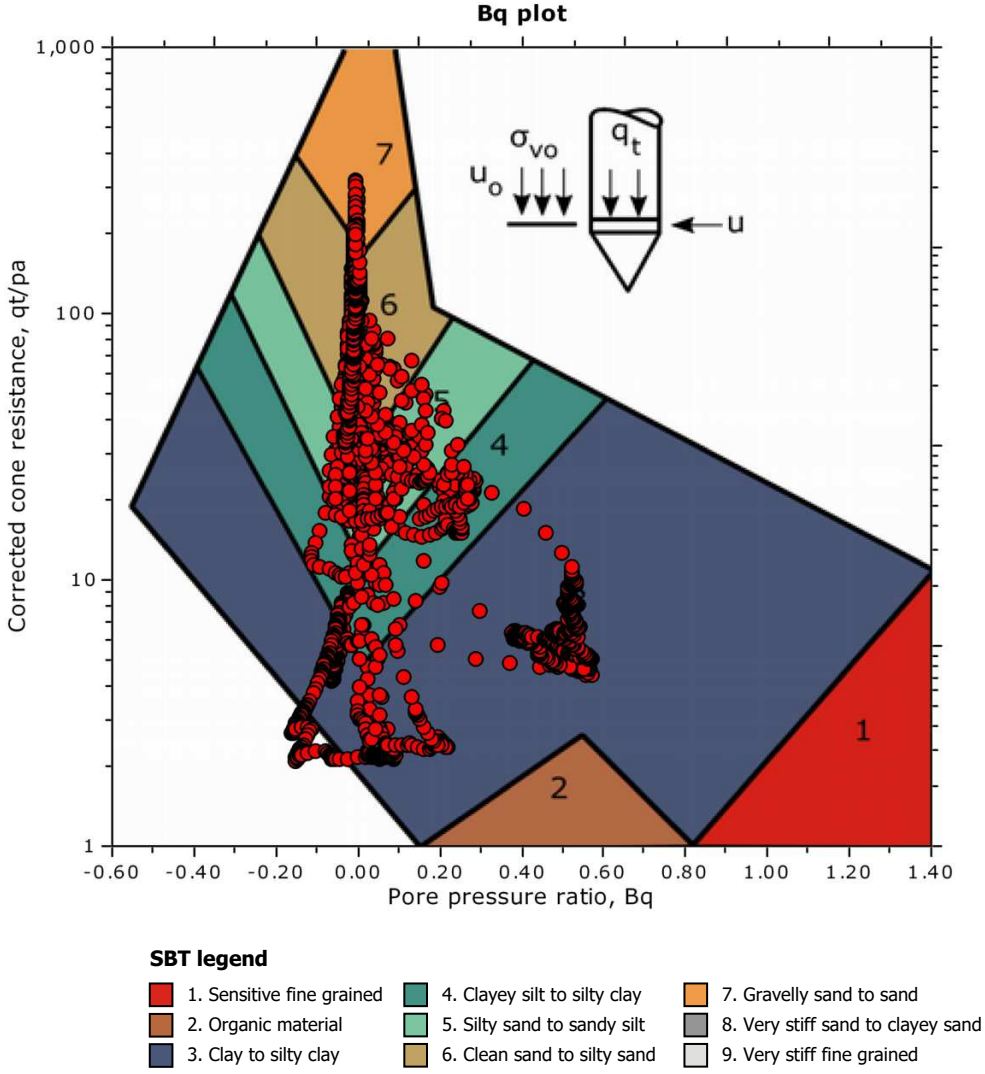



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

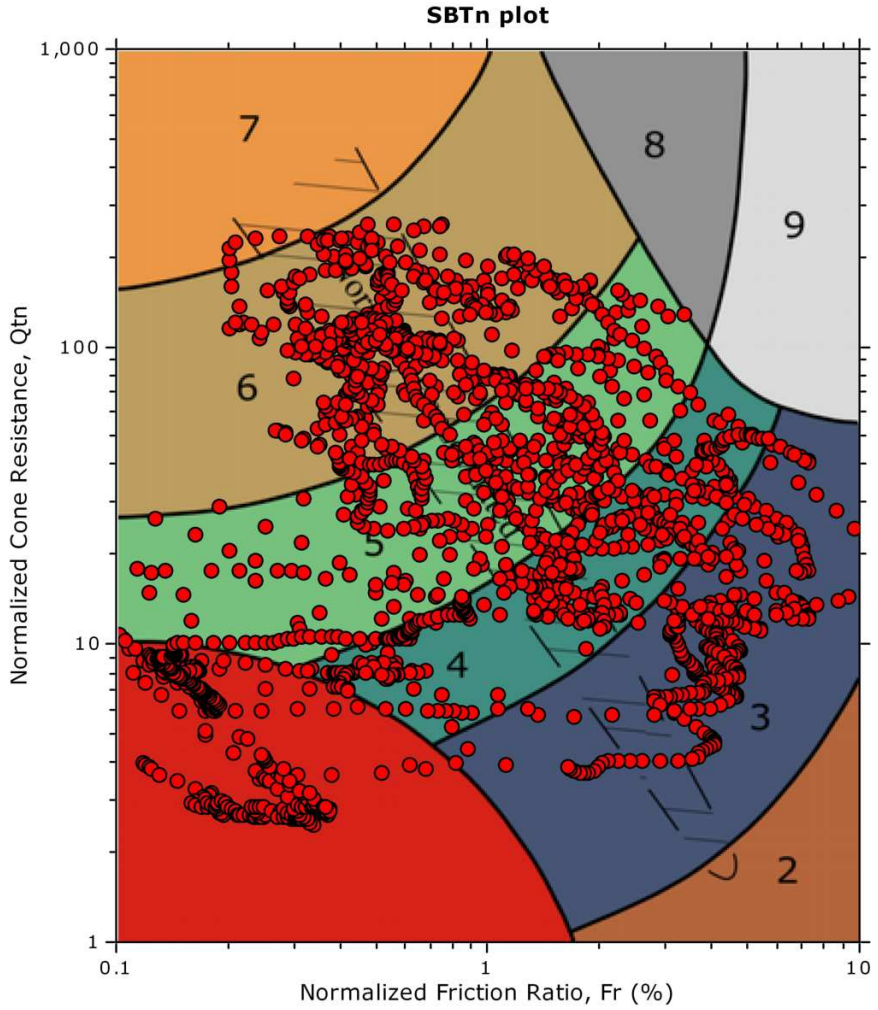


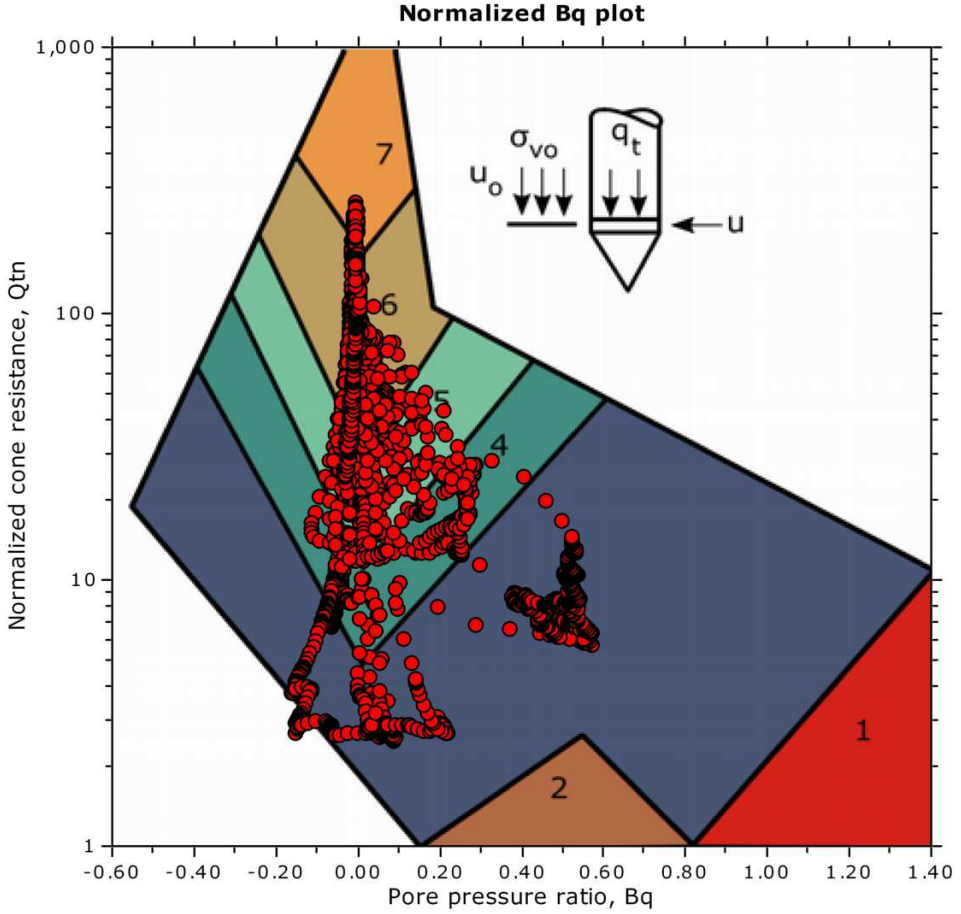
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
1
2
3
4
5
6
7
8
9


Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
4
6
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

## SBT - Bq plots (normalized)

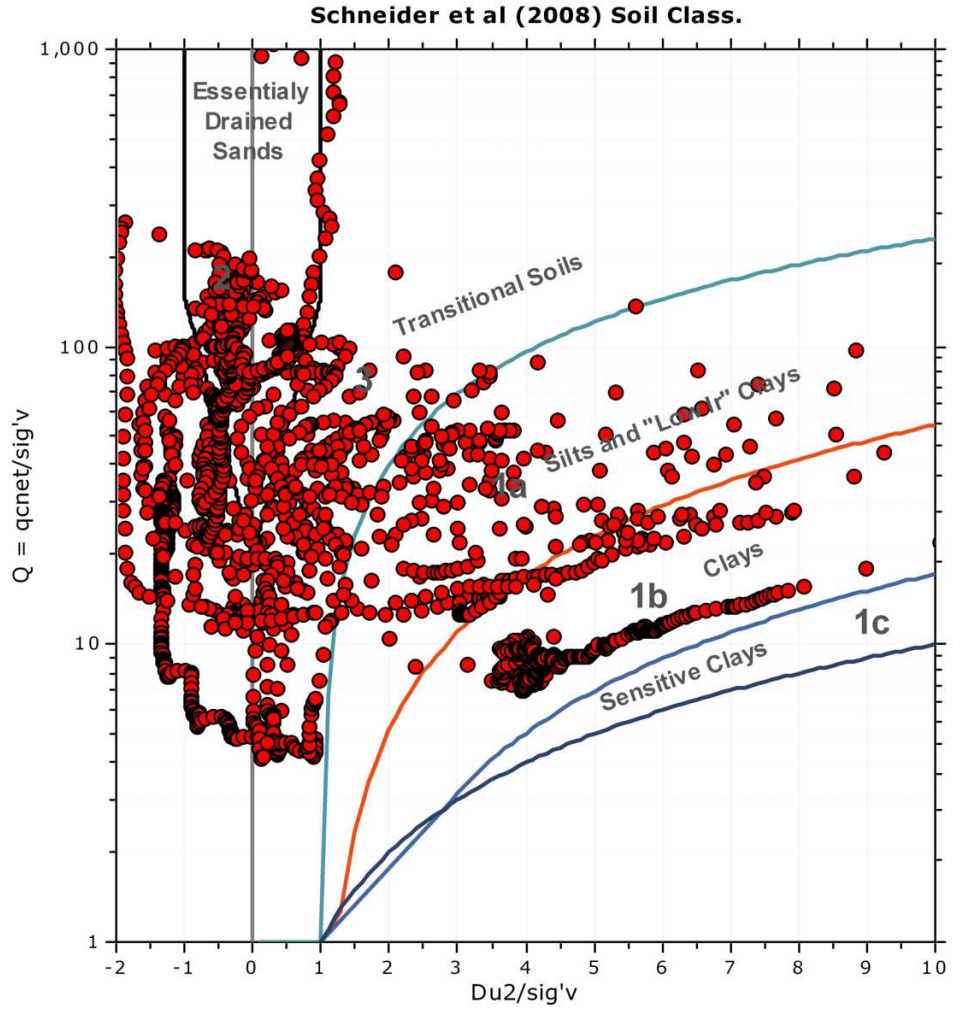


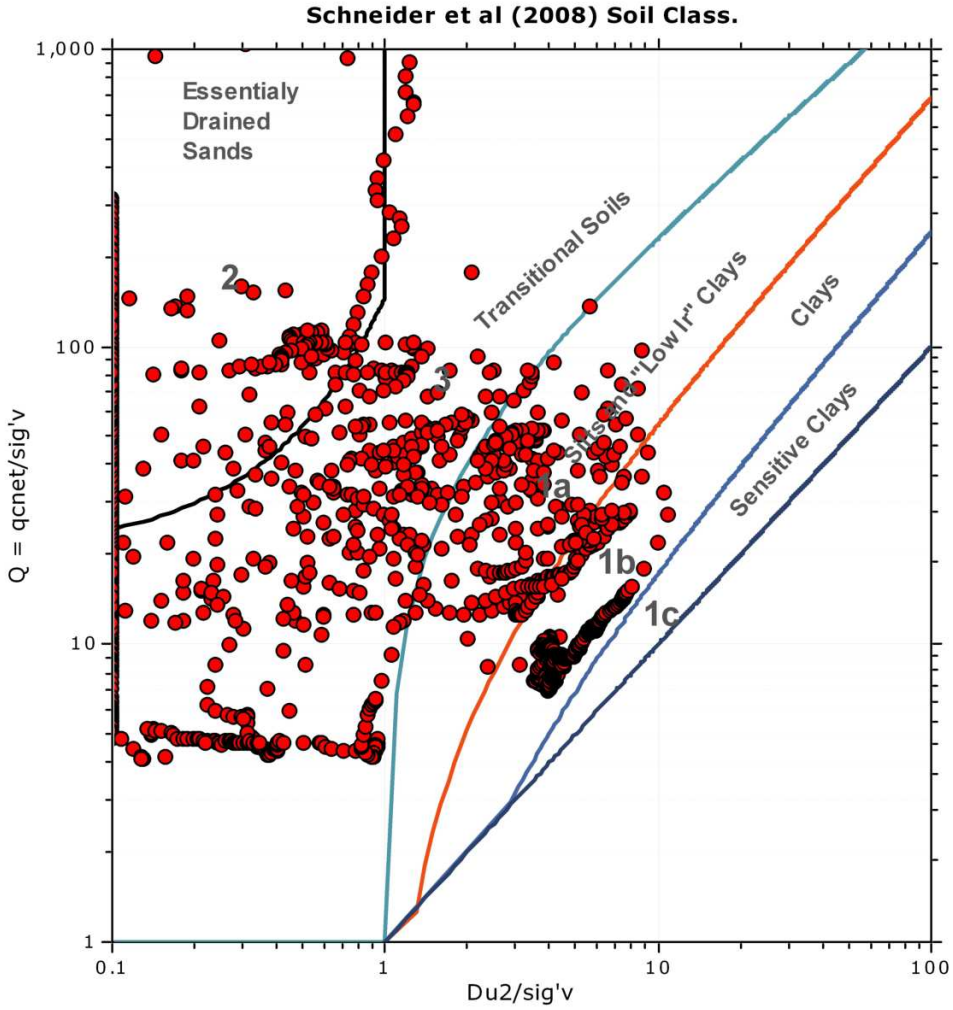



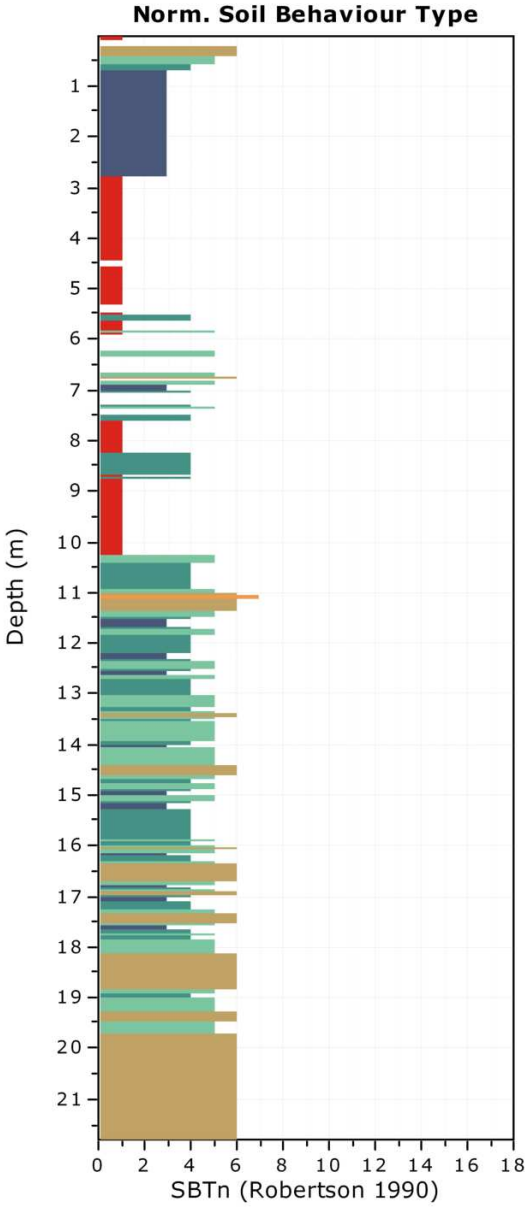

**SBTn legend**

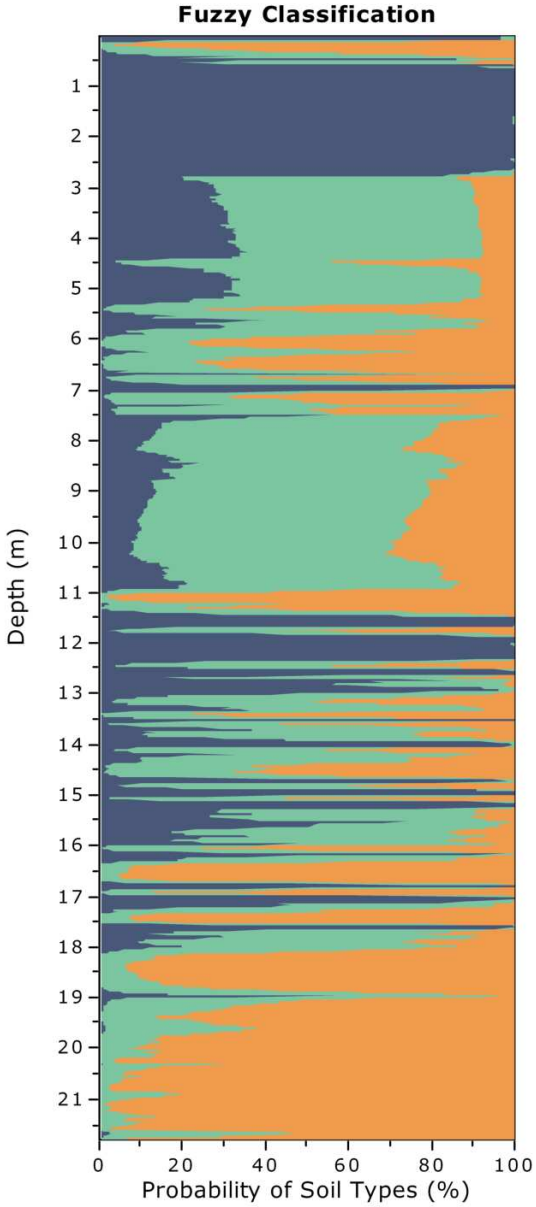
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



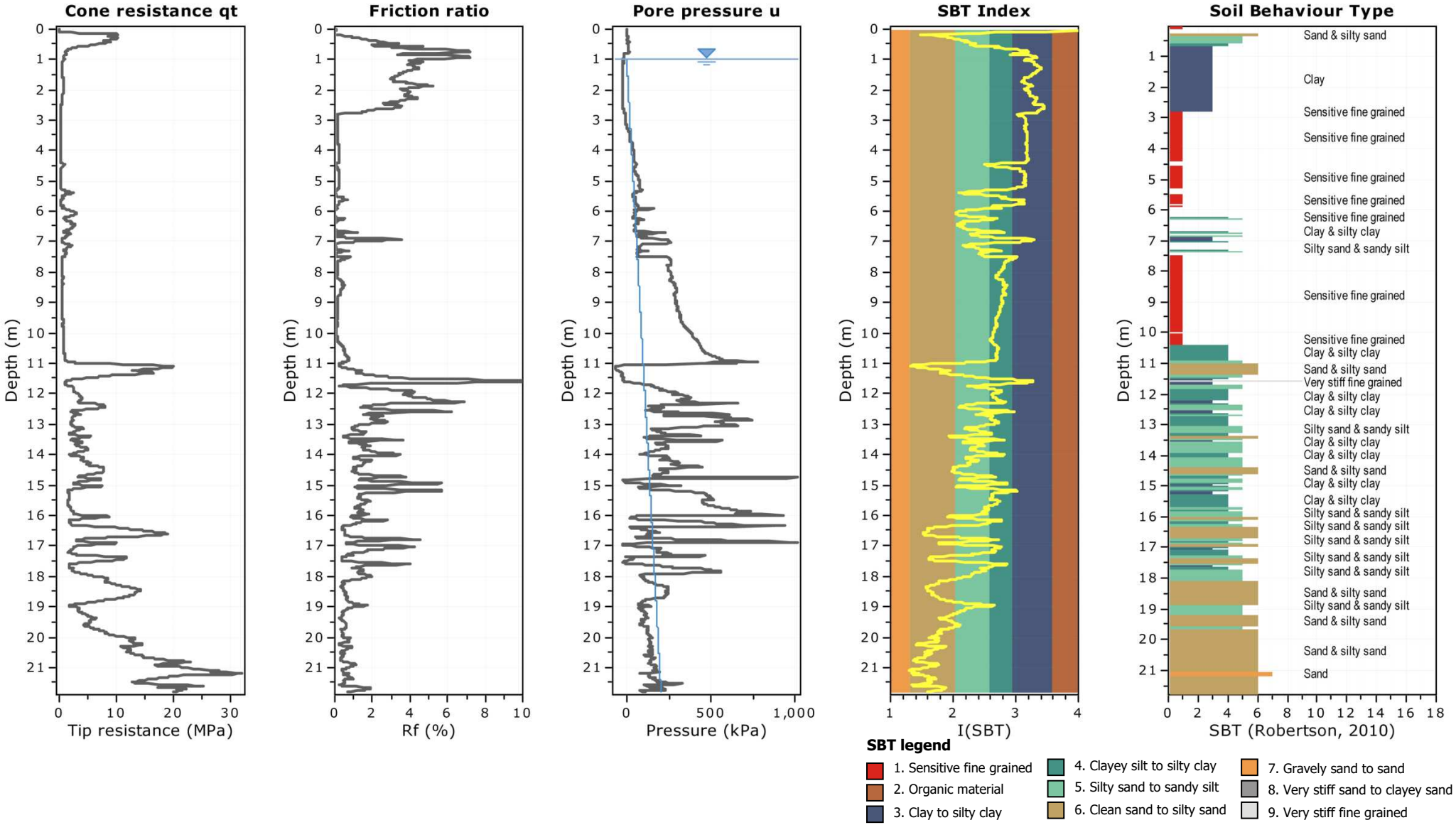



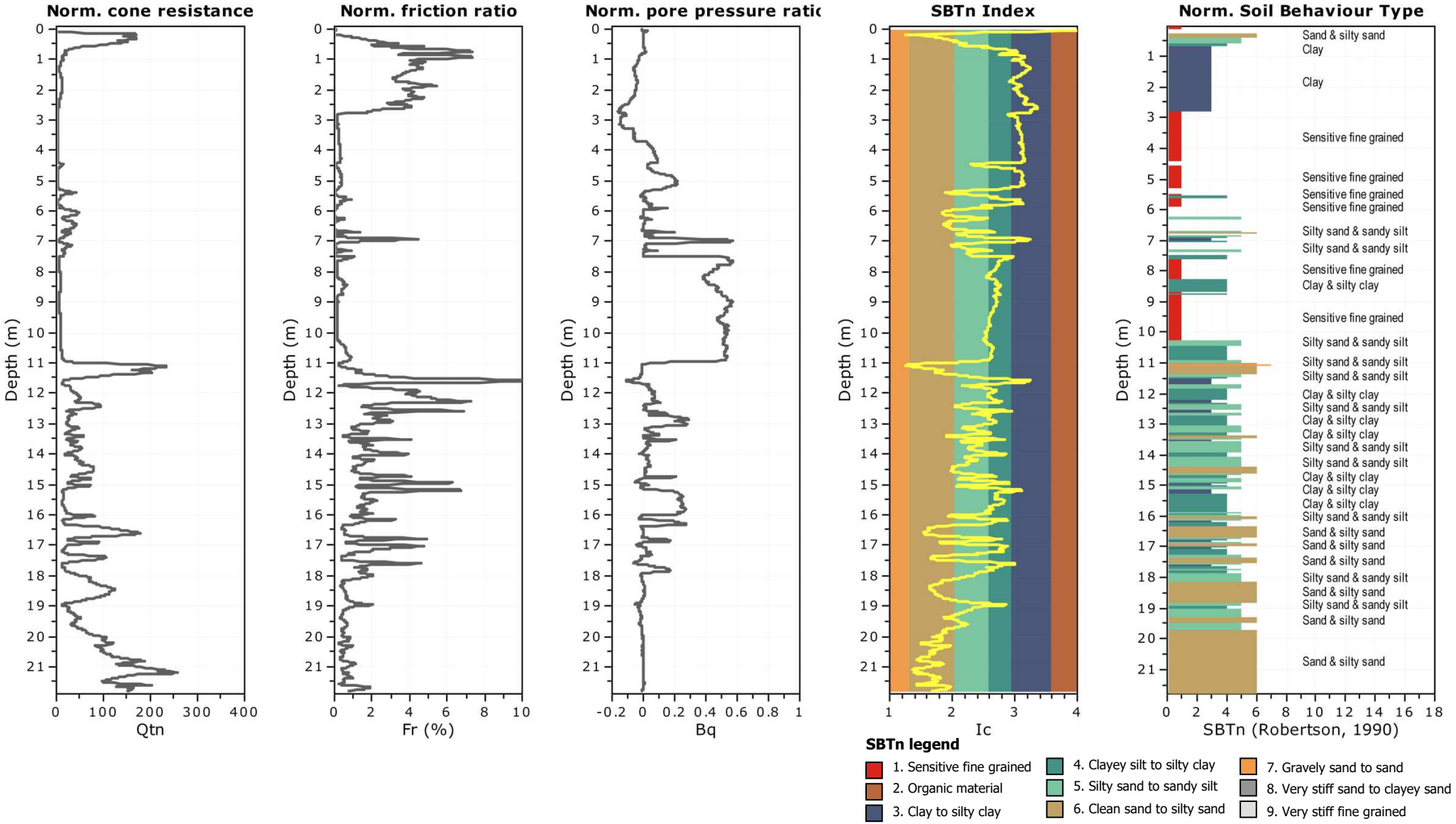


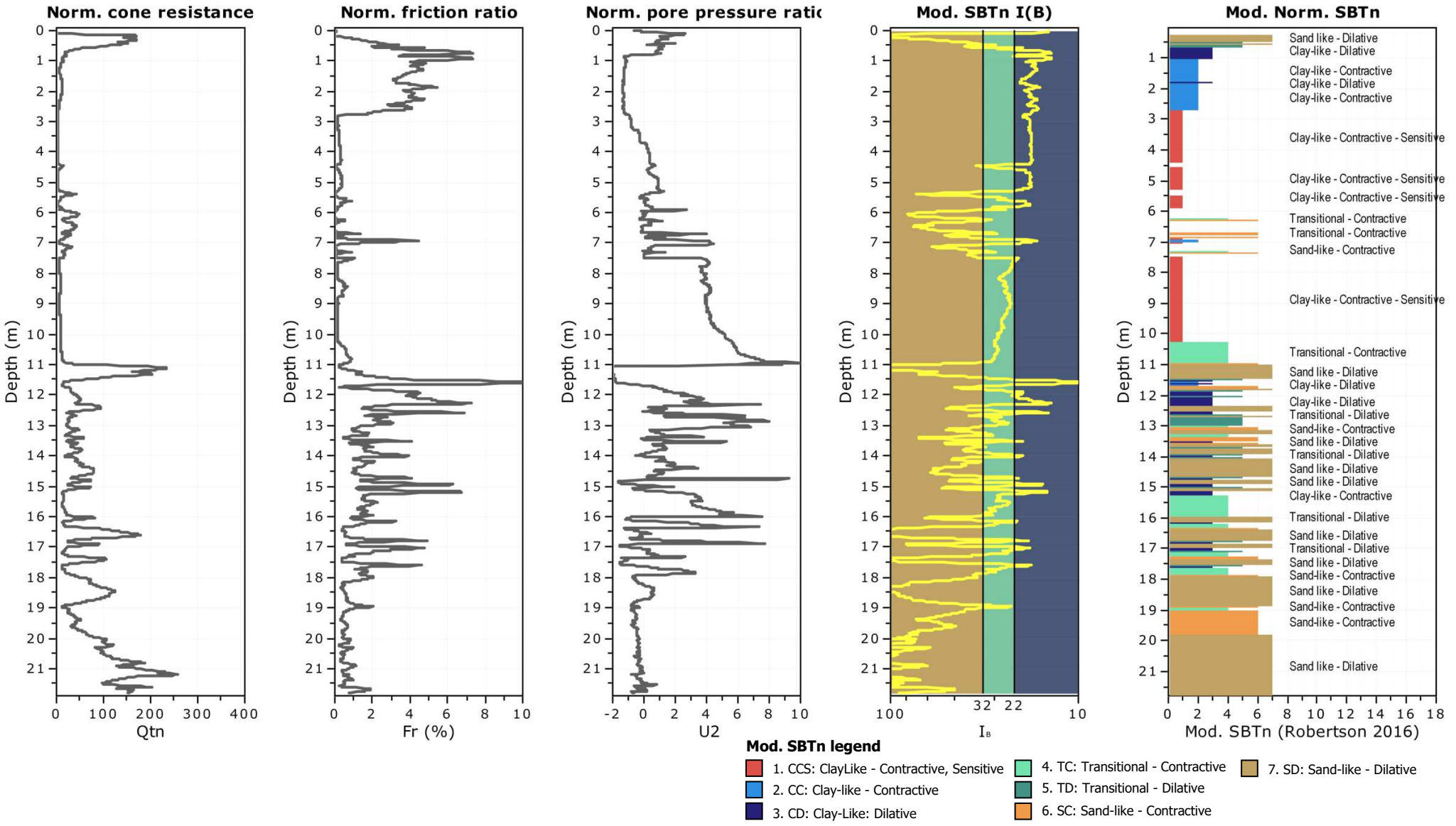




**Fuzzy classifiaction legend**

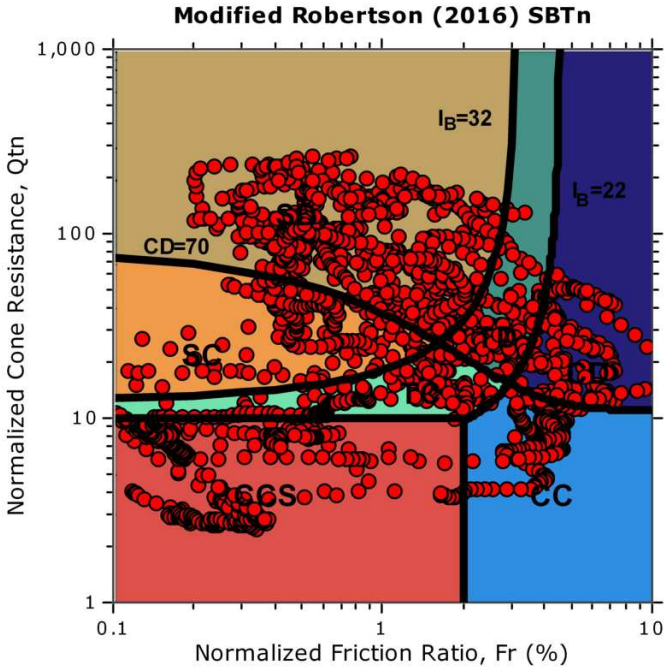
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

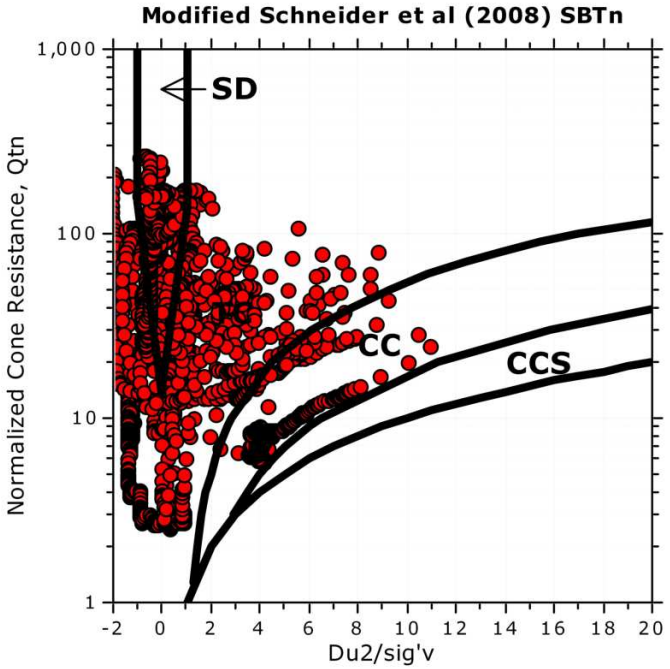

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Clay
Sensitive fine grained
Clay & silty clay
Silty sand & sandy silt
Very stiff fine grained
Sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

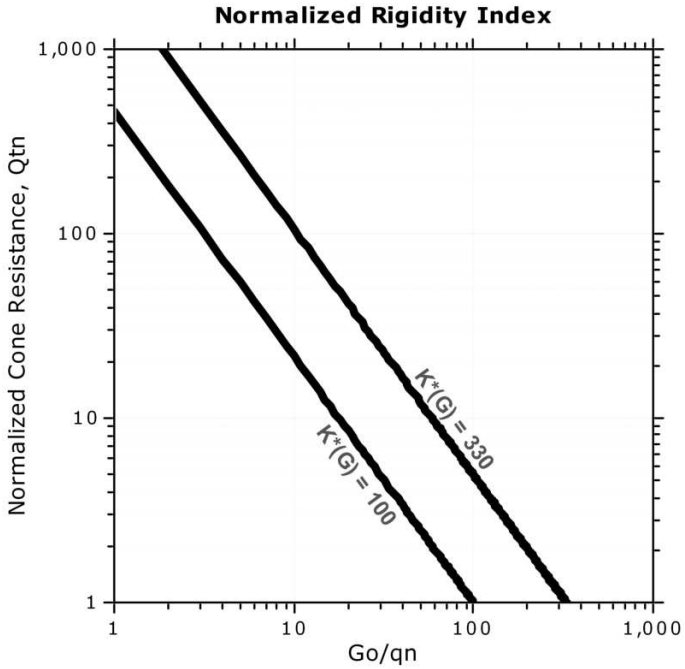

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Clay
Clay
Sensitive fine grained
Sensitive fine grained
Sensitive fine grained
Sensitive fine grained
Silty sand & sandy silt
Silty sand & sandy silt
Sensitive fine grained
Clay & silty clay
Sensitive fine grained
Silty sand & sandy silt
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Clay & silty clay
Silty sand & sandy silt
Sand & silty sand
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
Sand & silty sand
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Ib
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative
Sand like - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Transitional - Dilative
Sand-like - Contractive

## Updated SBTn plots

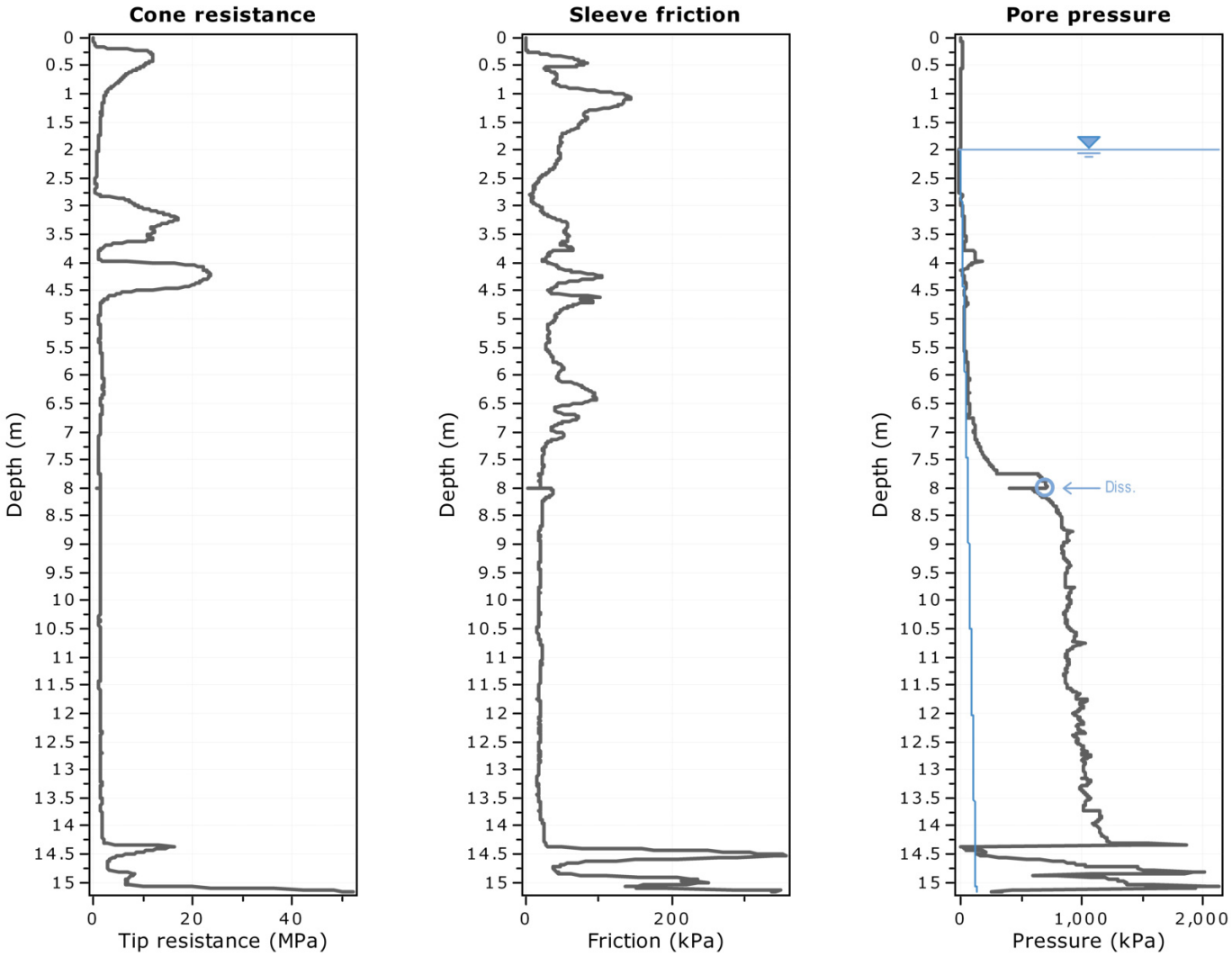


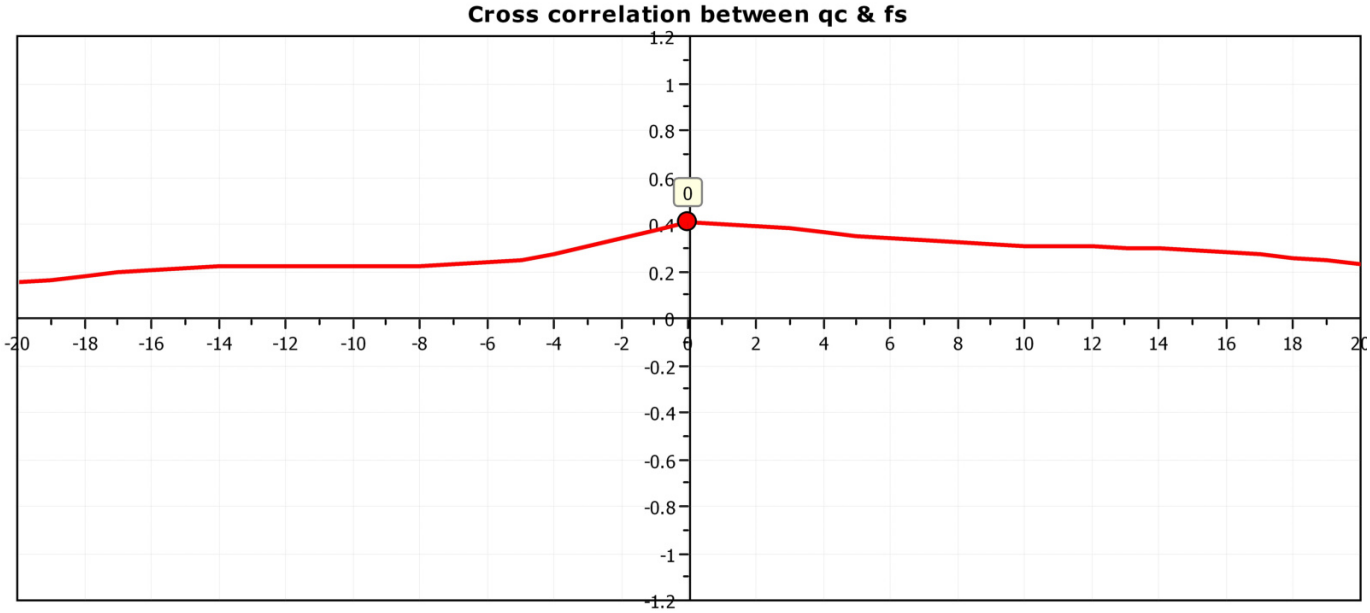




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

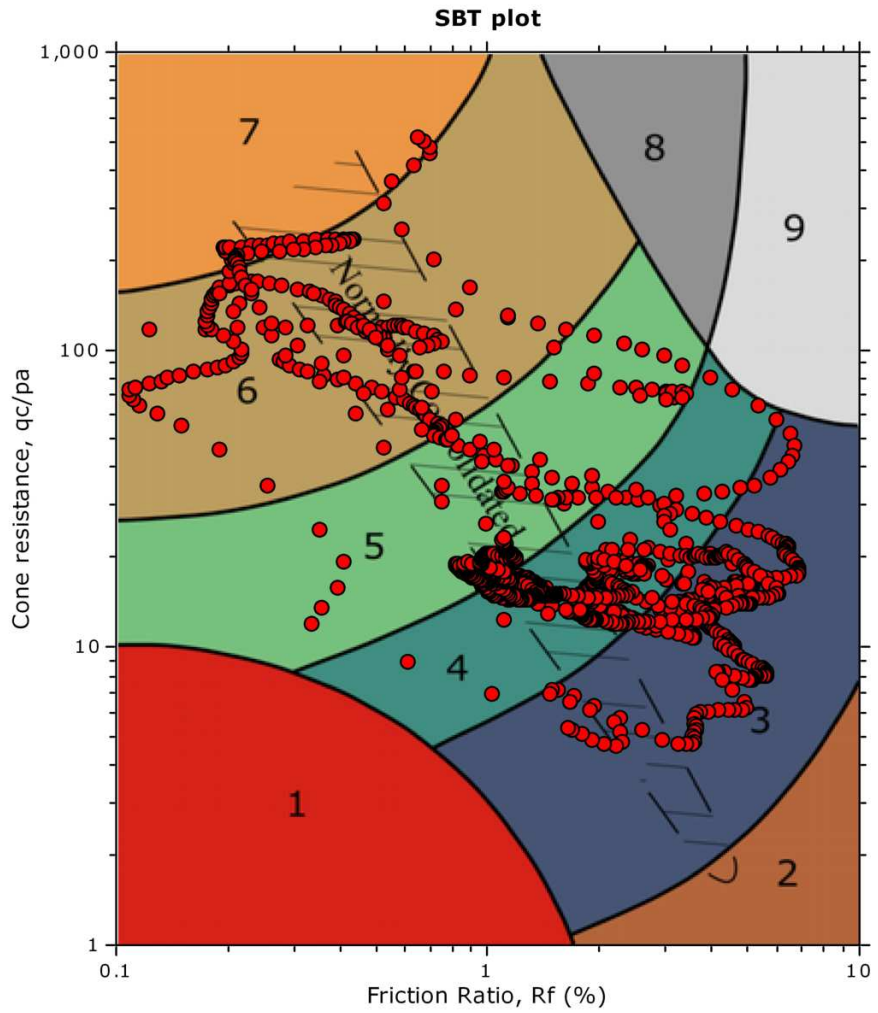
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

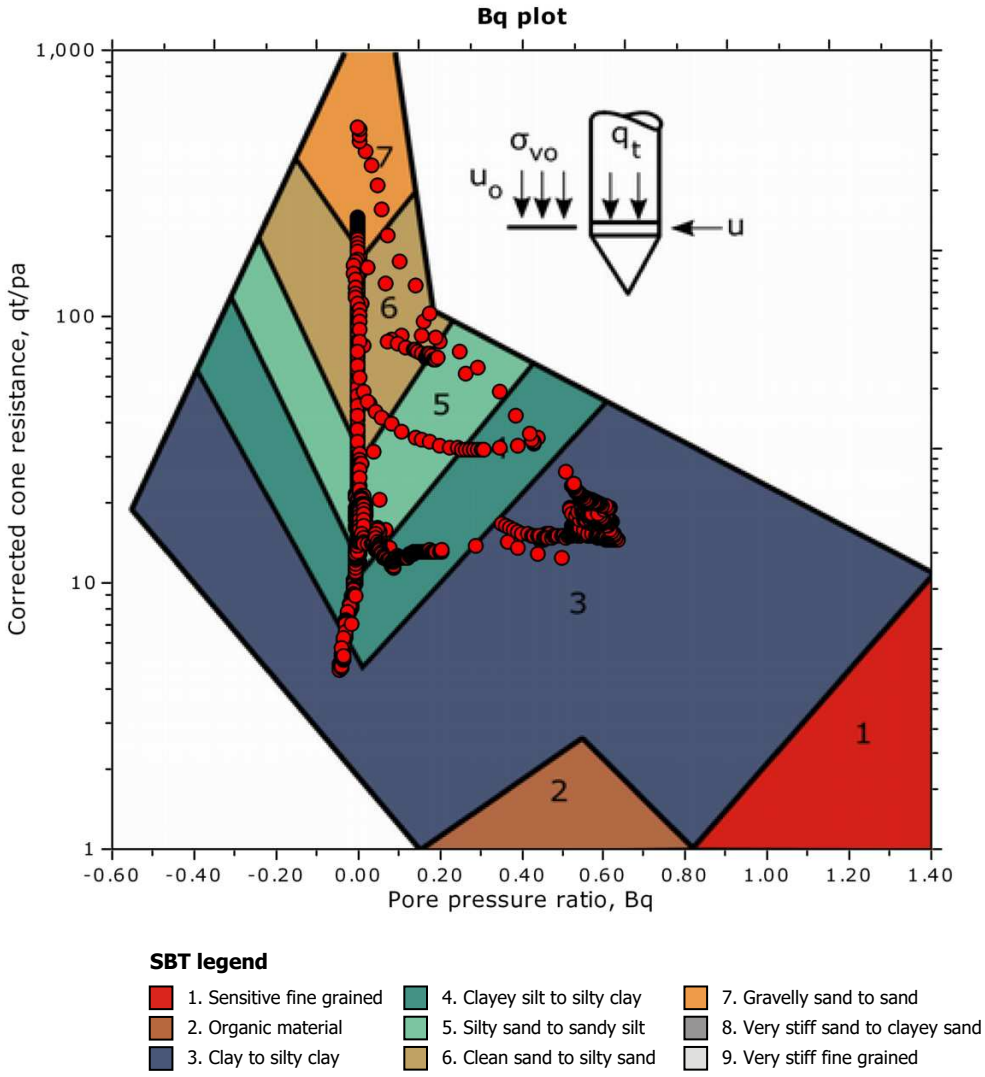



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

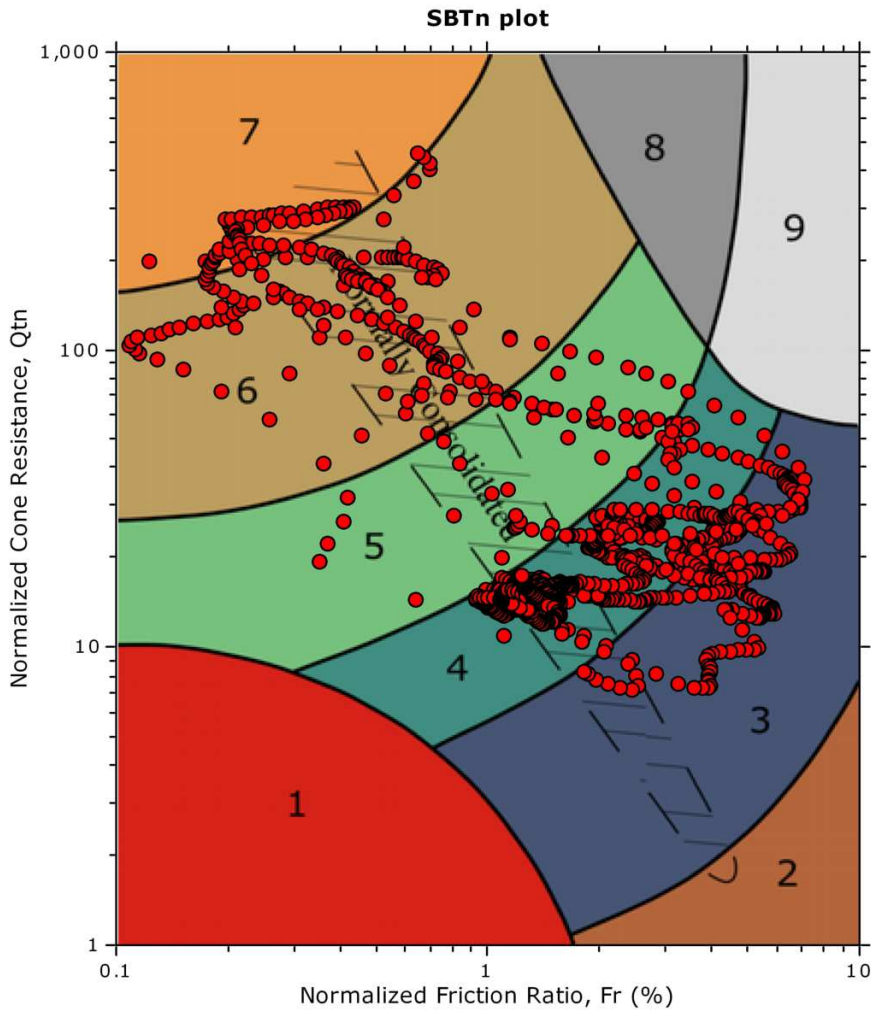


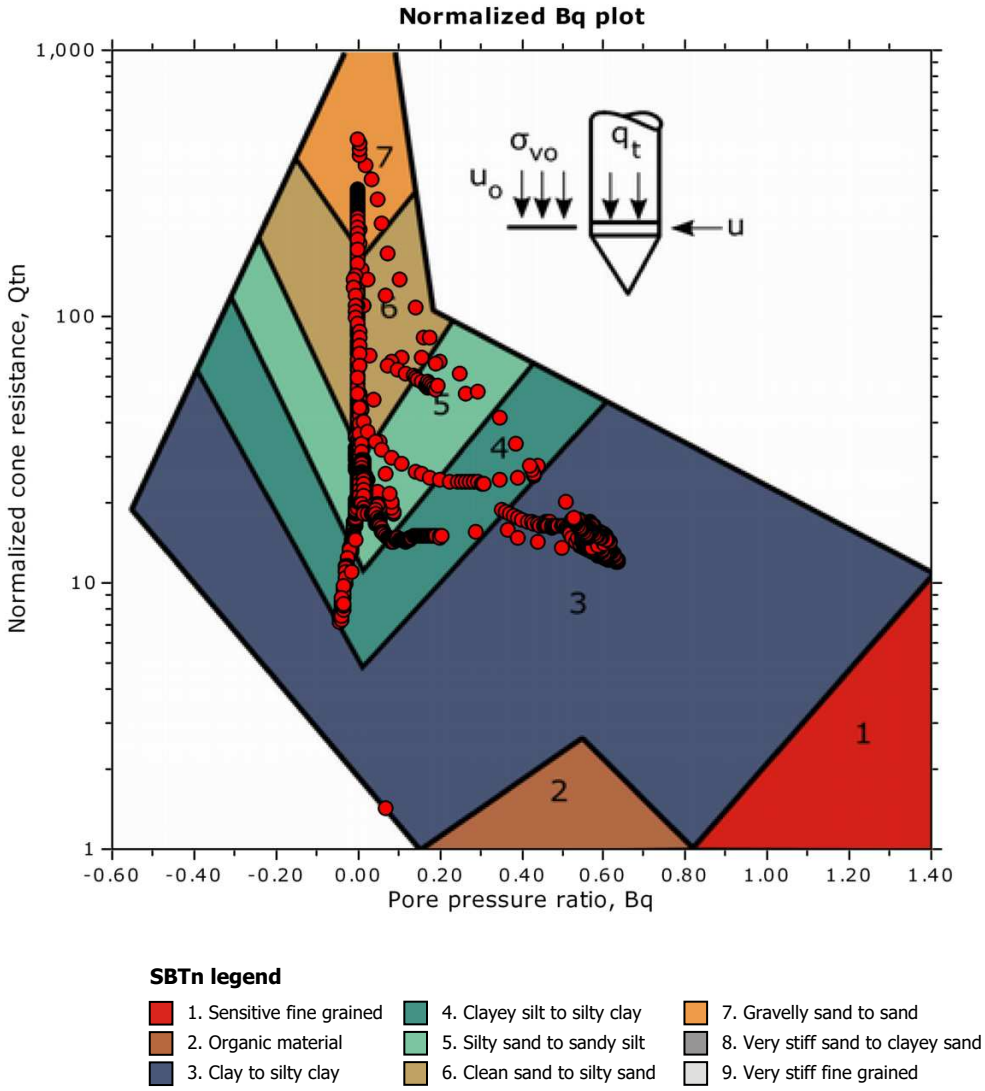
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
Normally Consolidated
1
2
3
4
5
6
7
8
9


Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
3
5
6
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

## SBT - Bq plots (normalized)

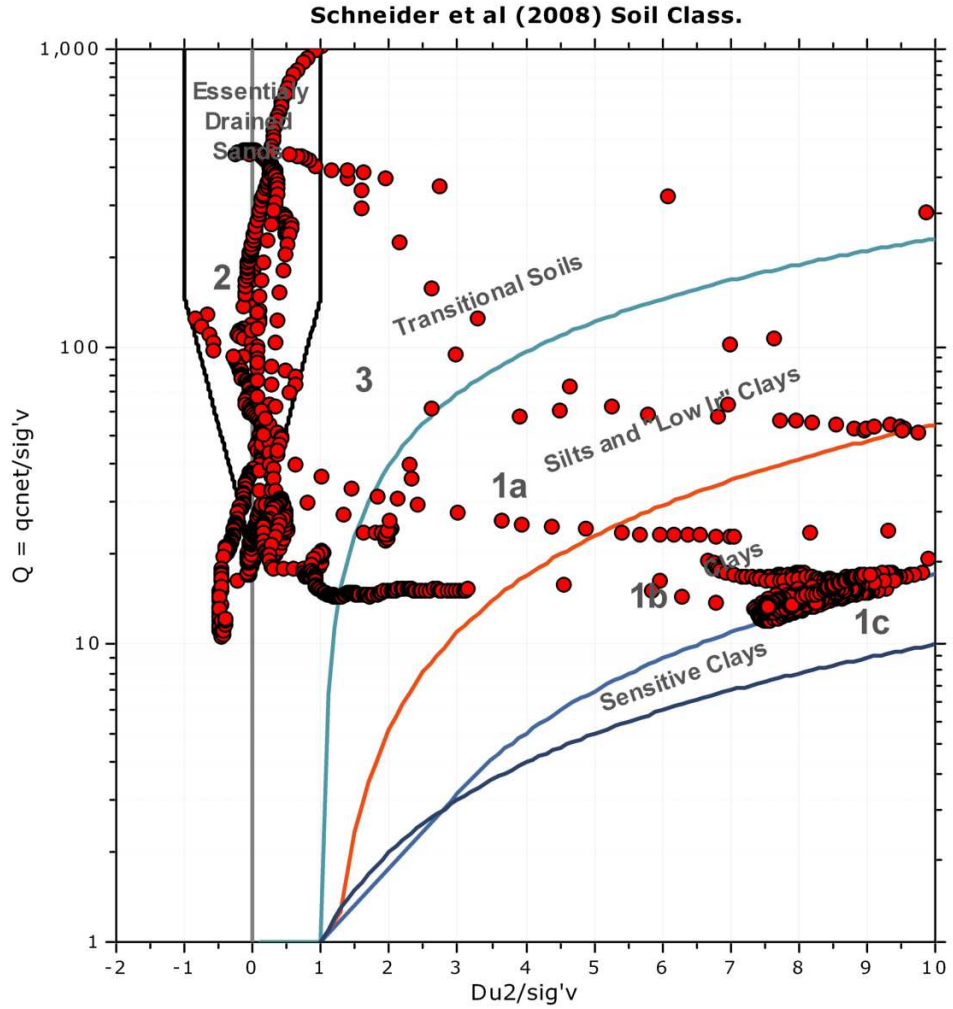


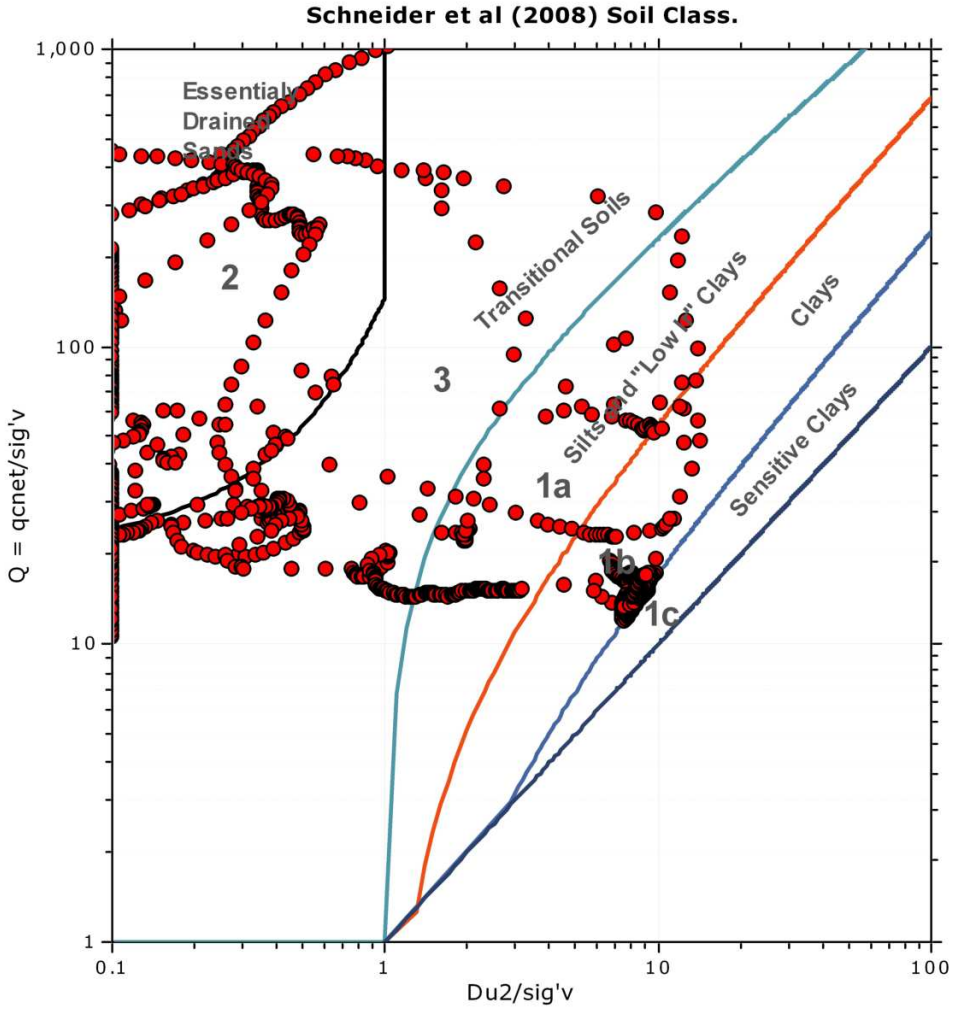



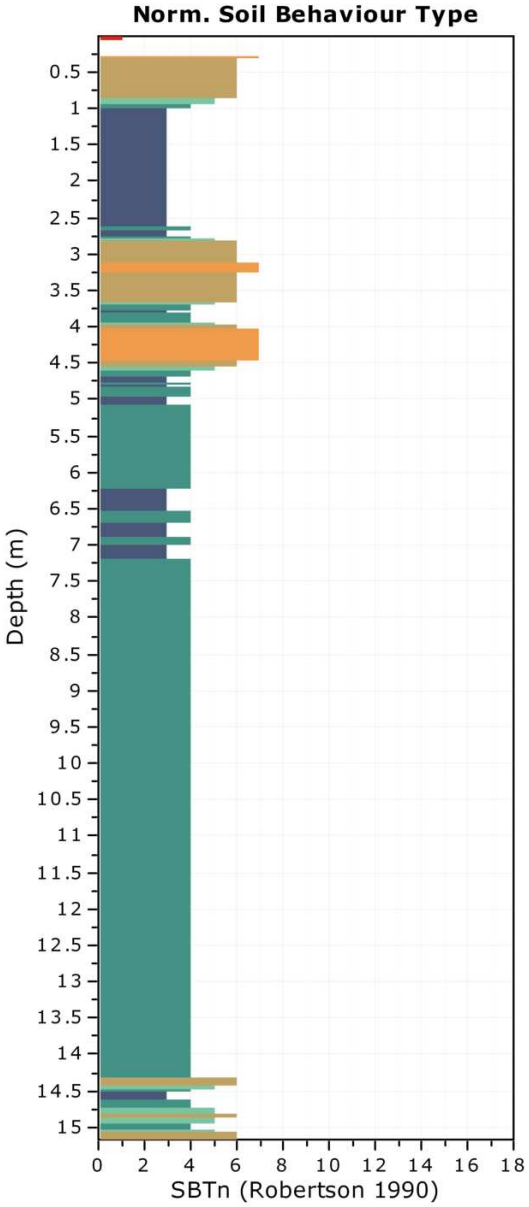

**SBTn legend**

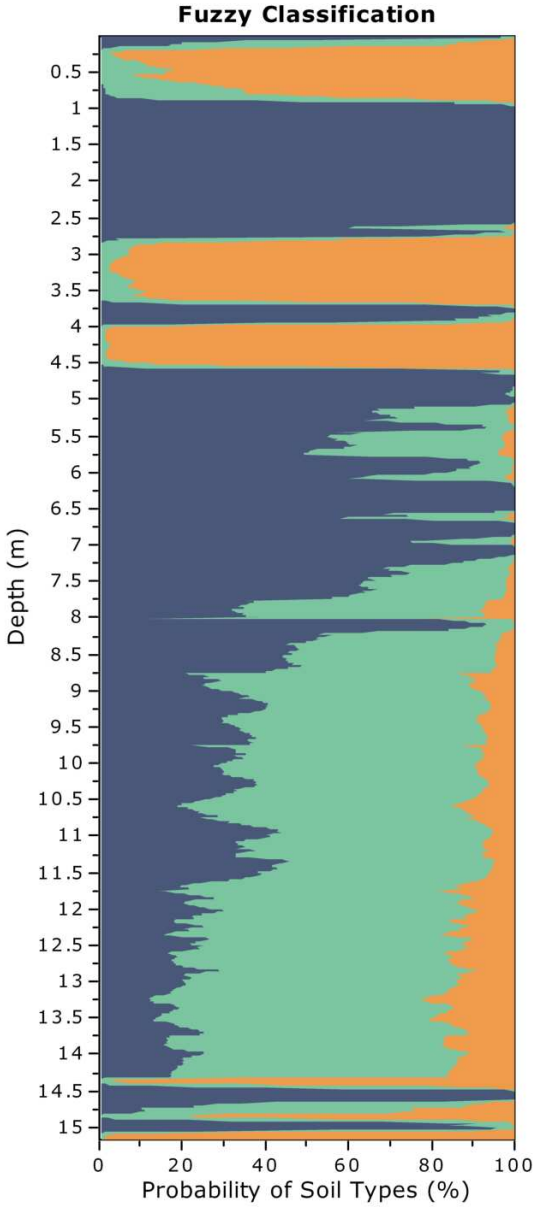
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



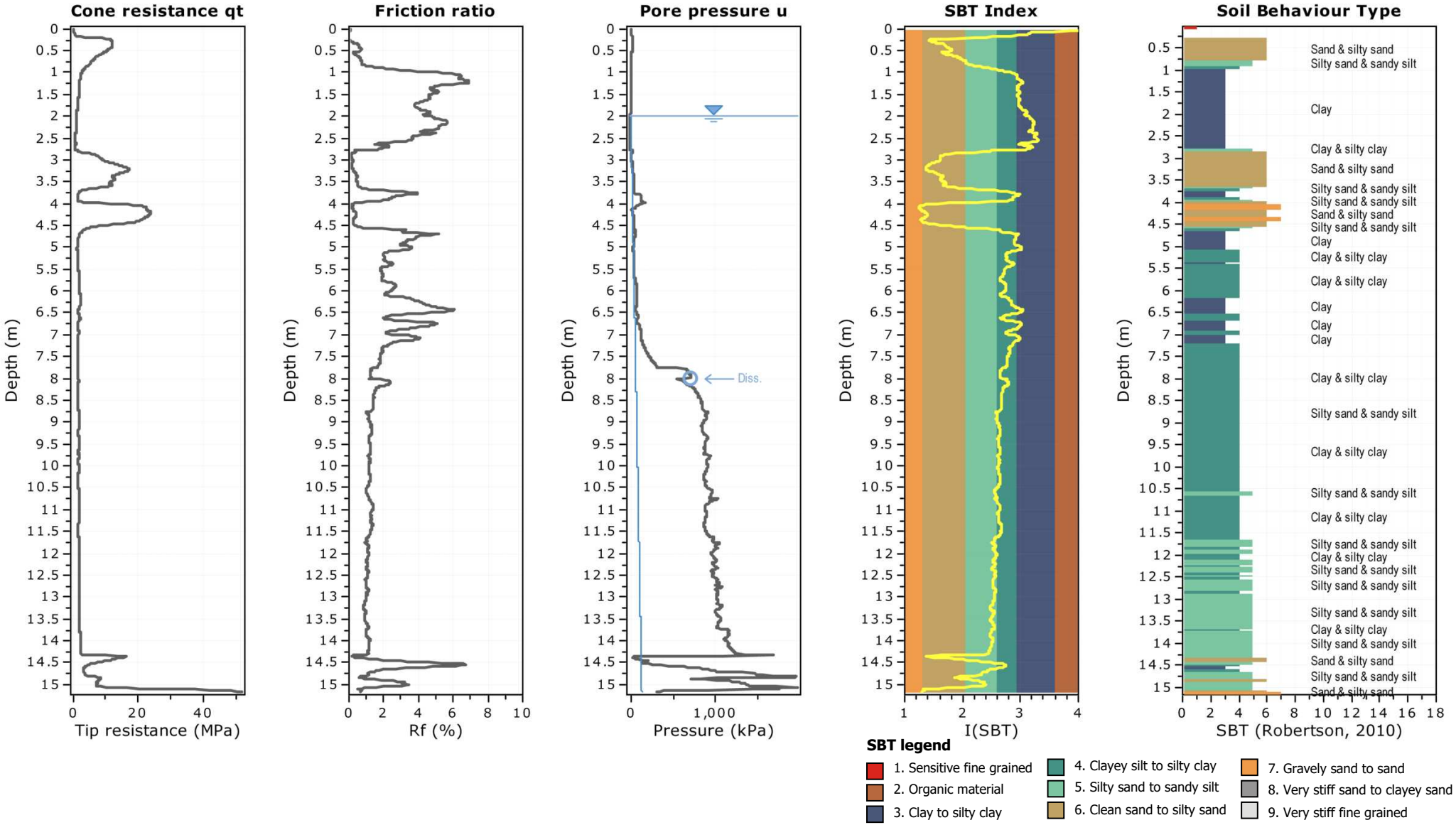



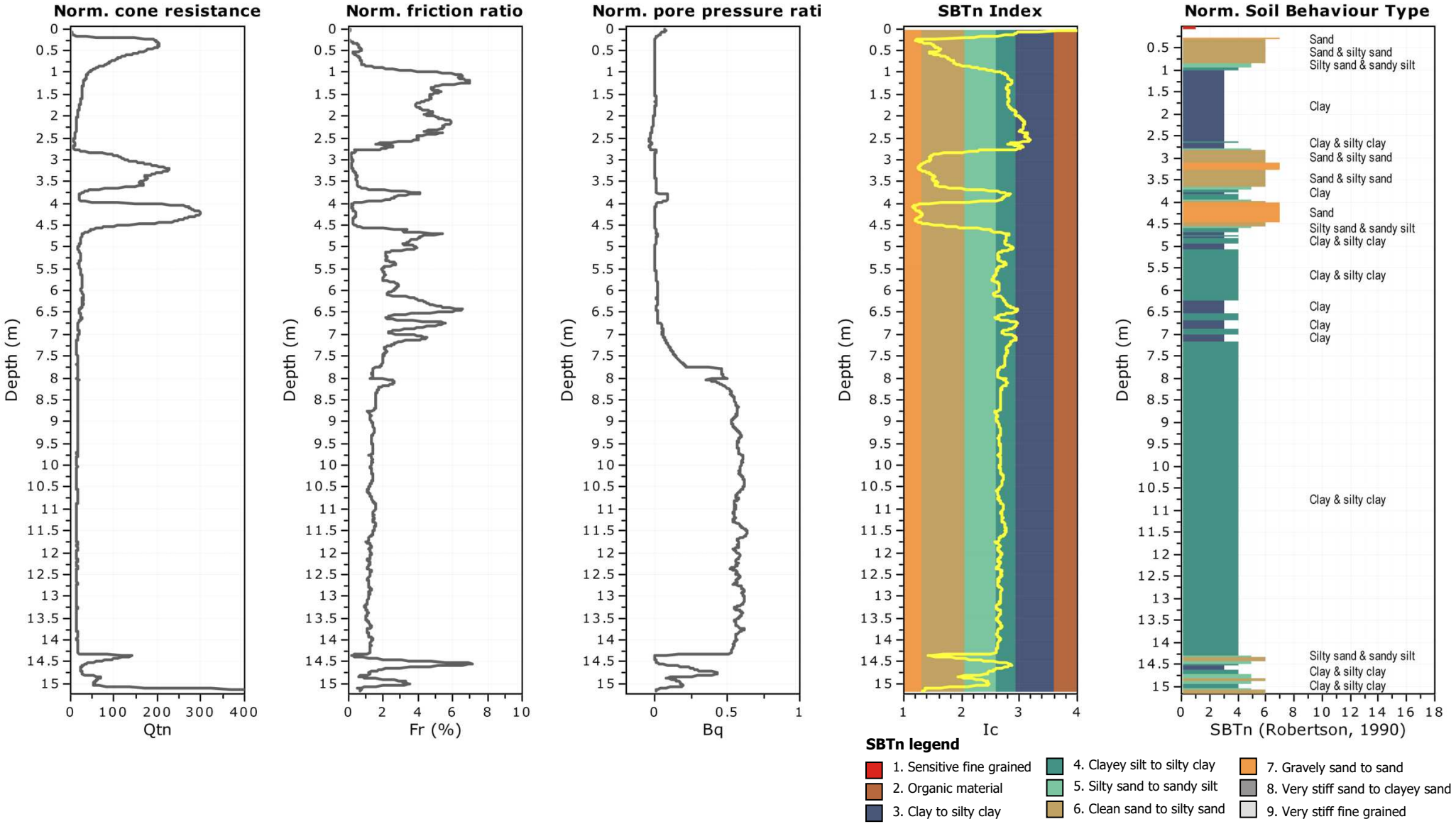


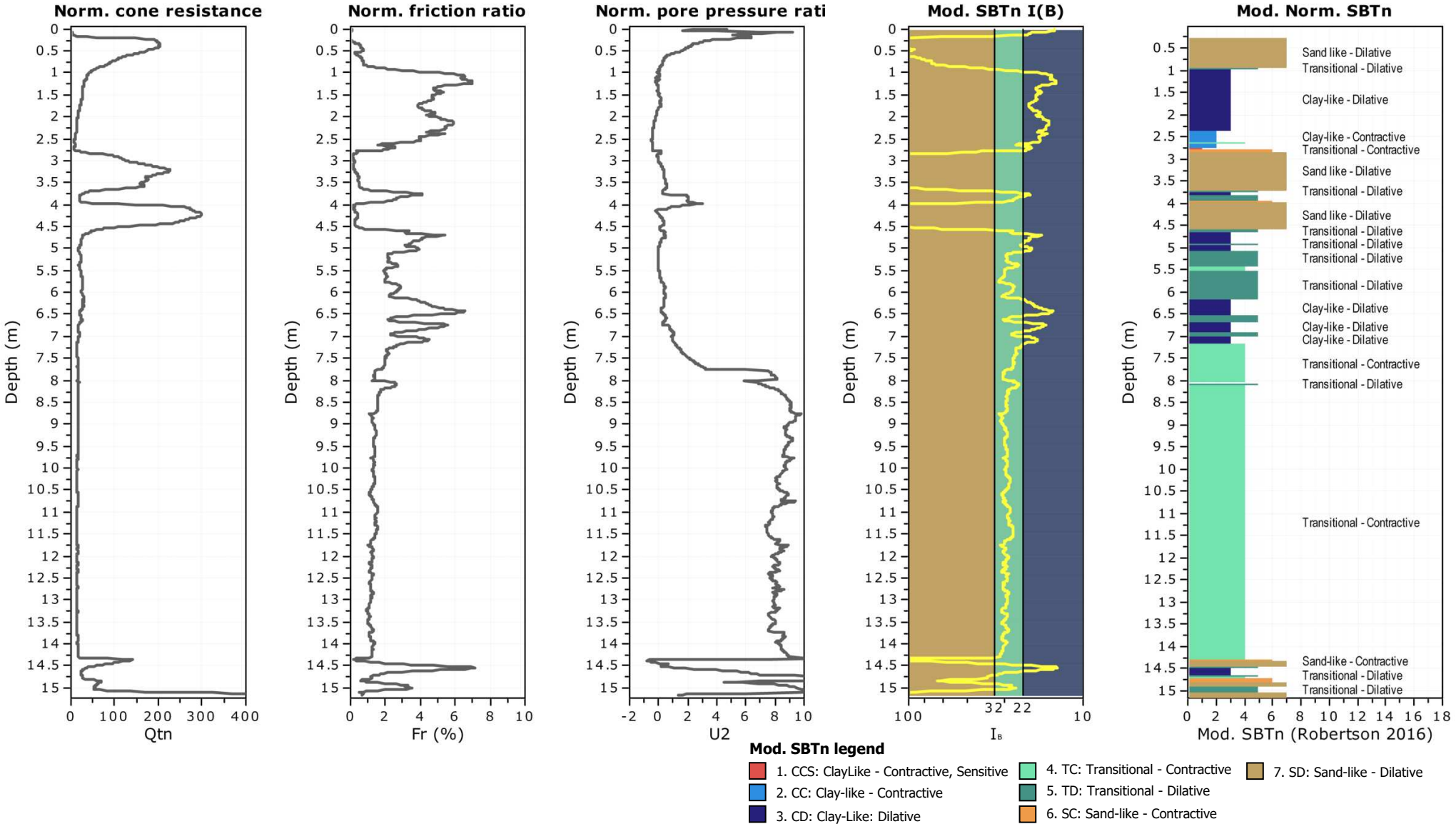




**Fuzzy classifiaction legend**

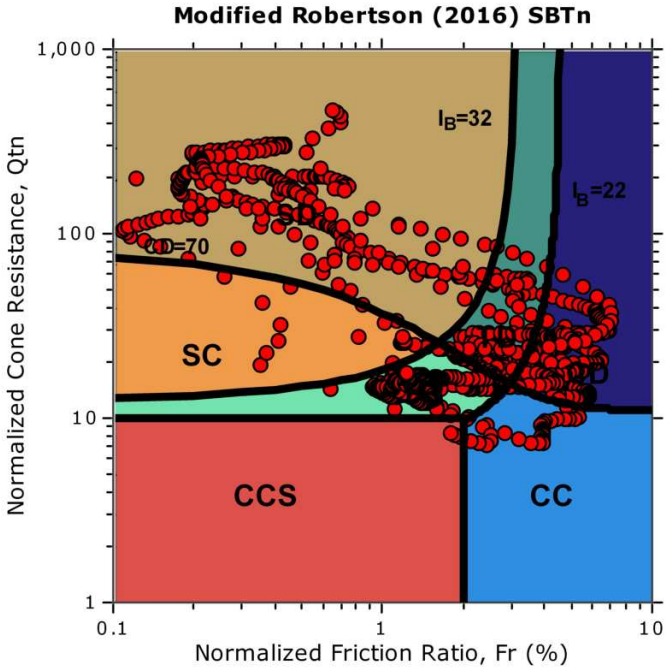
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

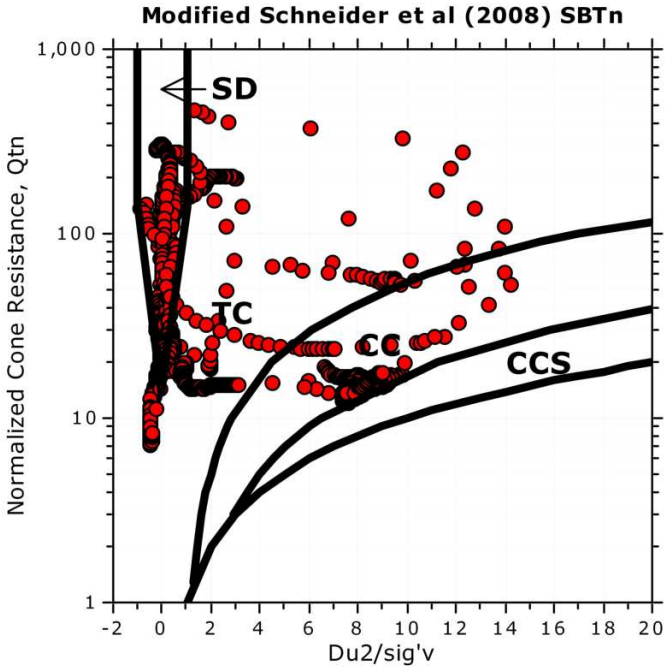

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Diss.
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

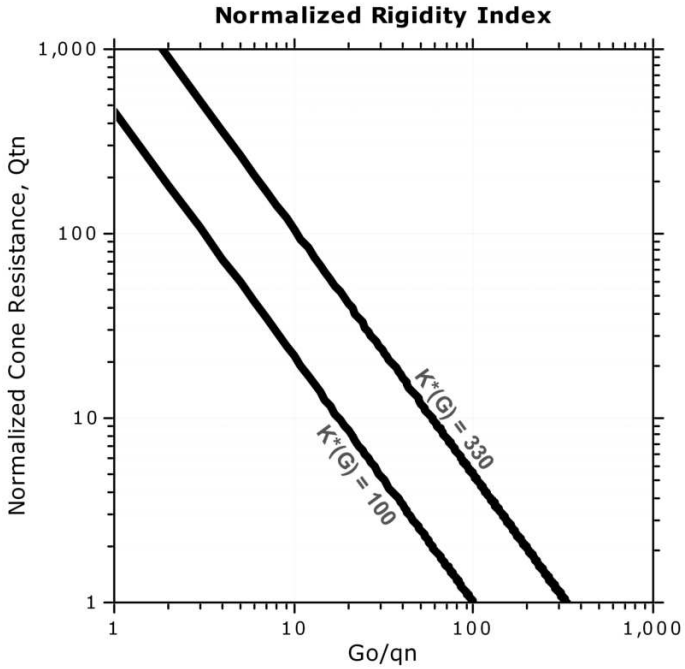

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
Sand & silty sand
Sand & silty sand
Clay
Sand
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Clay
Clay
Clay
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Transitional - Contractive
Transitional - Contractive
Sand-like - Contractive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

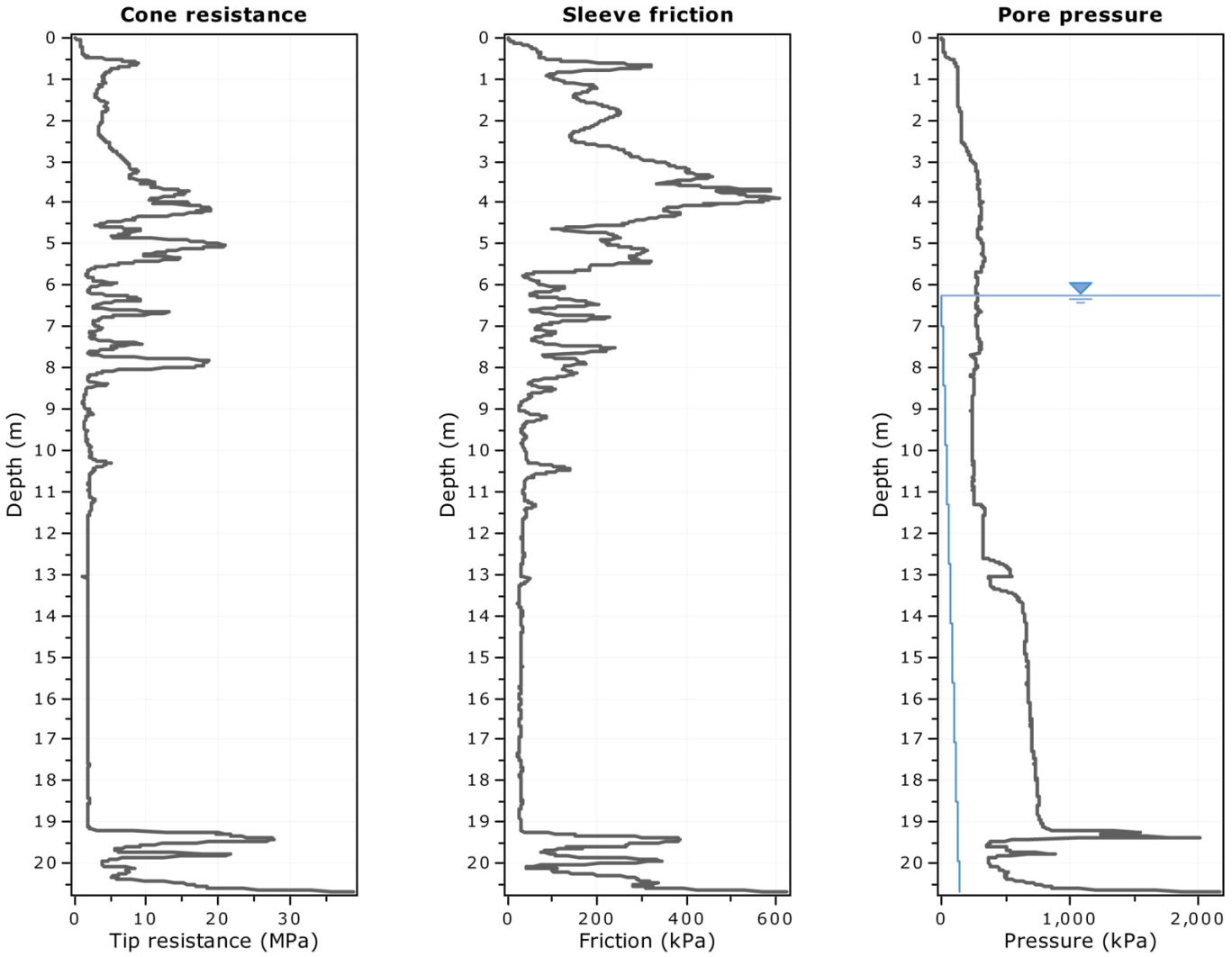


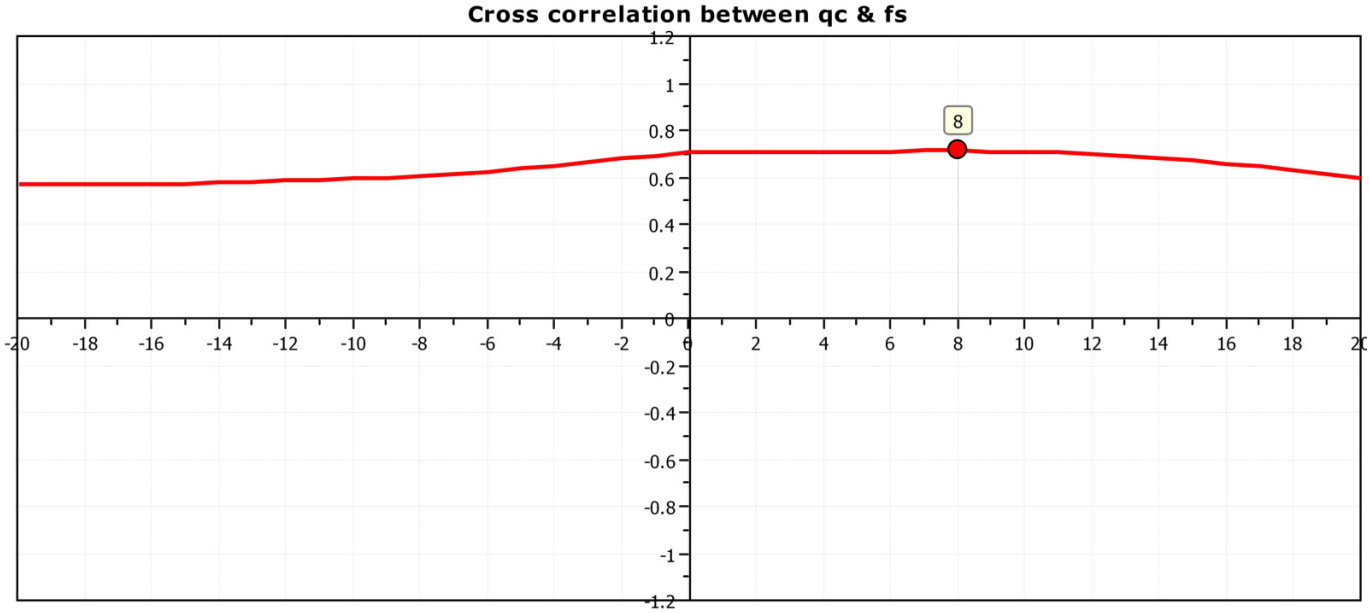




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

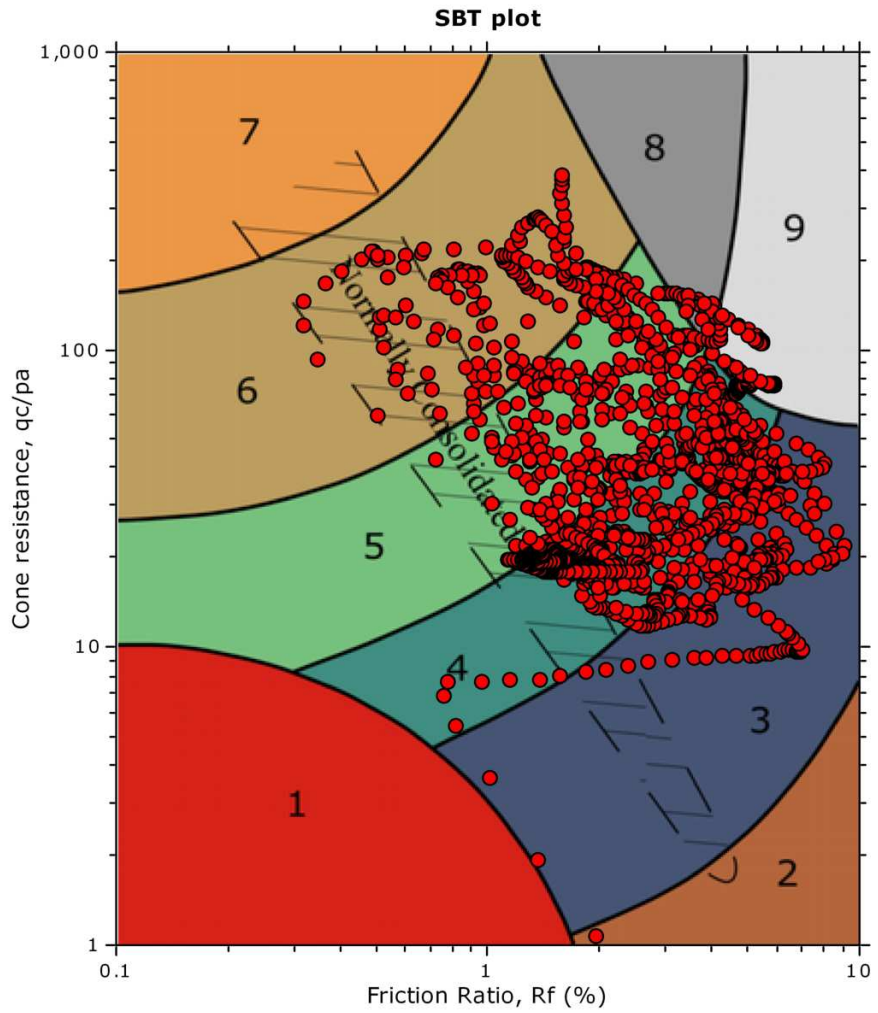
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

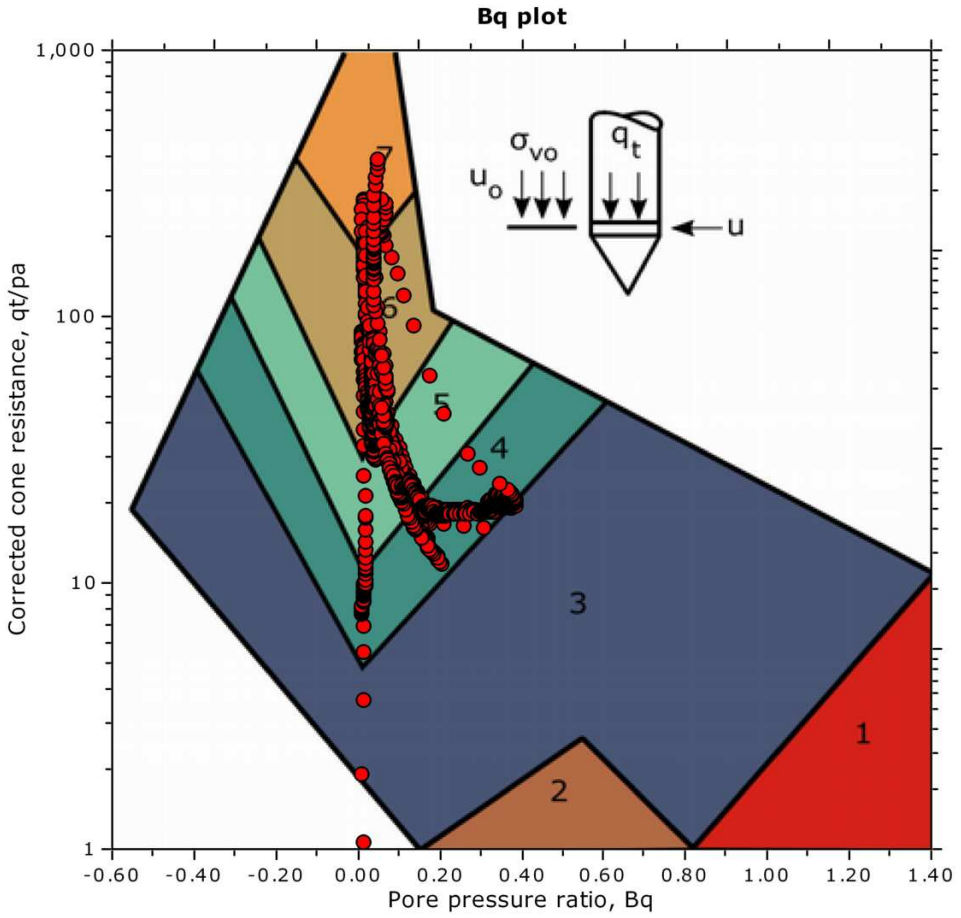



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

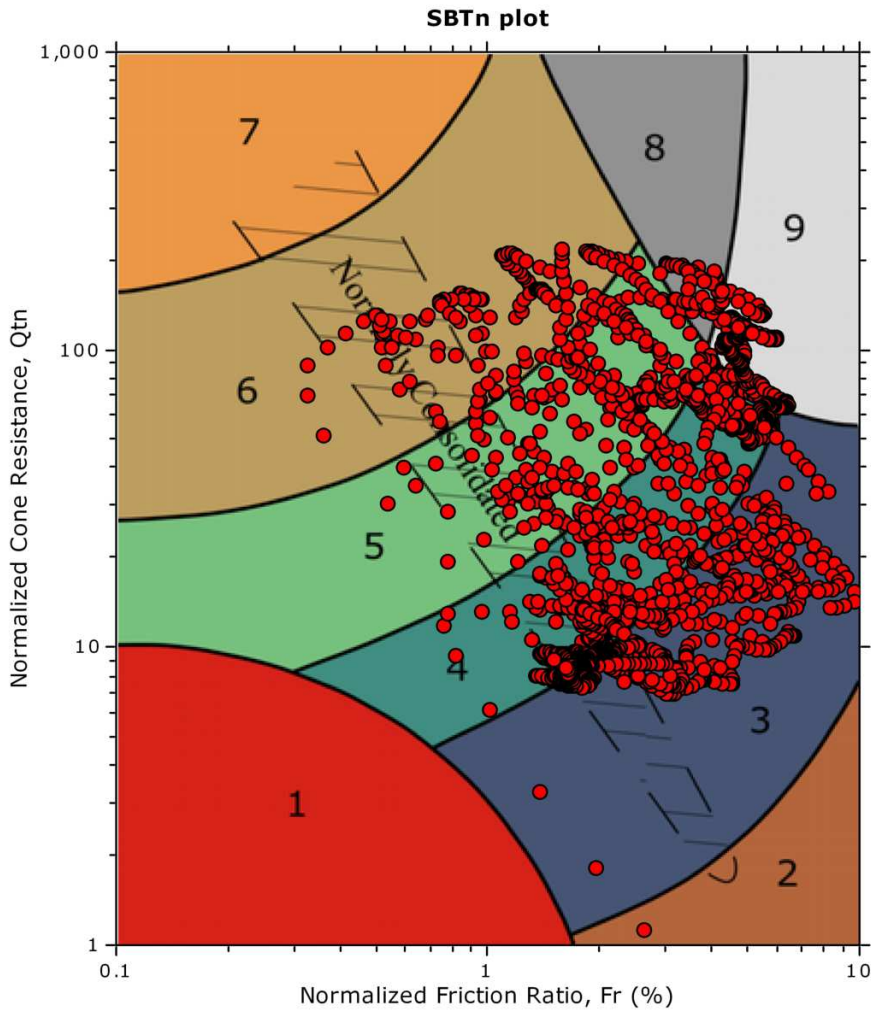


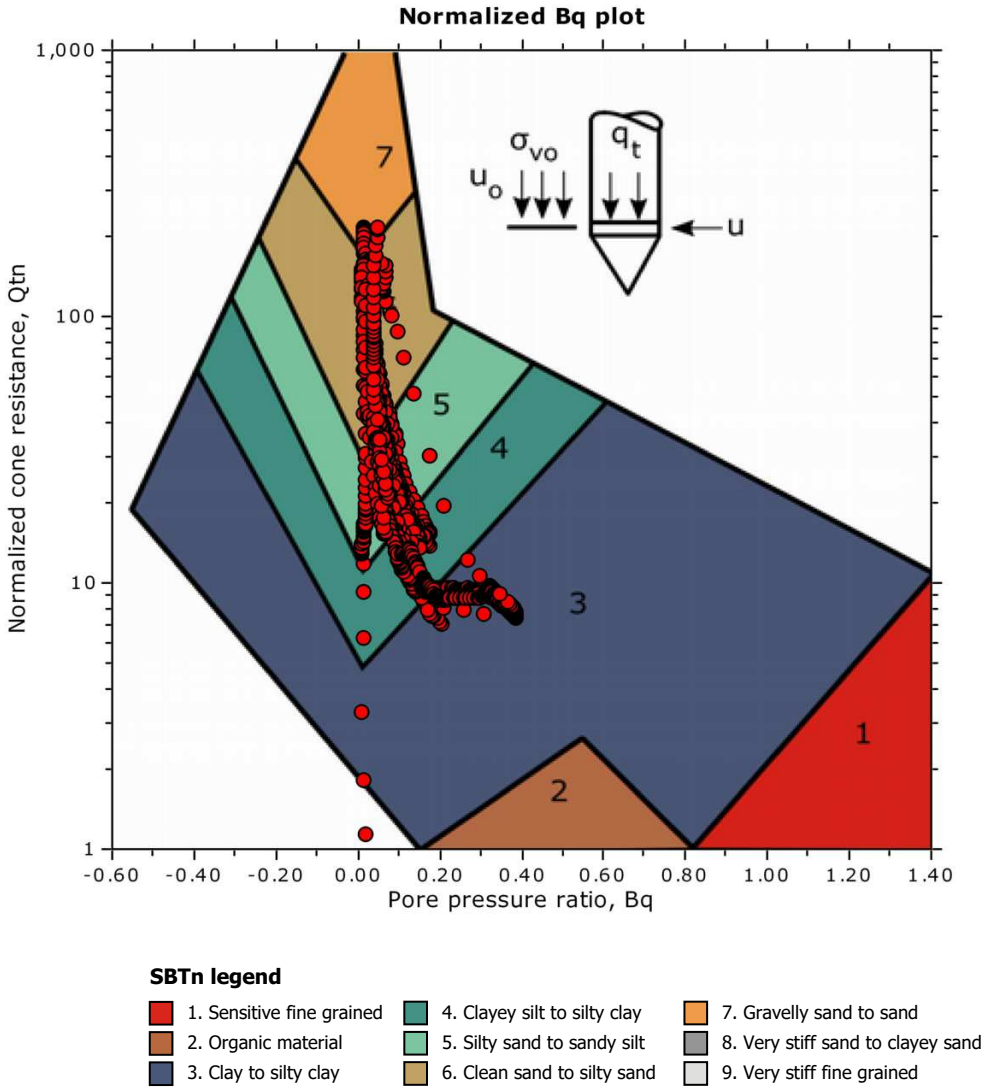




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

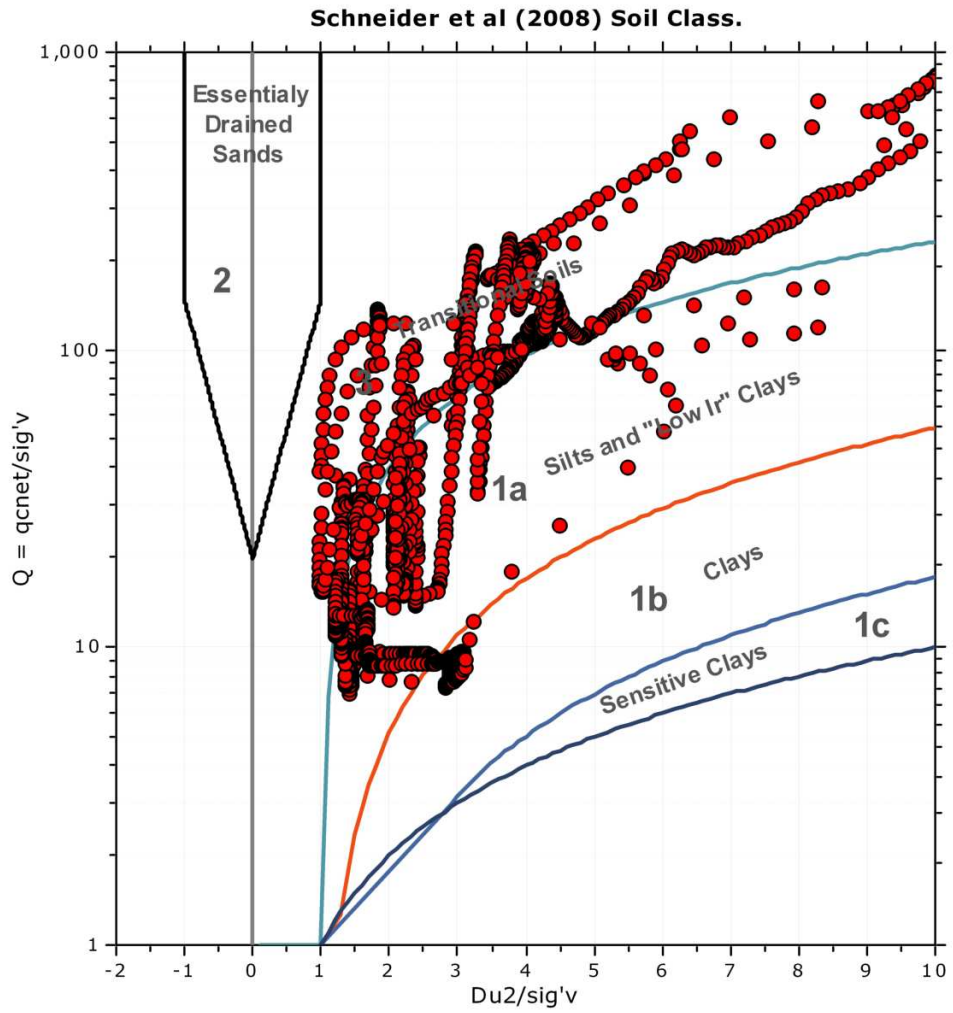


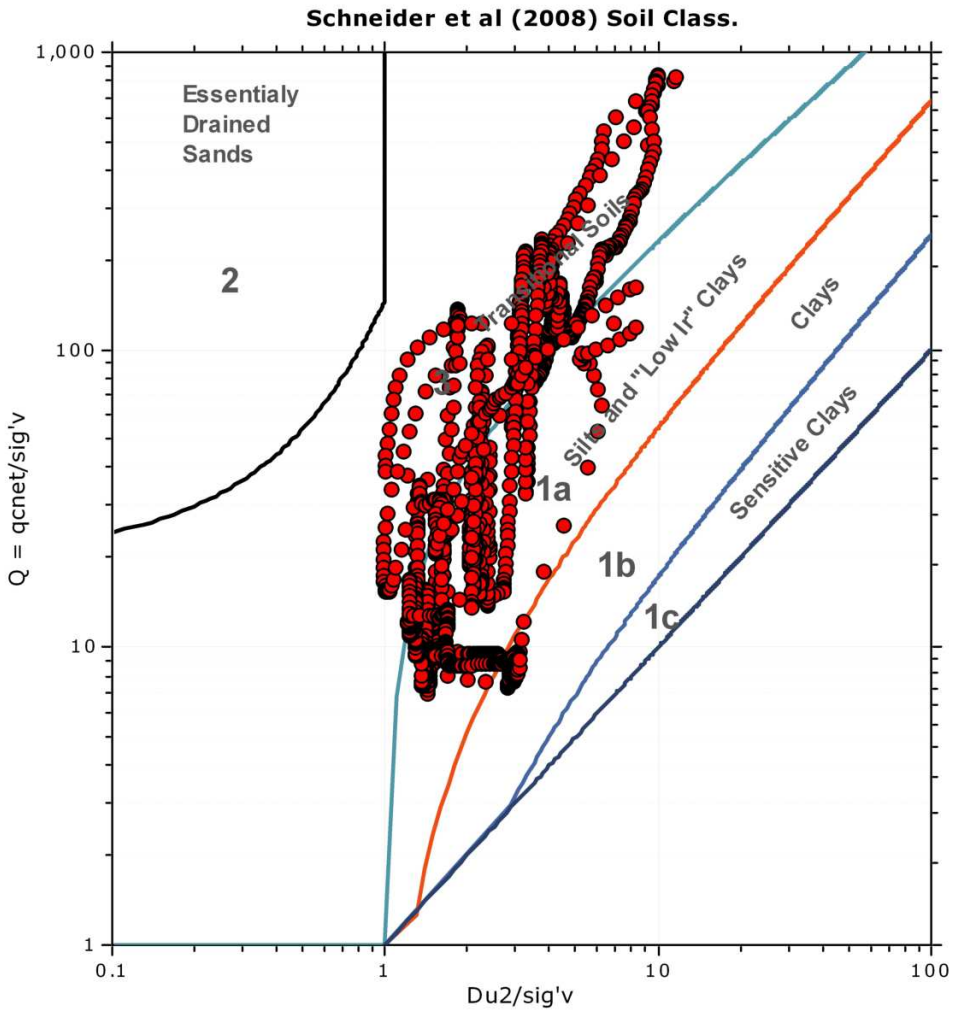



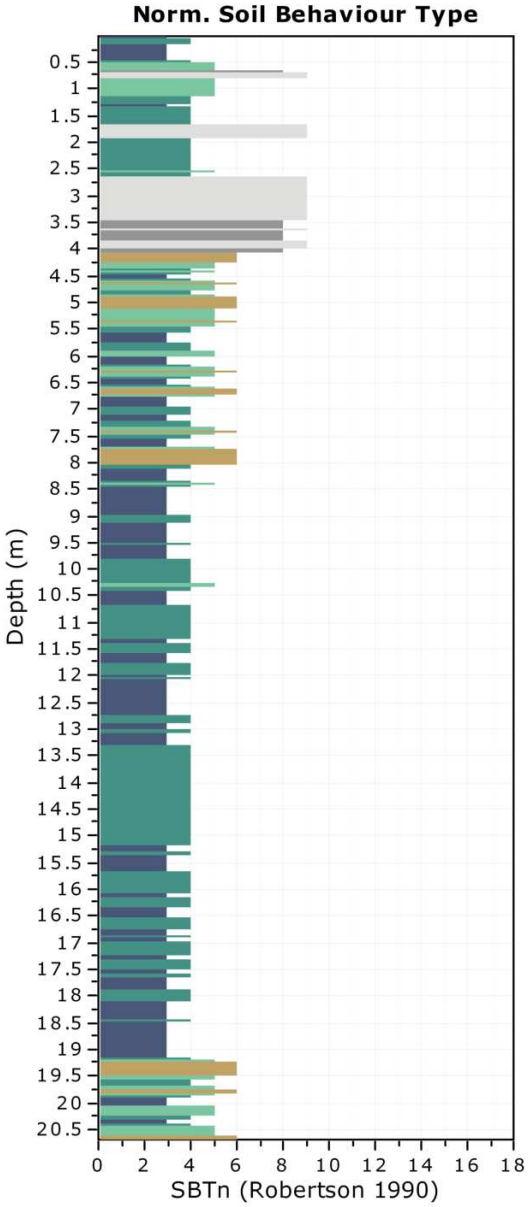

**SBTn legend**

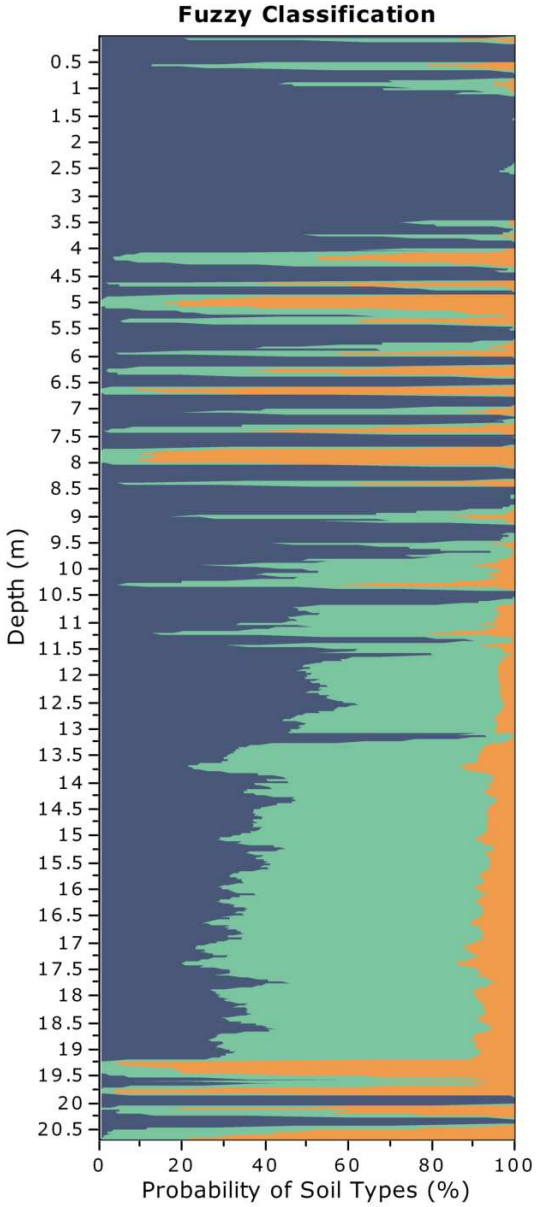
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



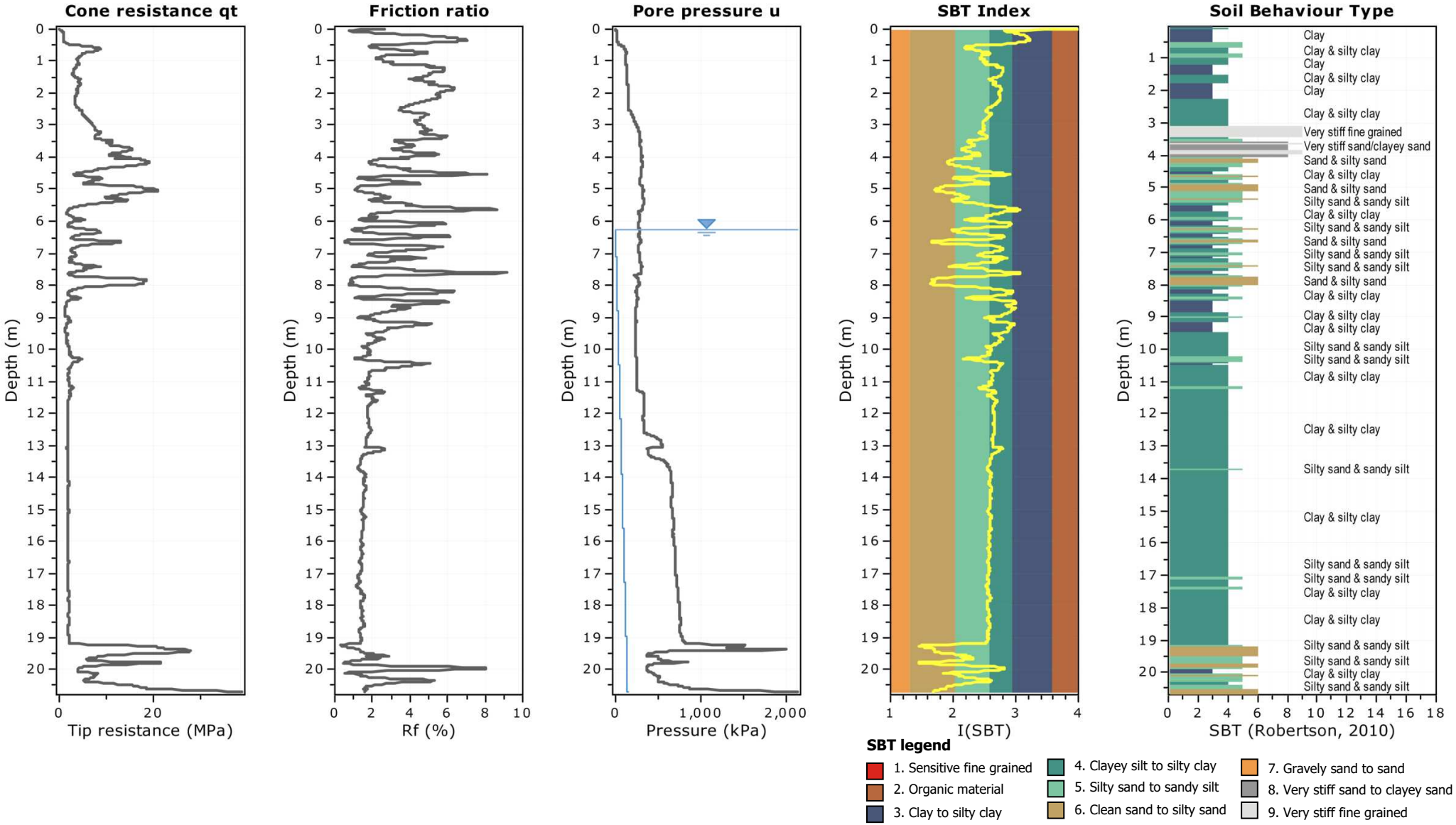



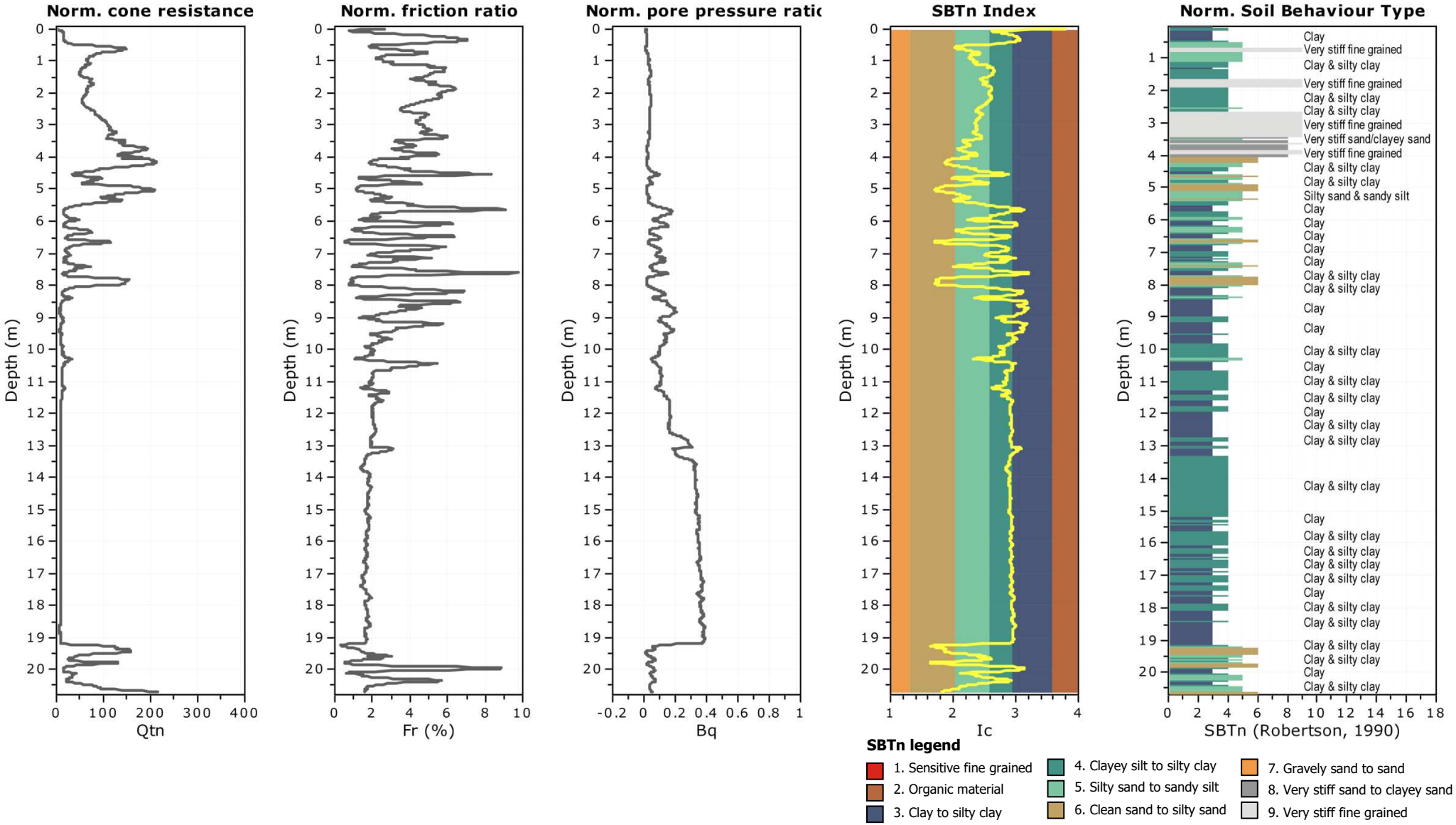


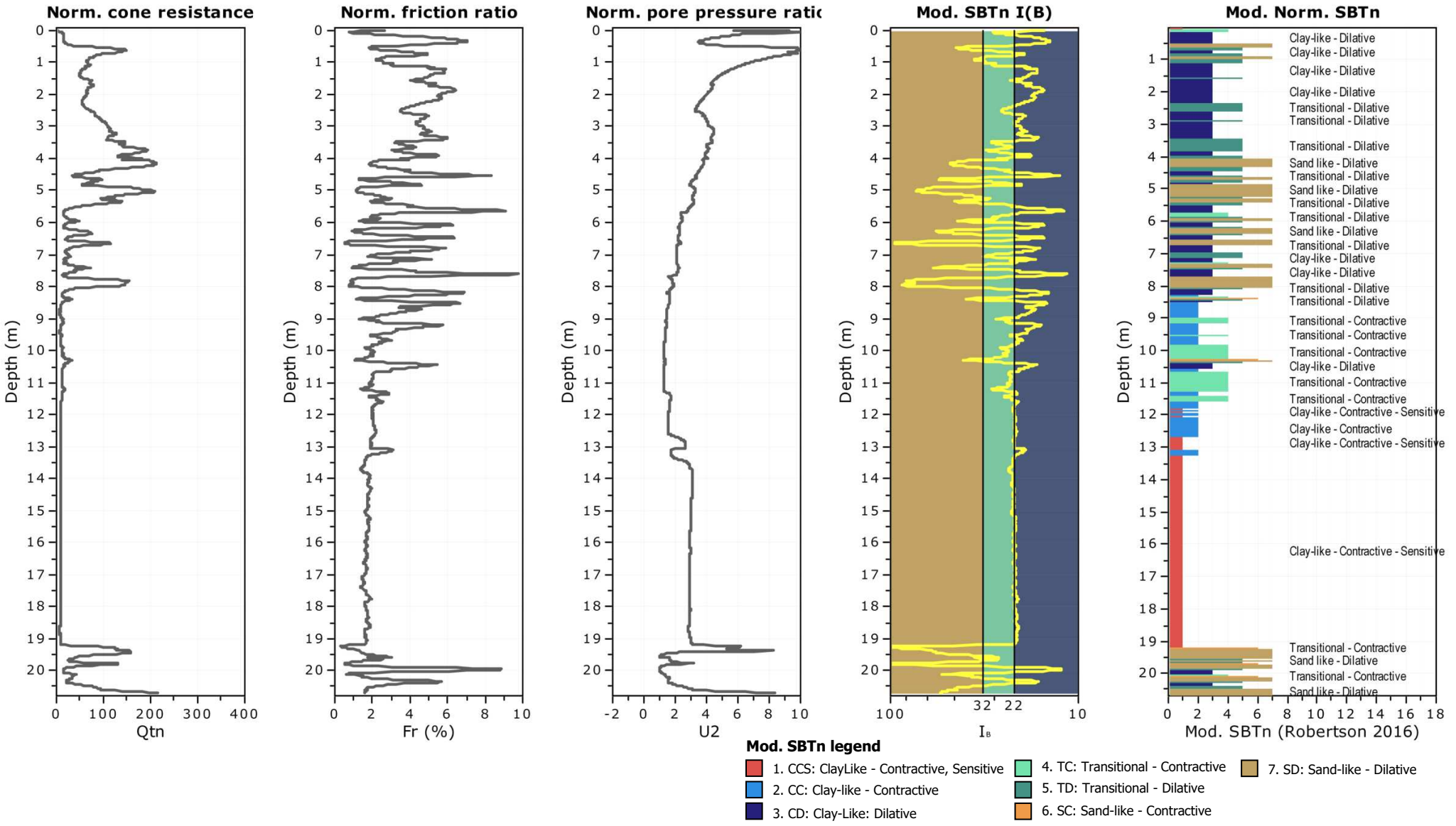




**Fuzzy classifiaction legend**

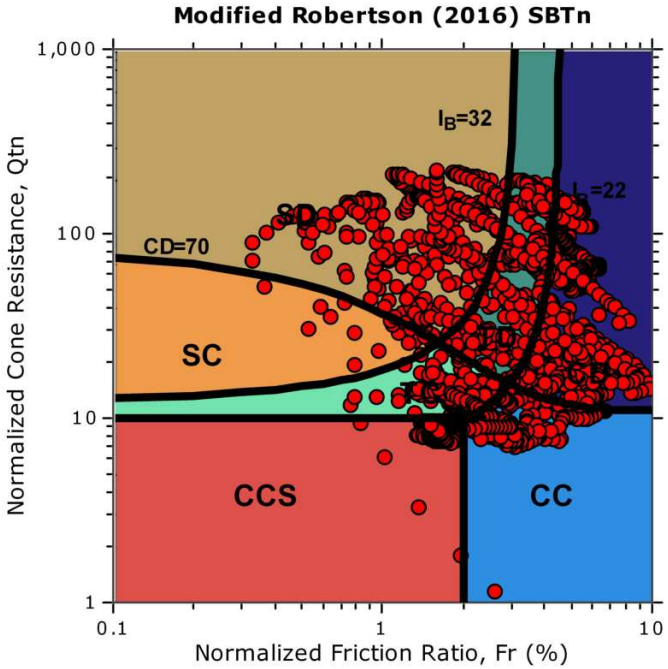
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

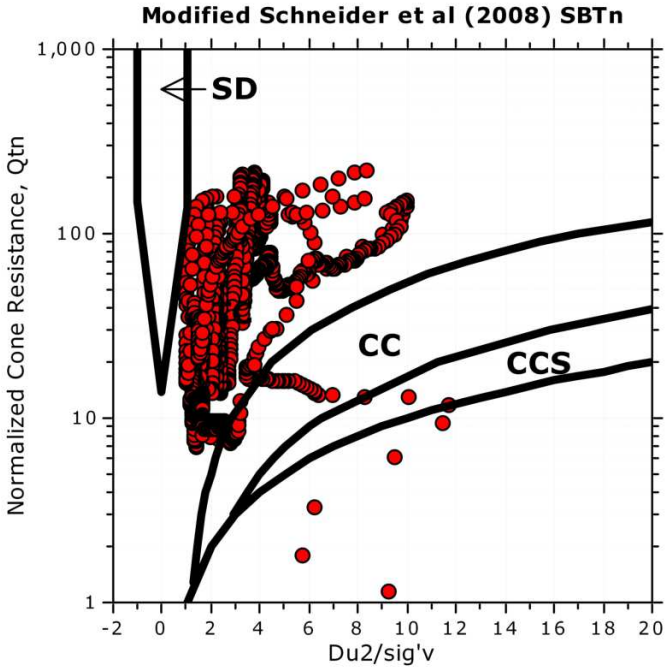

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Clay
Clay & silty clay
Very stiff fine grained
Very stiff sand/clayey sand
Sand & silty sand
Silty sand & sandy silt
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

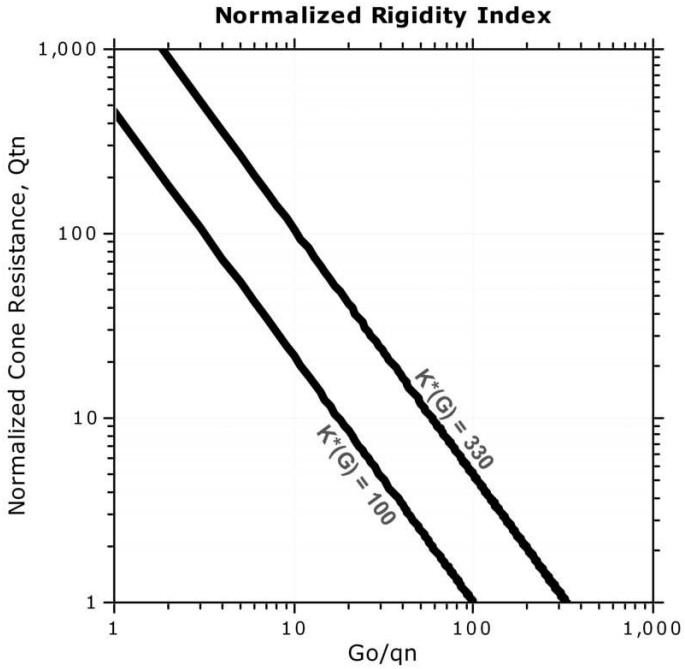

Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Depth (m)
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Iв
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Clay-like - Dilative
Transitional - Dilative
Sand like - Dilative
Transitional - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

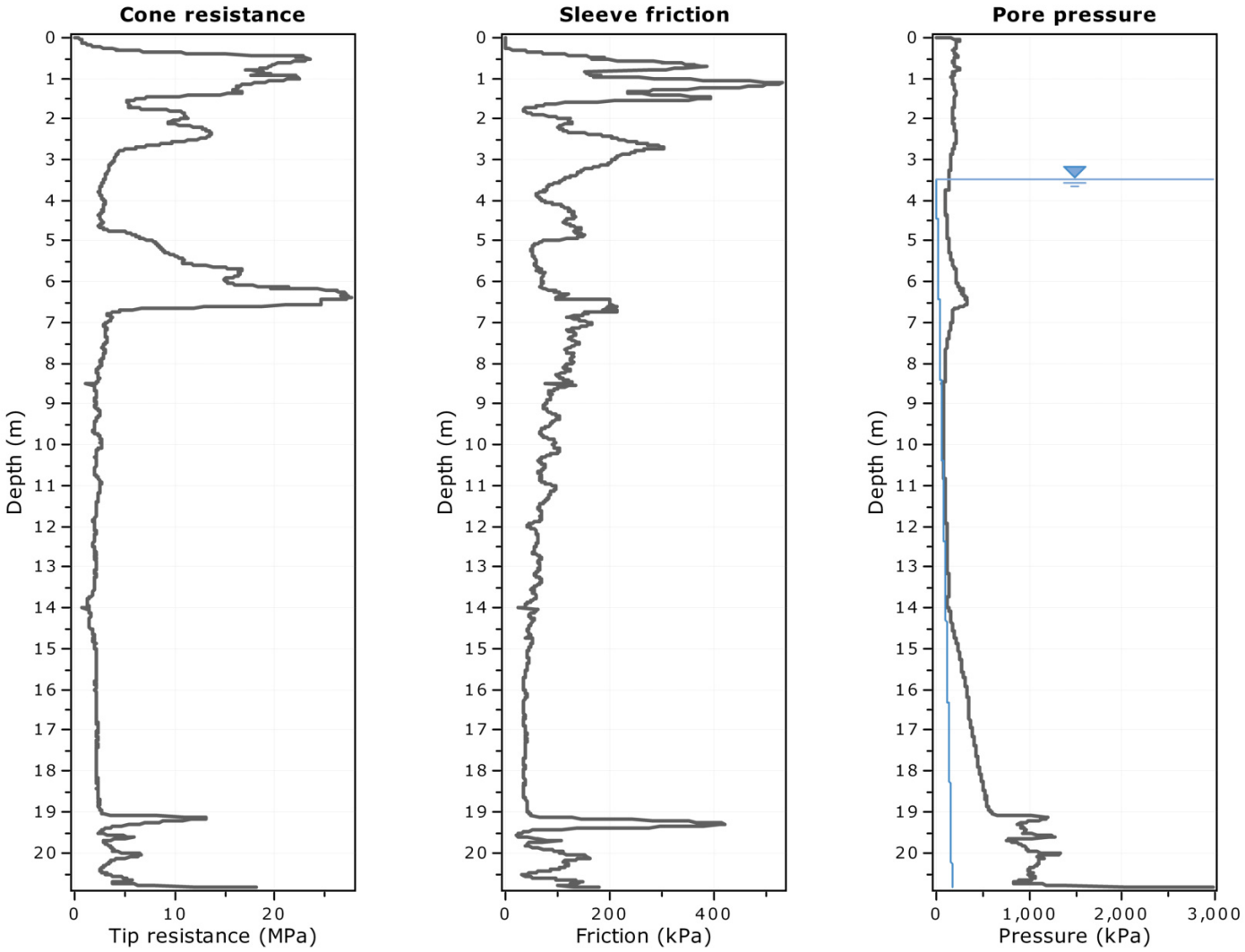


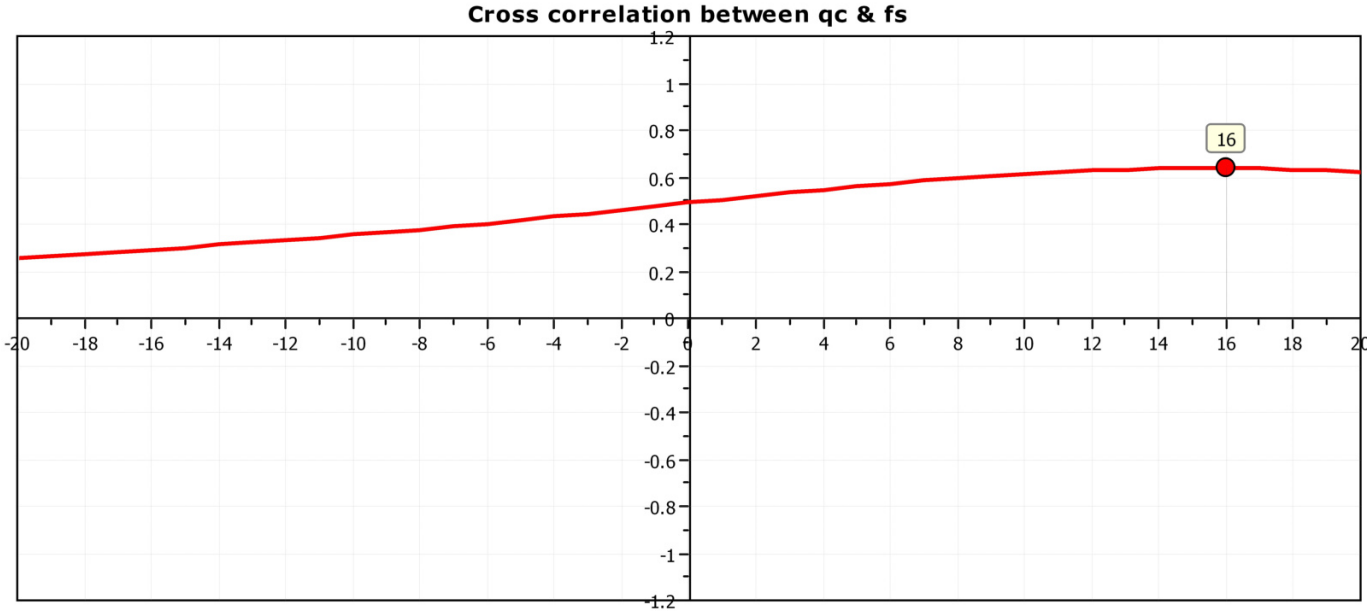




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

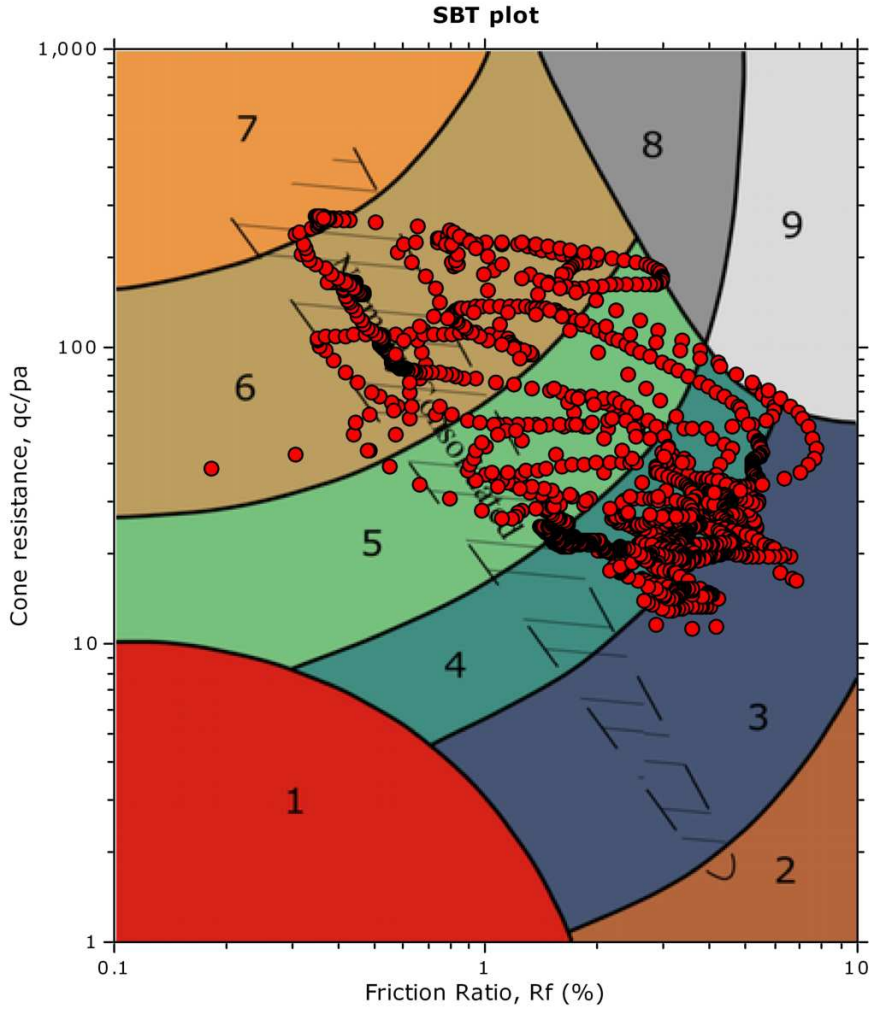
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

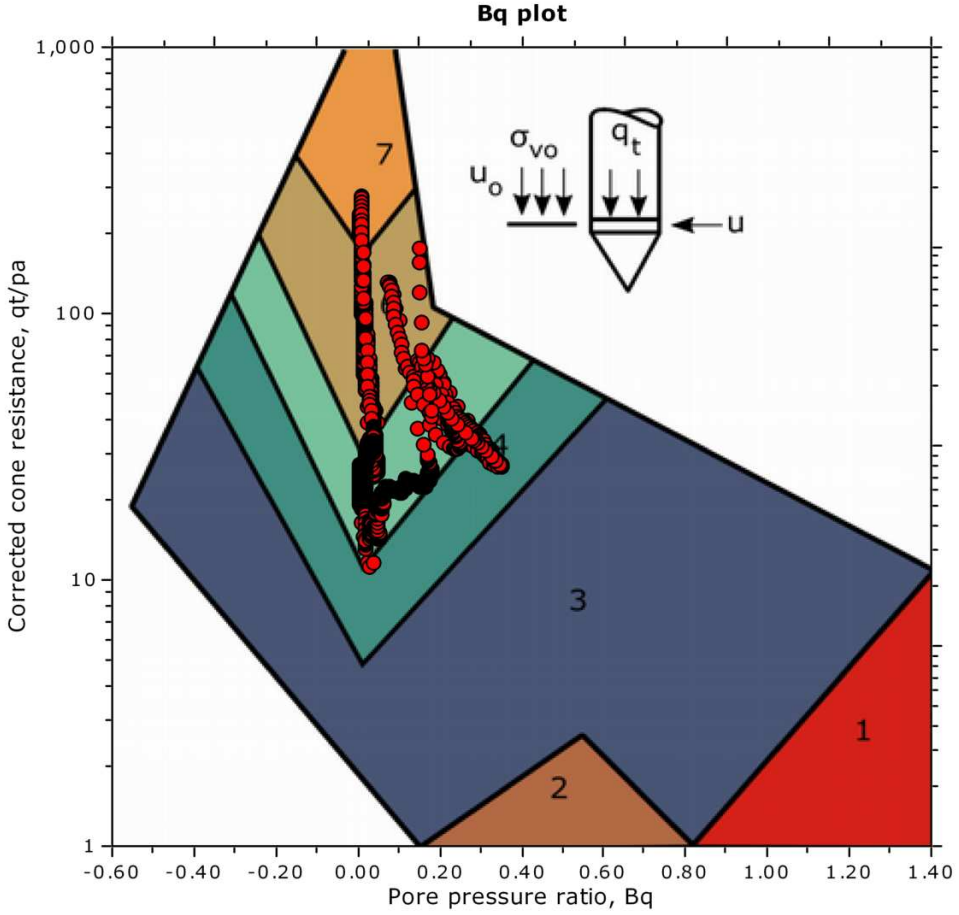



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

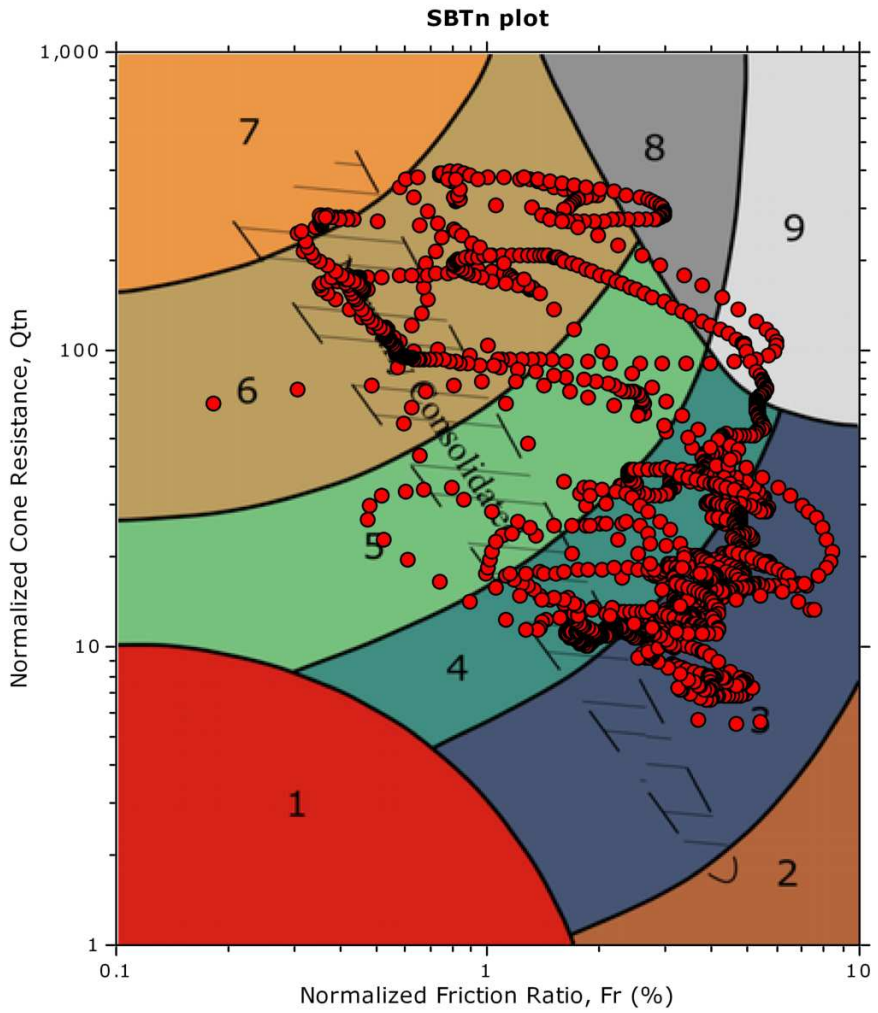


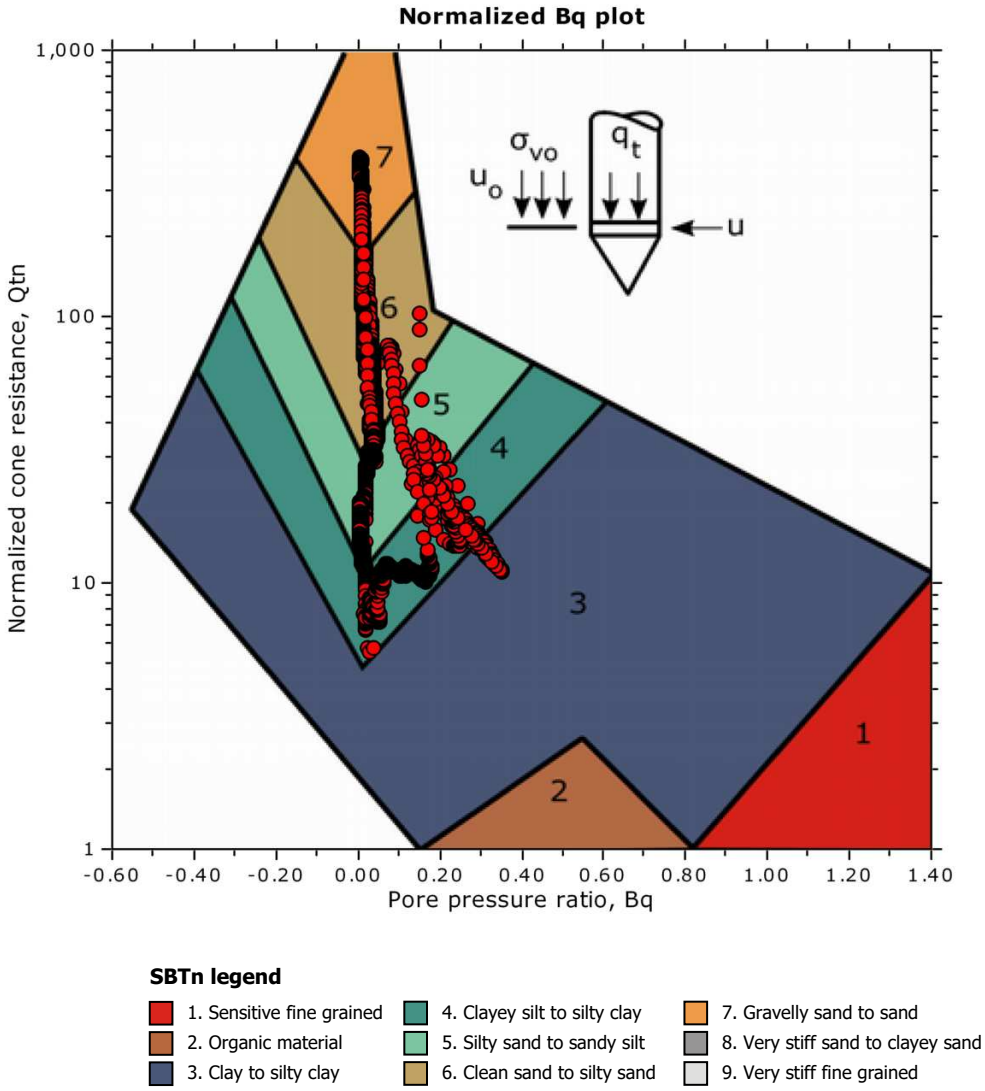




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

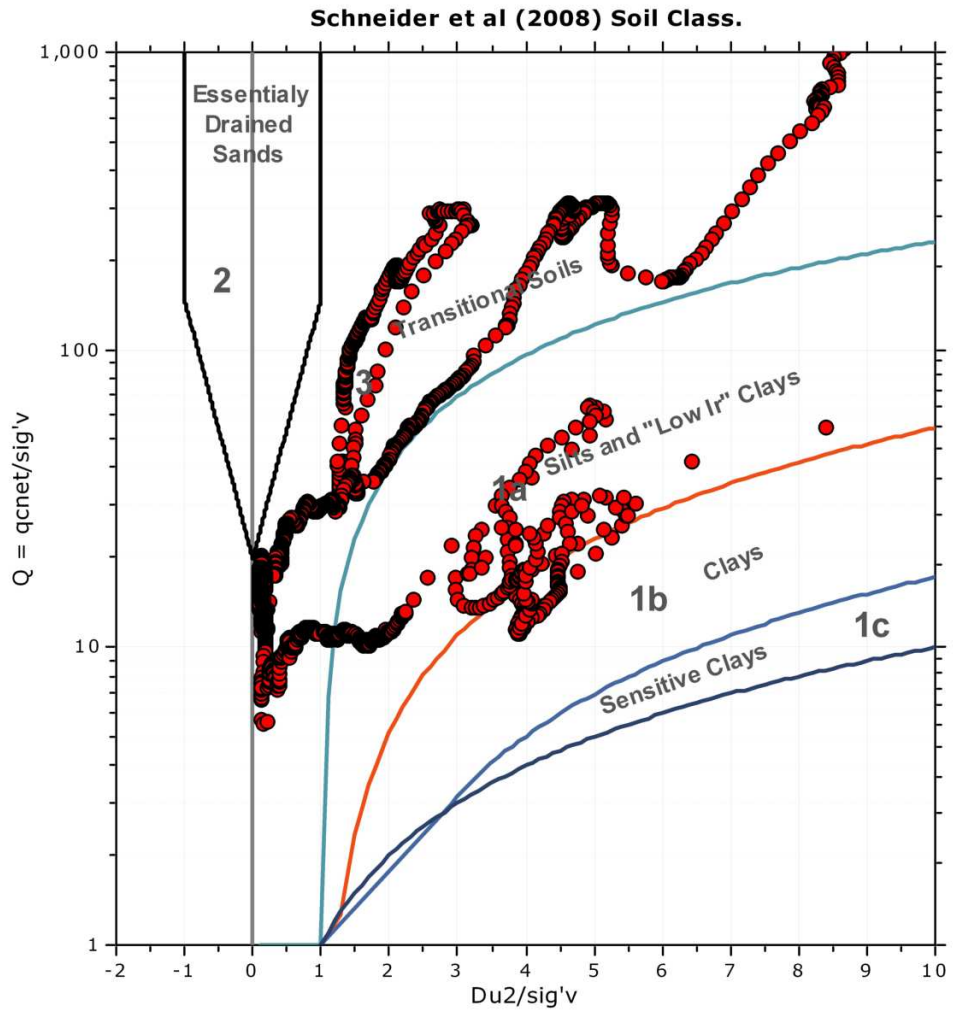


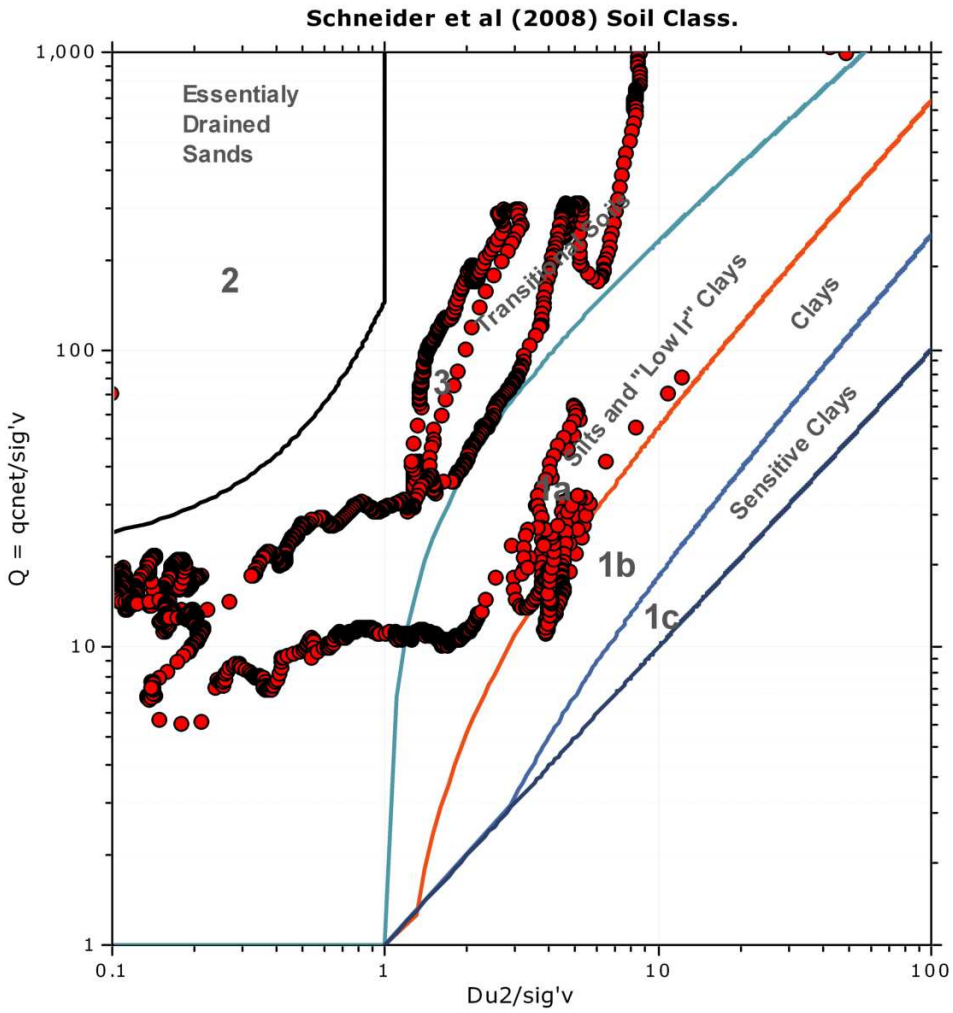



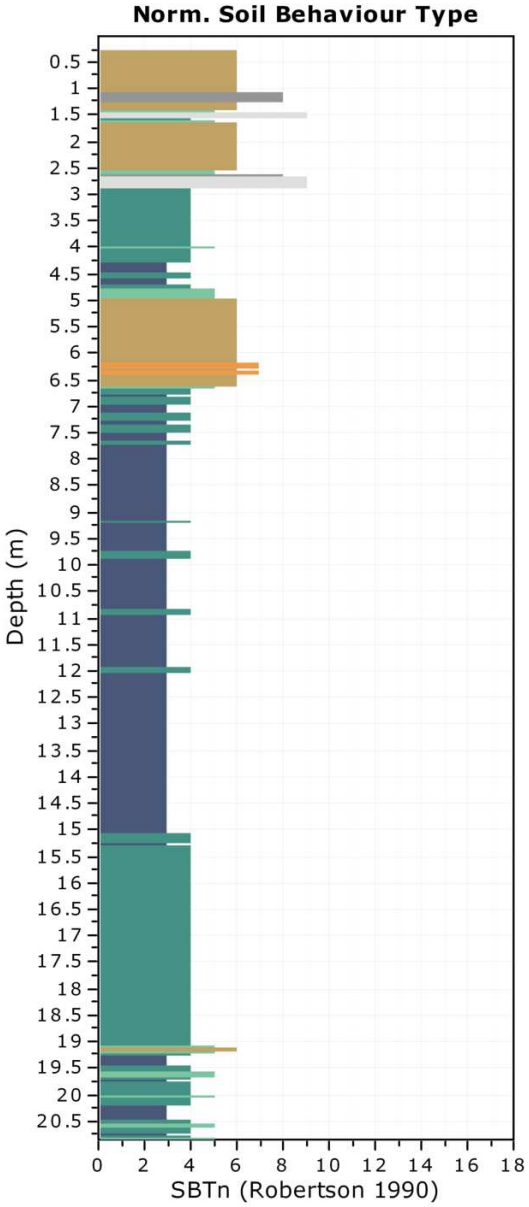

**SBTn legend**

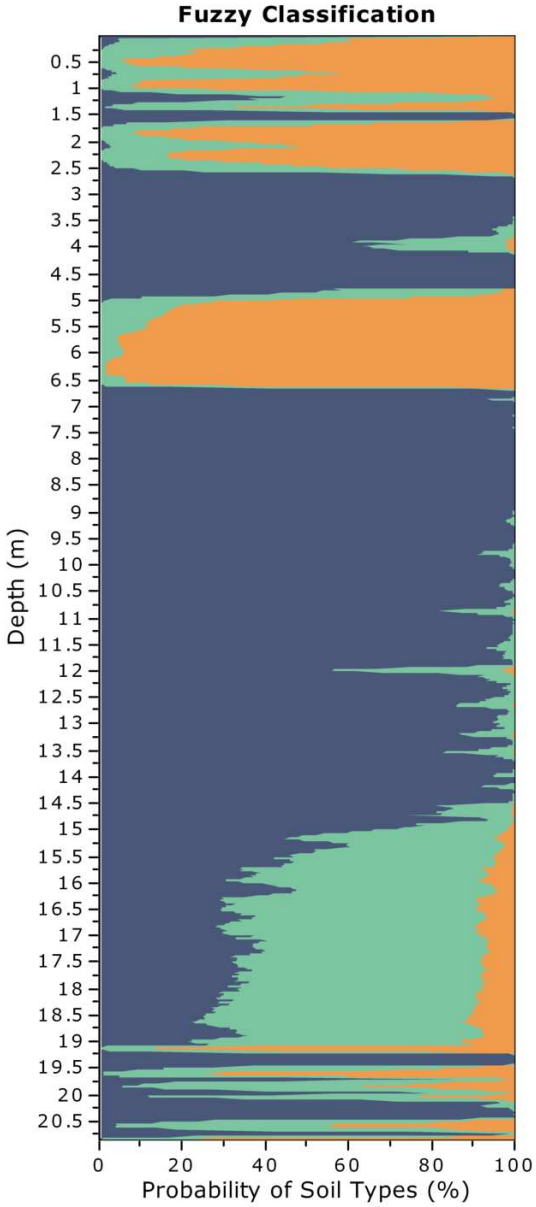
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



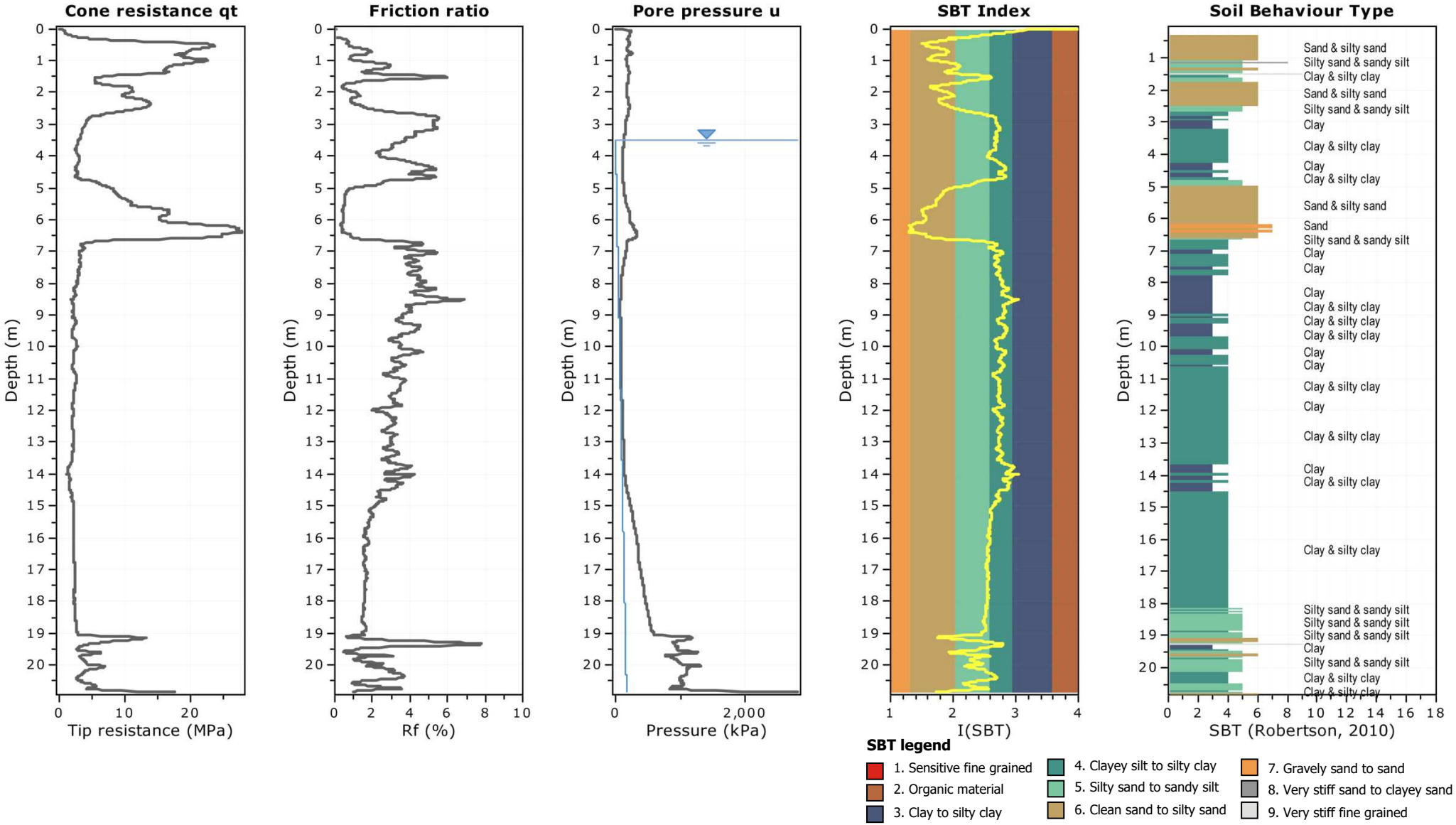



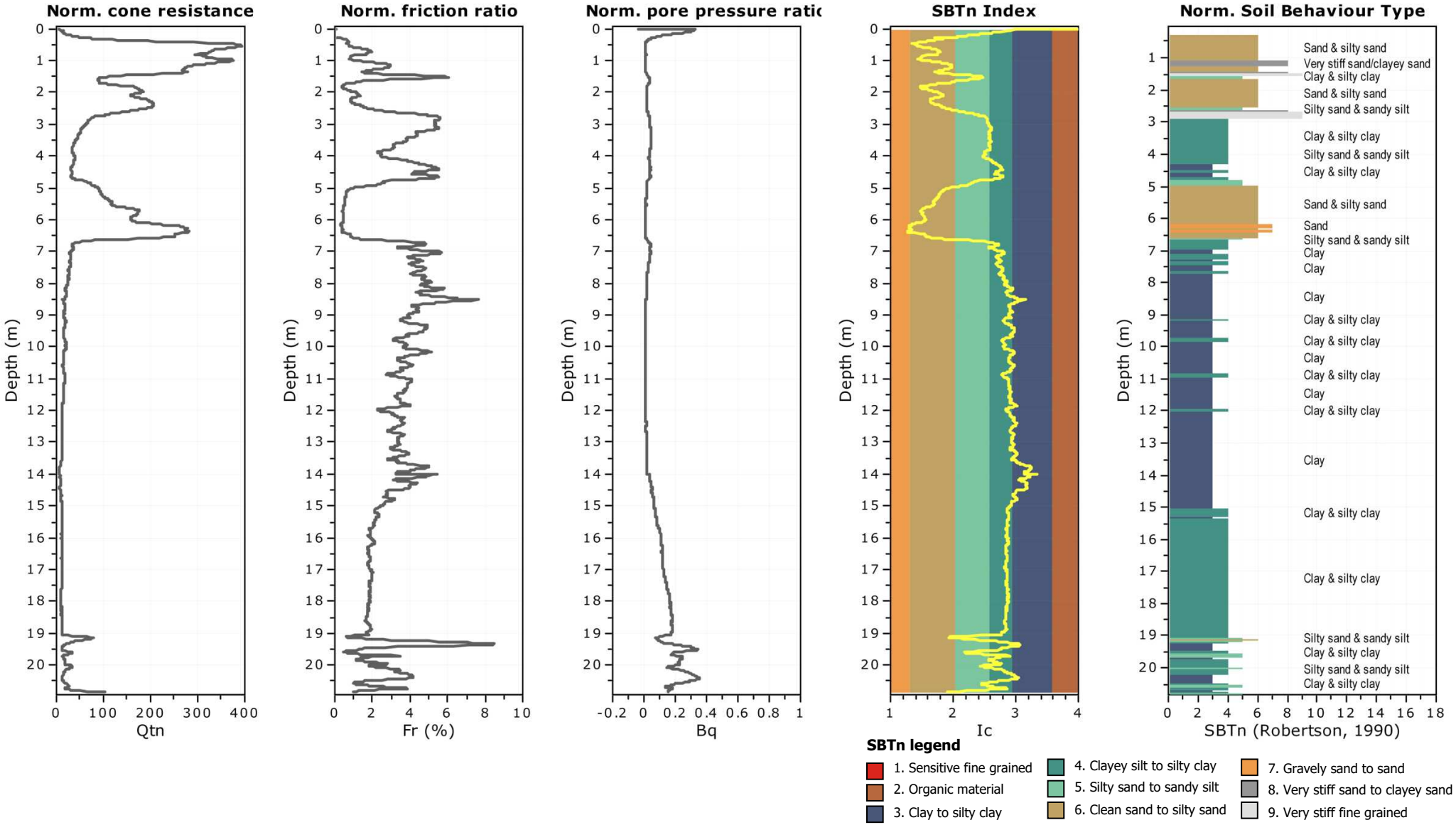


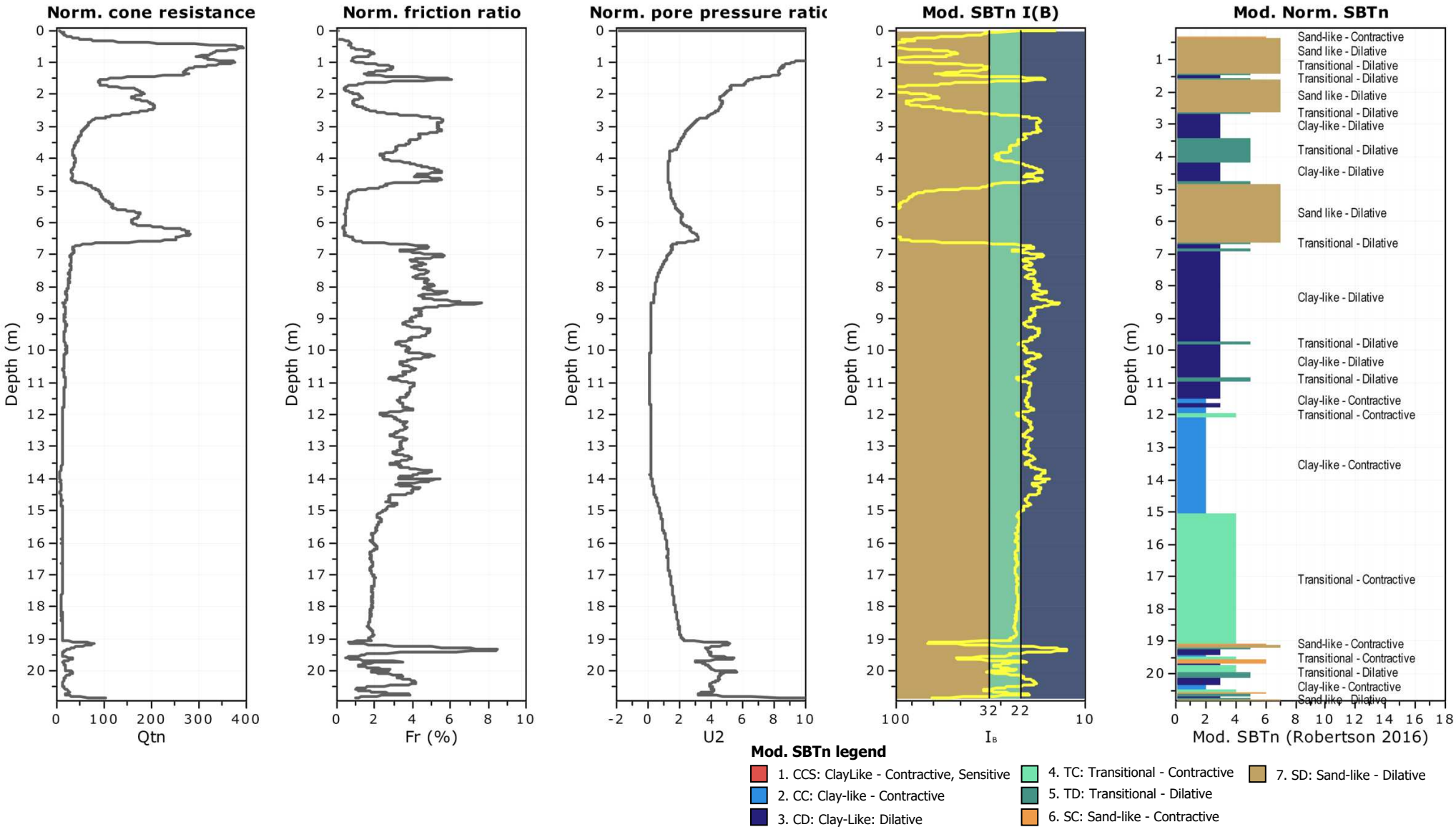




**Fuzzy classifiaction legend**

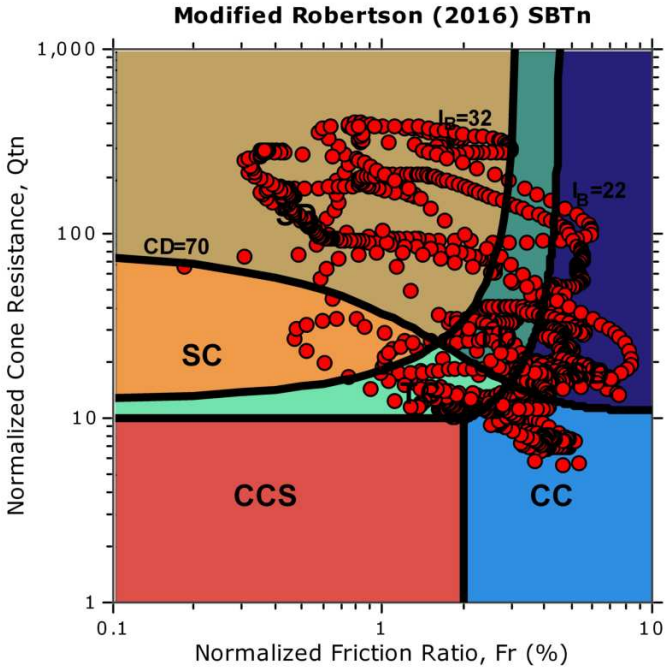
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

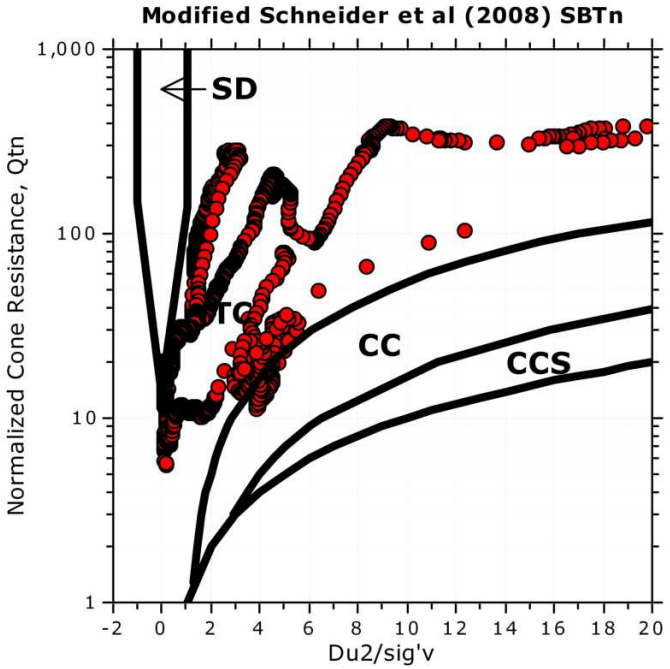

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

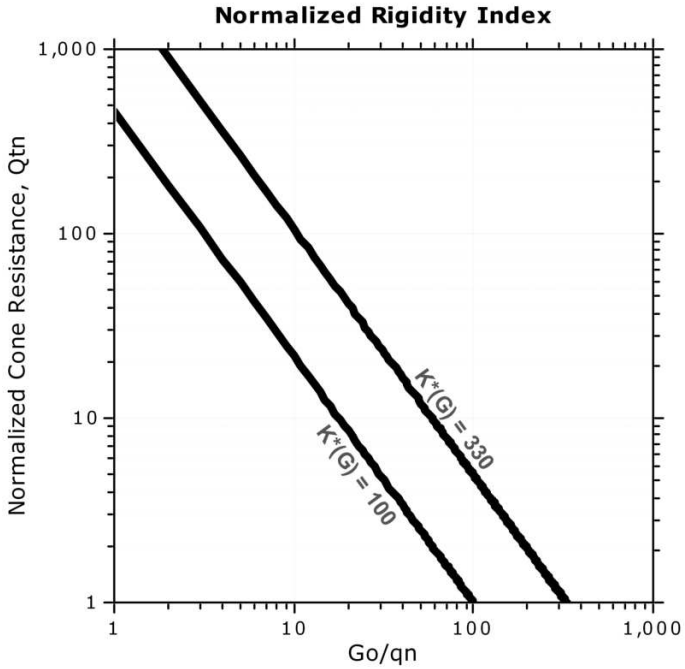

Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Depth (m)
Sand & silty sand
Very stiff sand/clayey sand
Clay & silty clay
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Sand & silty sand
Sand
Silty sand & sandy silt
Clay
Clay
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Iв
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand-like - Contractive
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Transitional - Contractive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

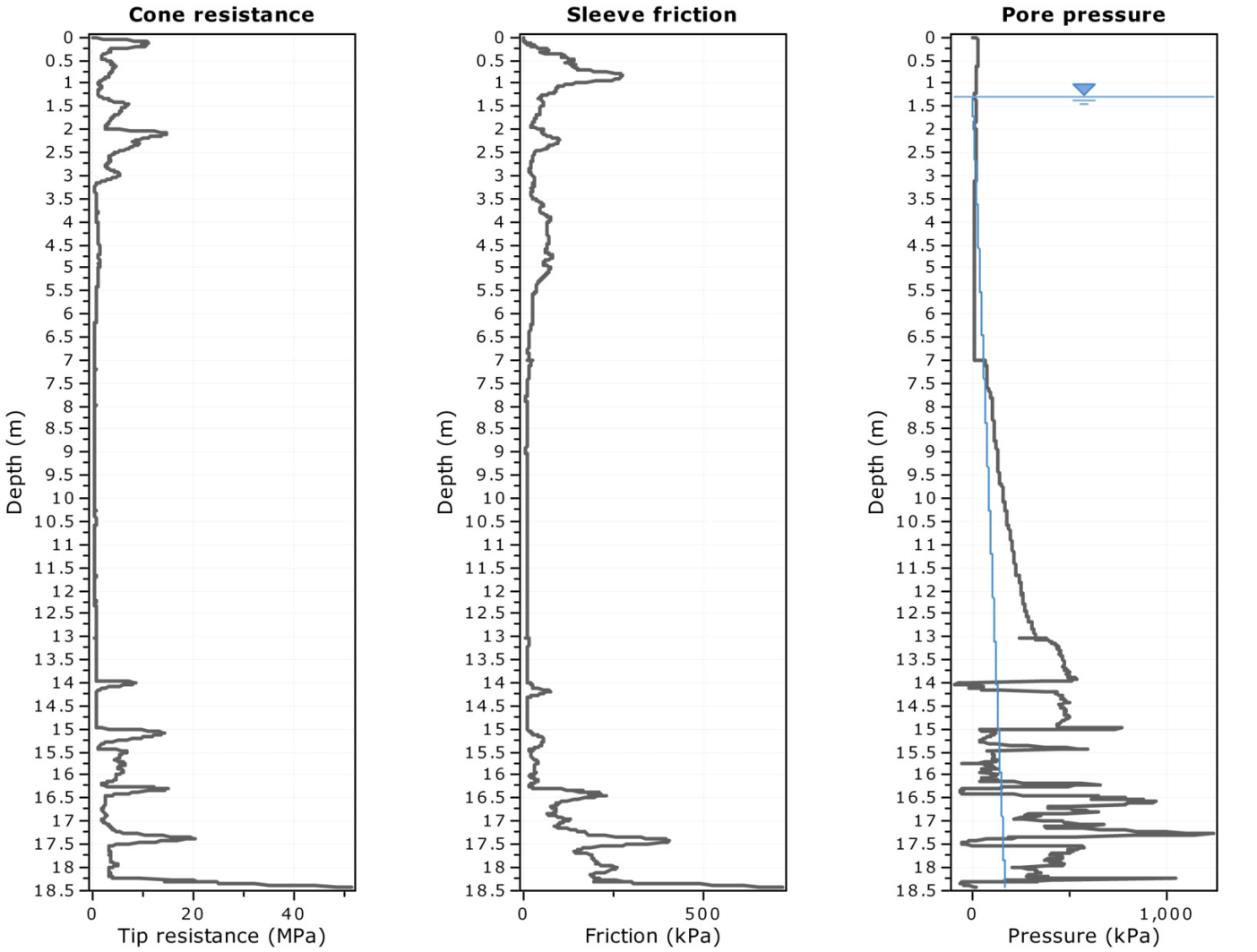


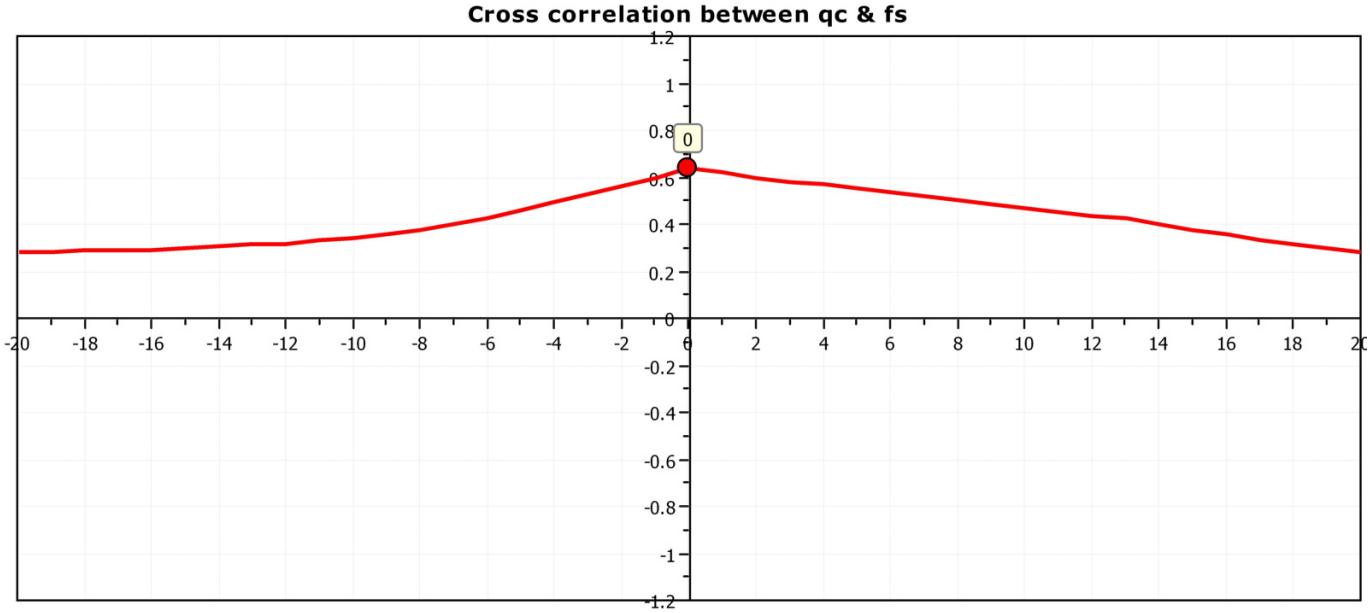




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

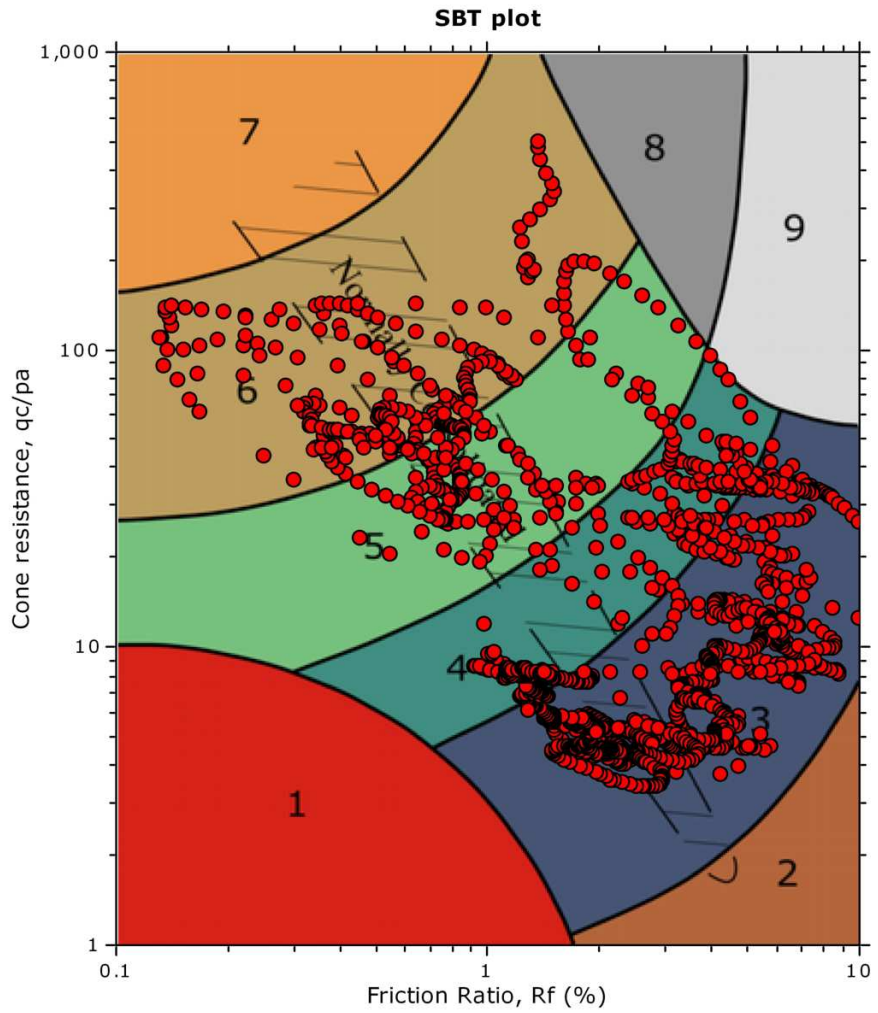
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

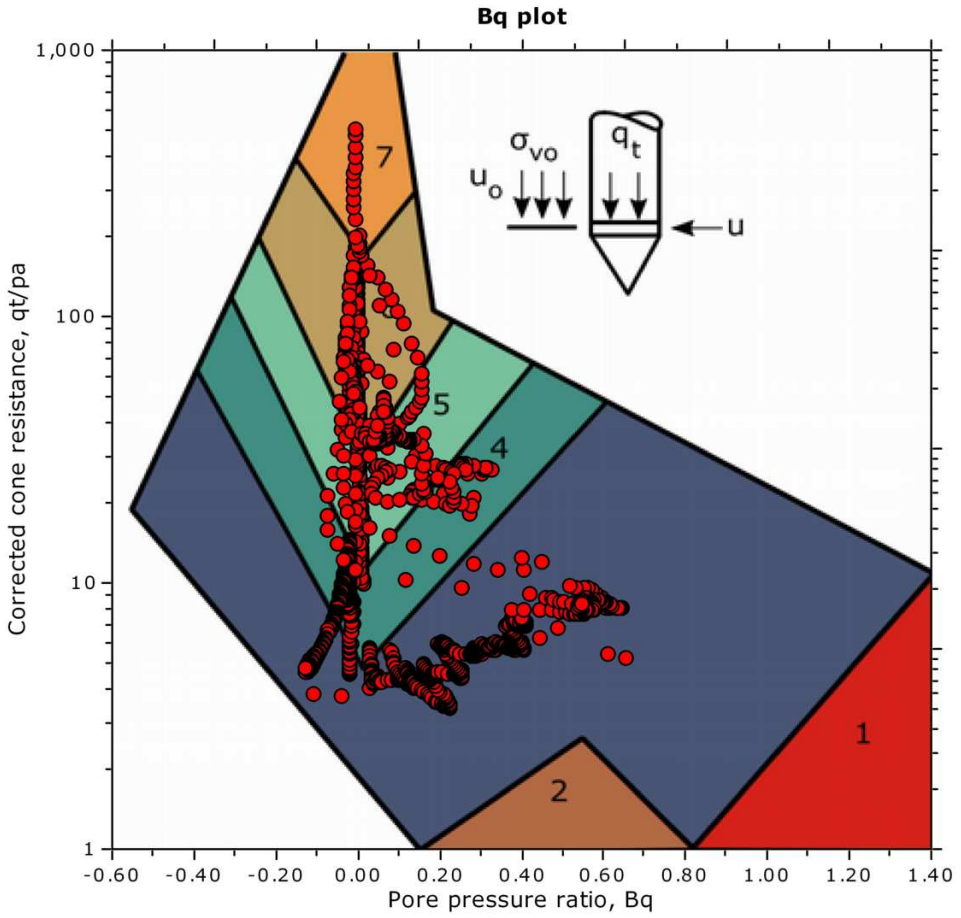



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

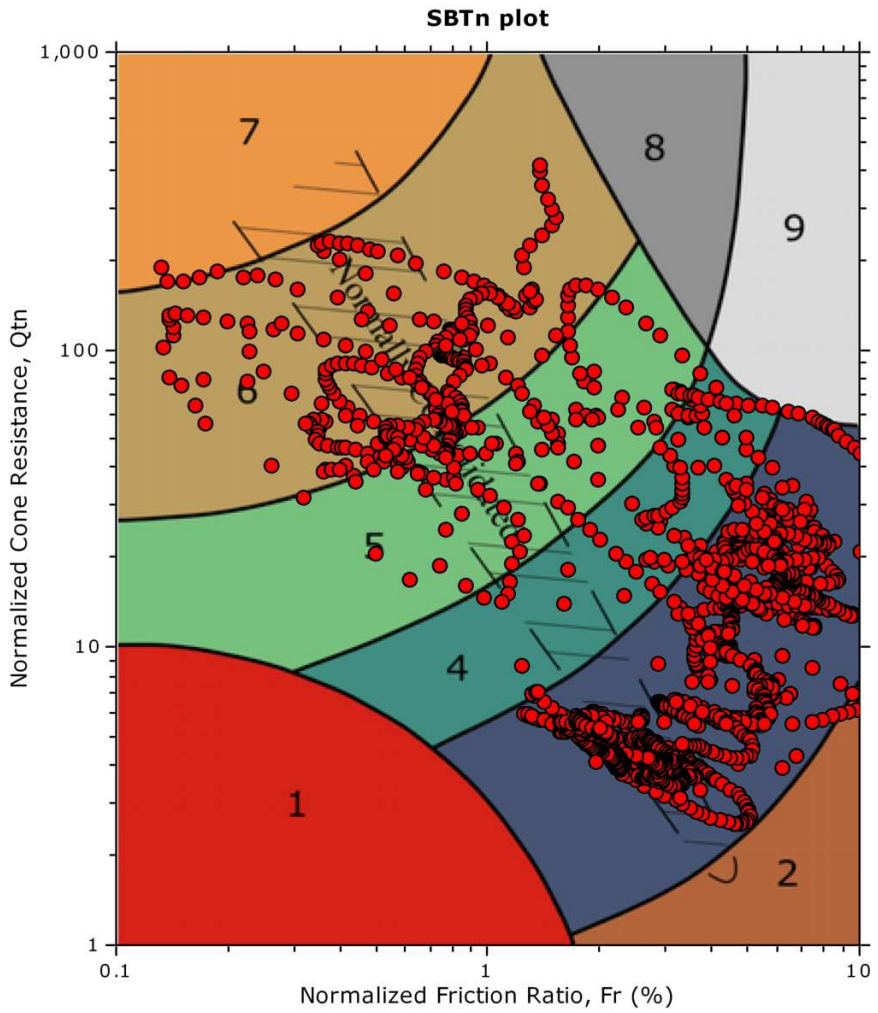


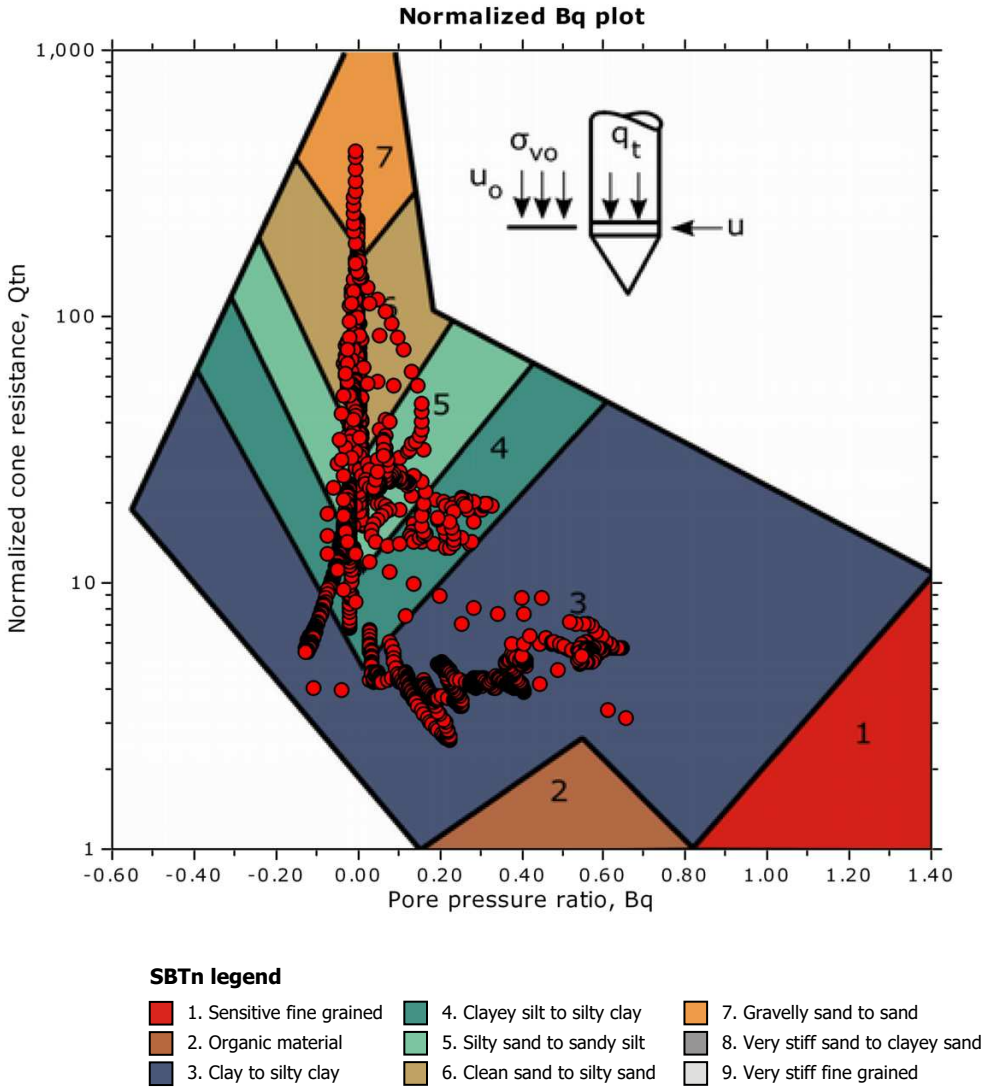




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

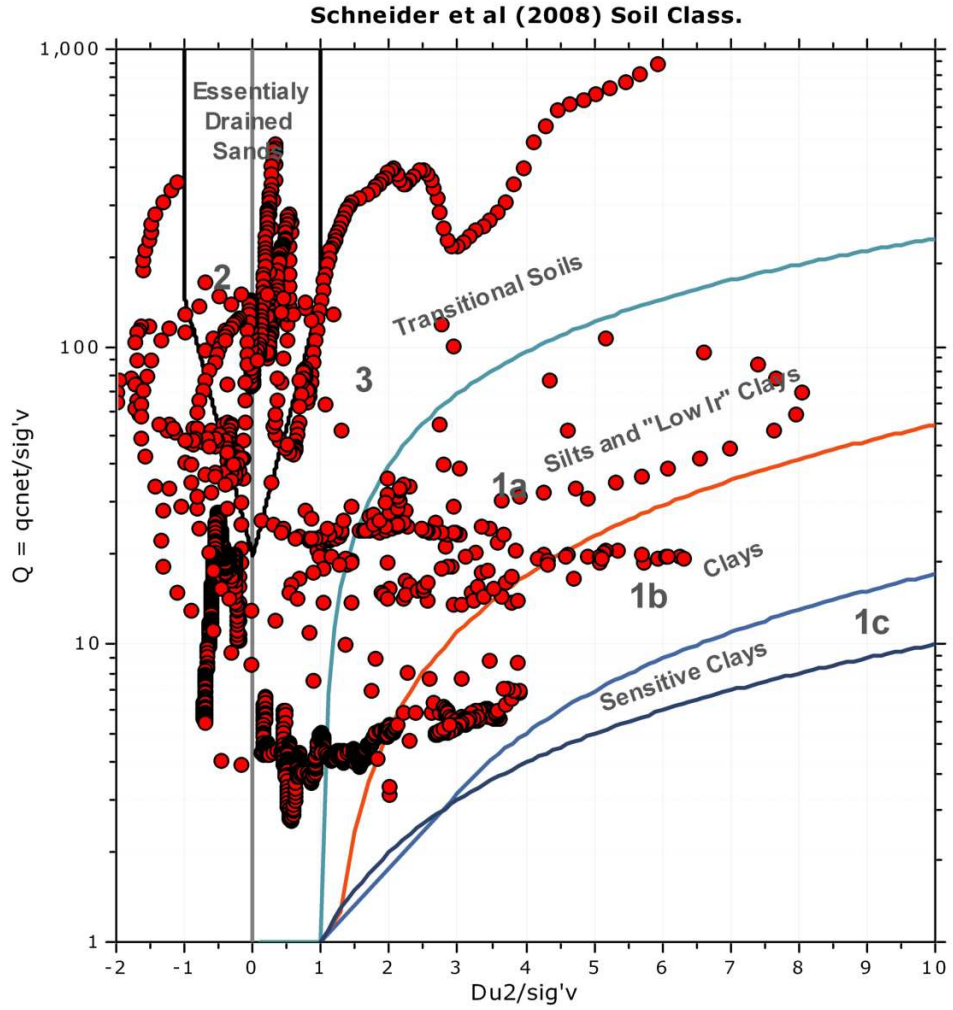


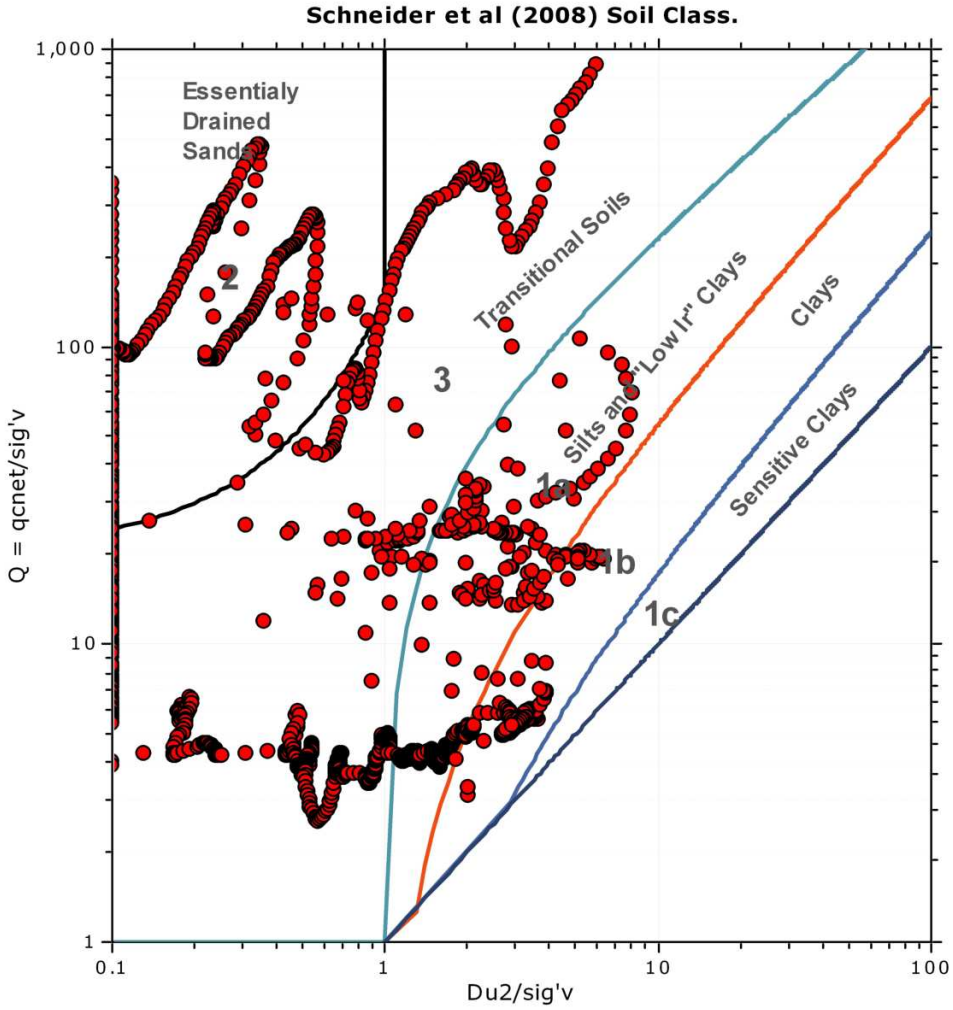



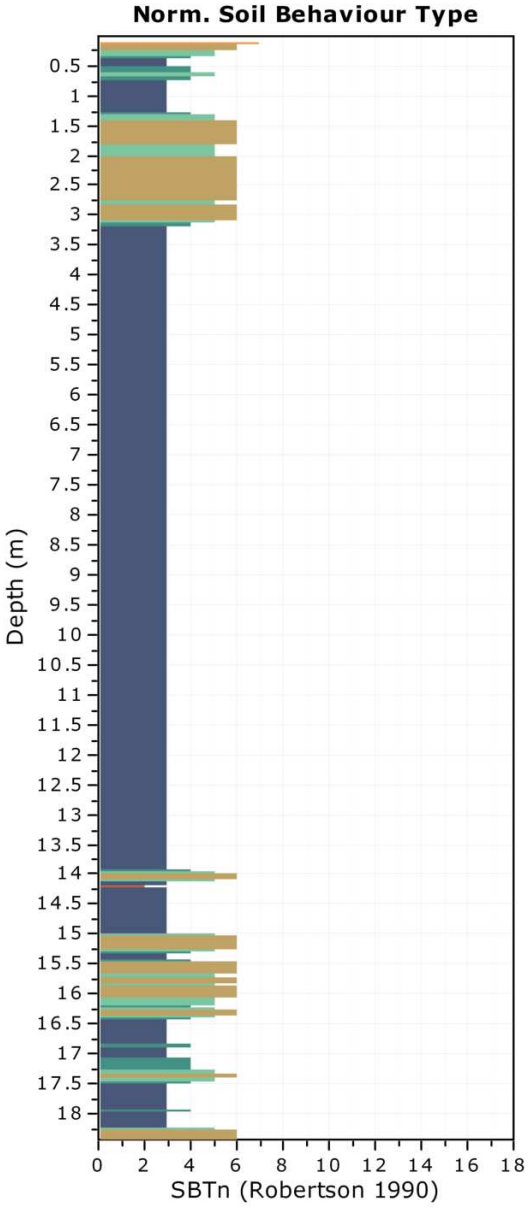

**SBTn legend**

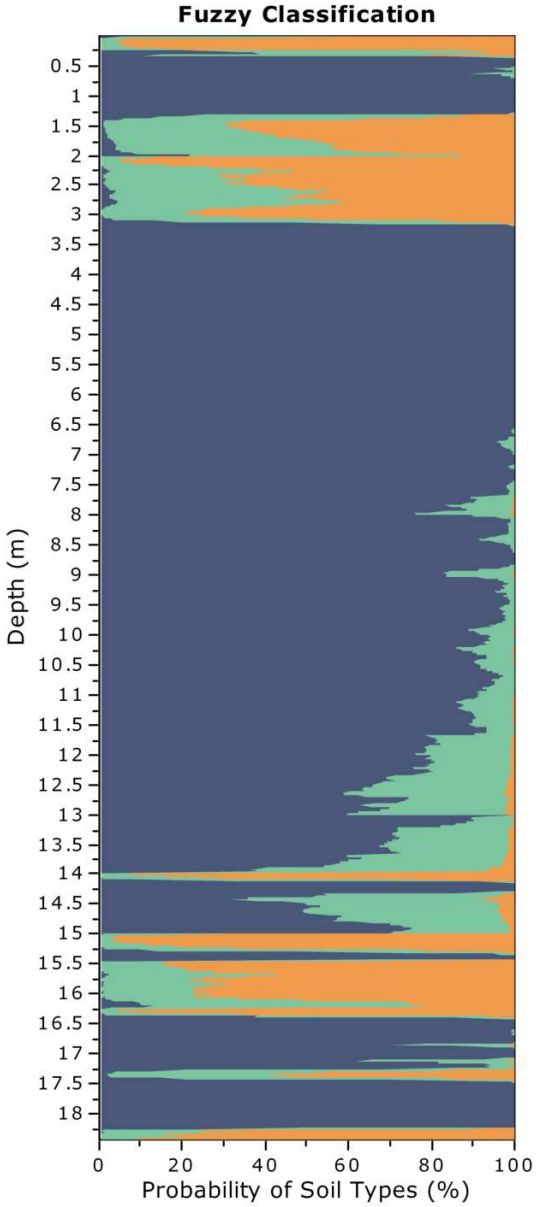
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



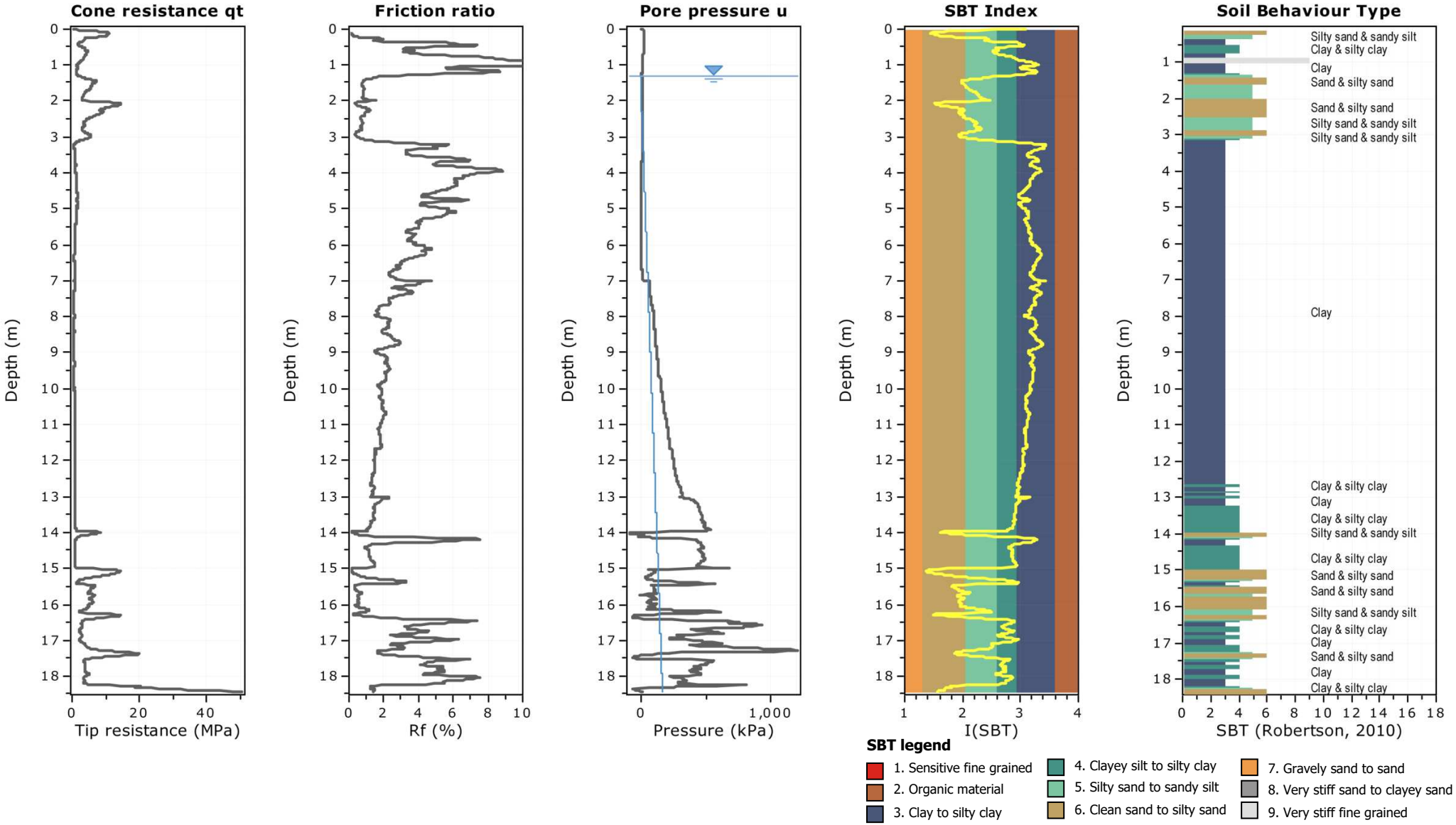



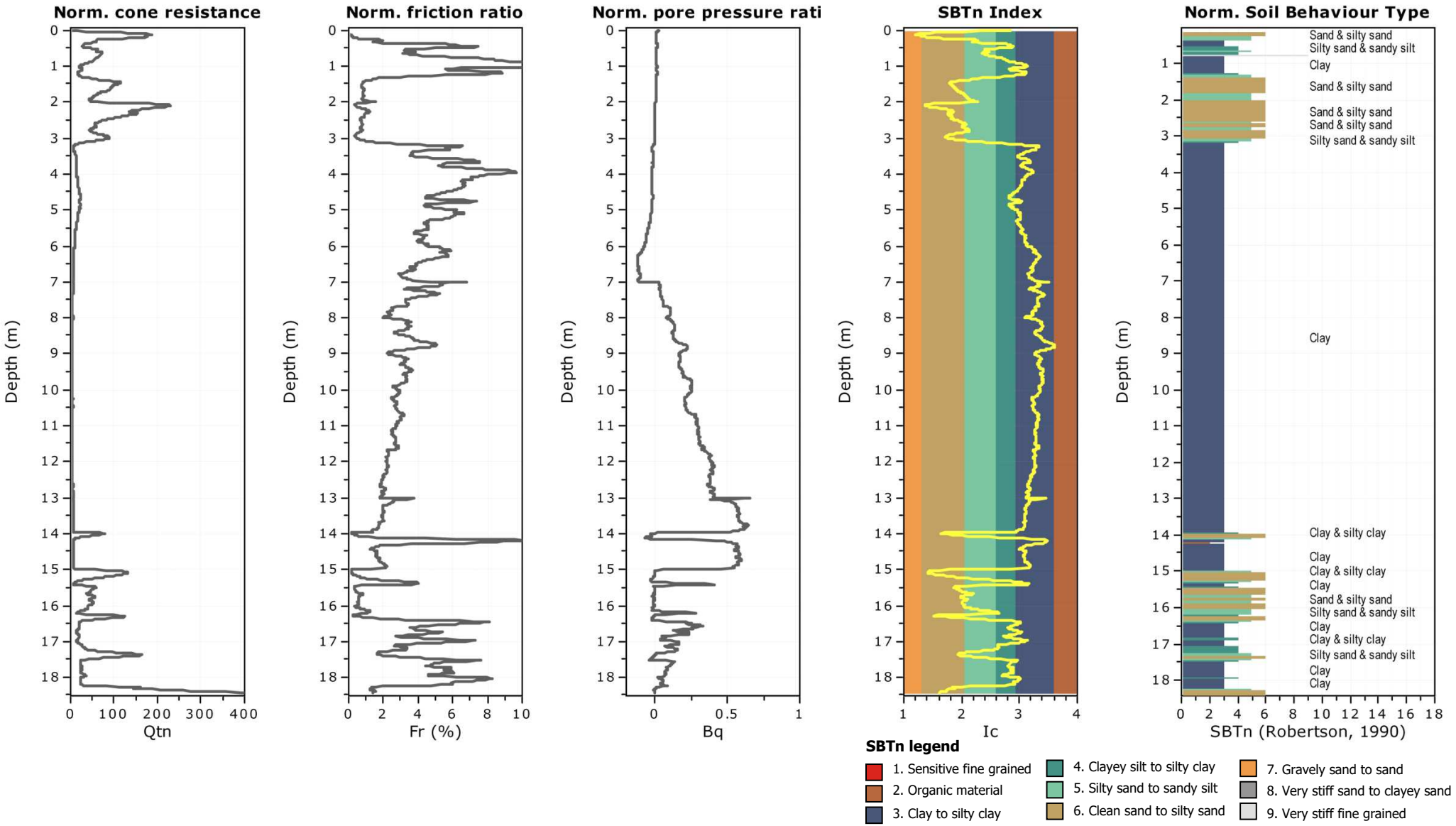


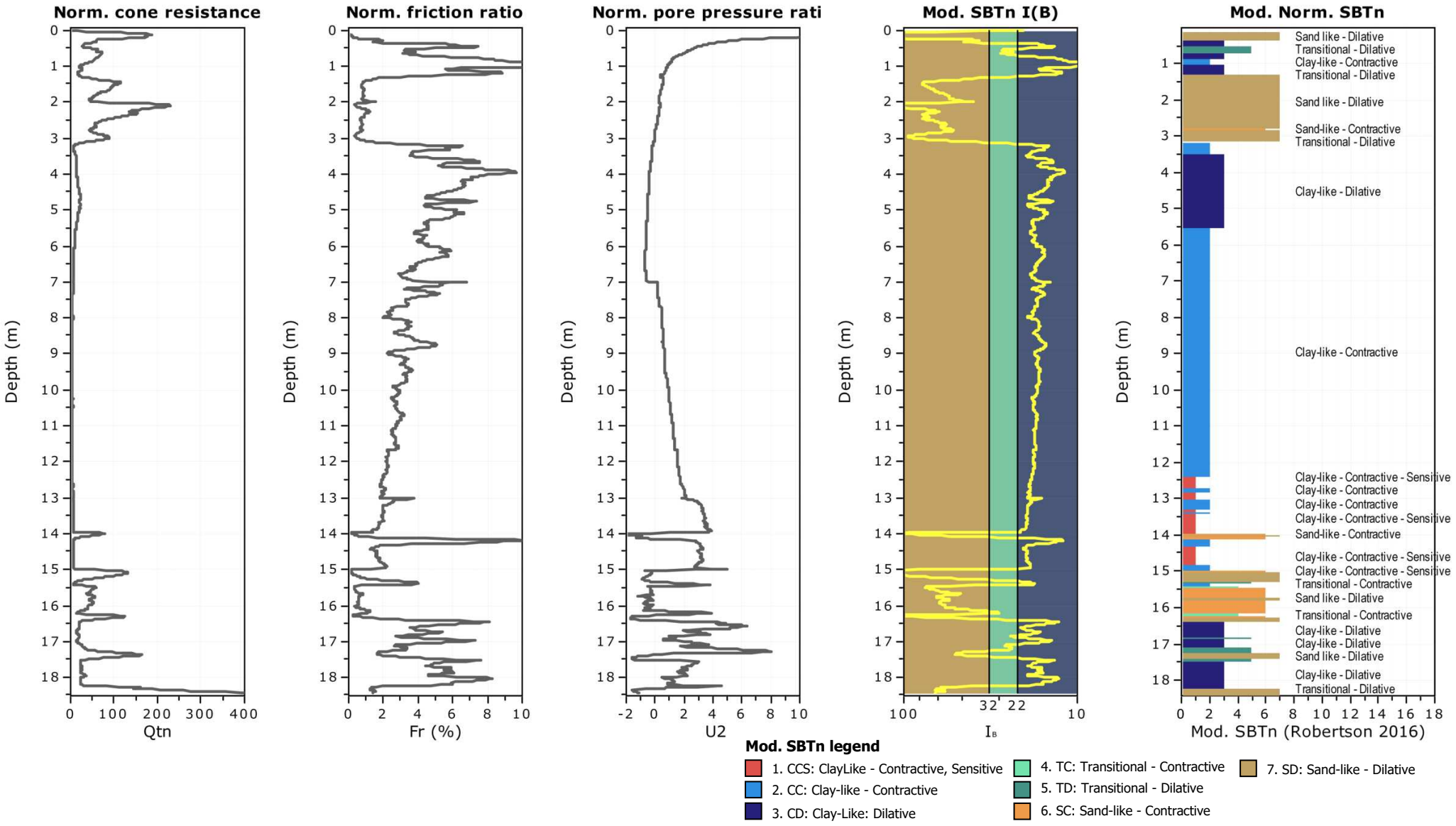




**Fuzzy classifiaction legend**

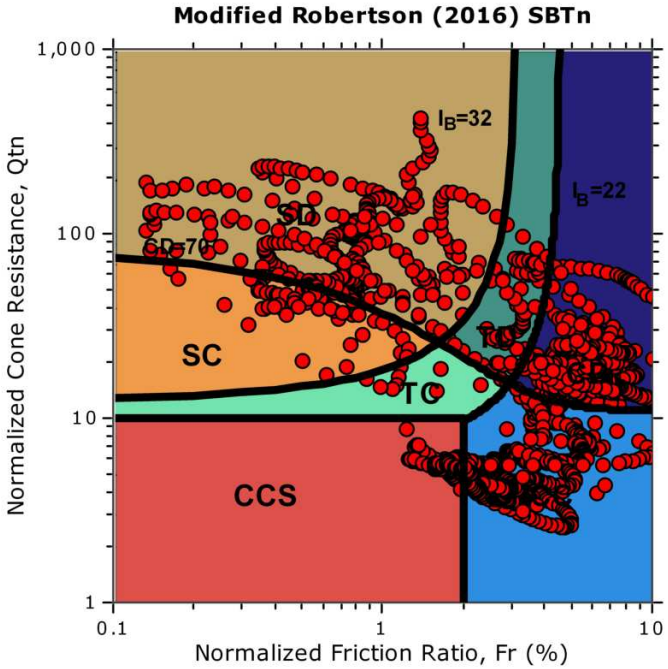
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

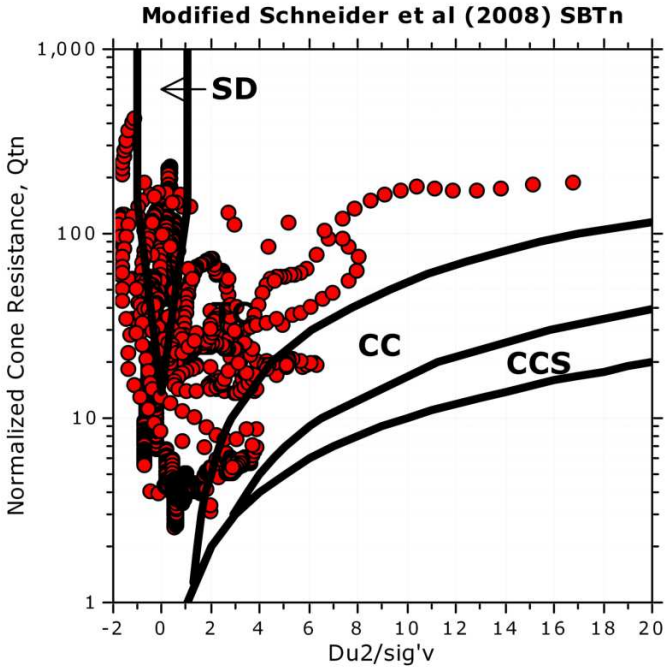

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Silty sand & sandy silt
Clay & silty clay
Clay
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Silty sand & sandy silt
Clay
Clay & silty clay
Clay
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Sand & silty sand
Clay
Clay & silty clay
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

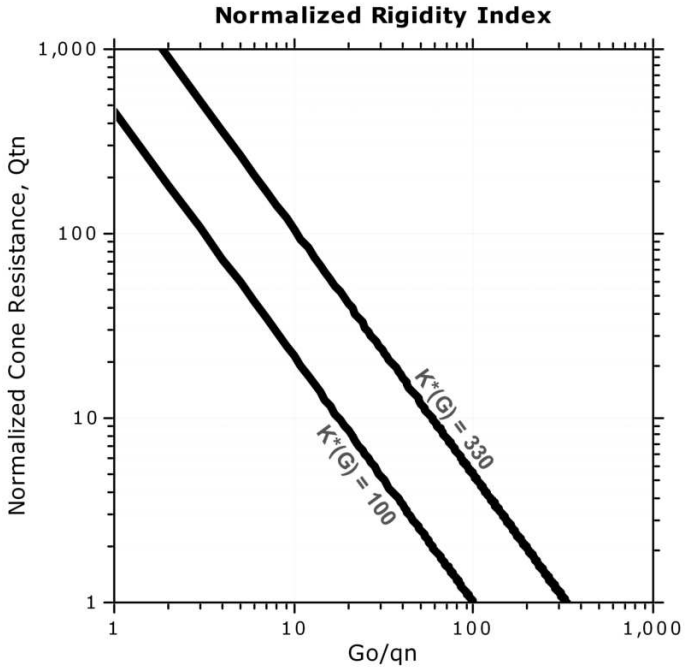

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Transitional - Dilative
Clay-like - Contractive
Transitional - Dilative
Sand like - Dilative
Sand-like - Contractive
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Sand-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Sand like - Dilative
Transitional - Contractive
Clay-like - Dilative
Clay-like - Dilative
Sand like - Dilative
Clay-like - Dilative
Transitional - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

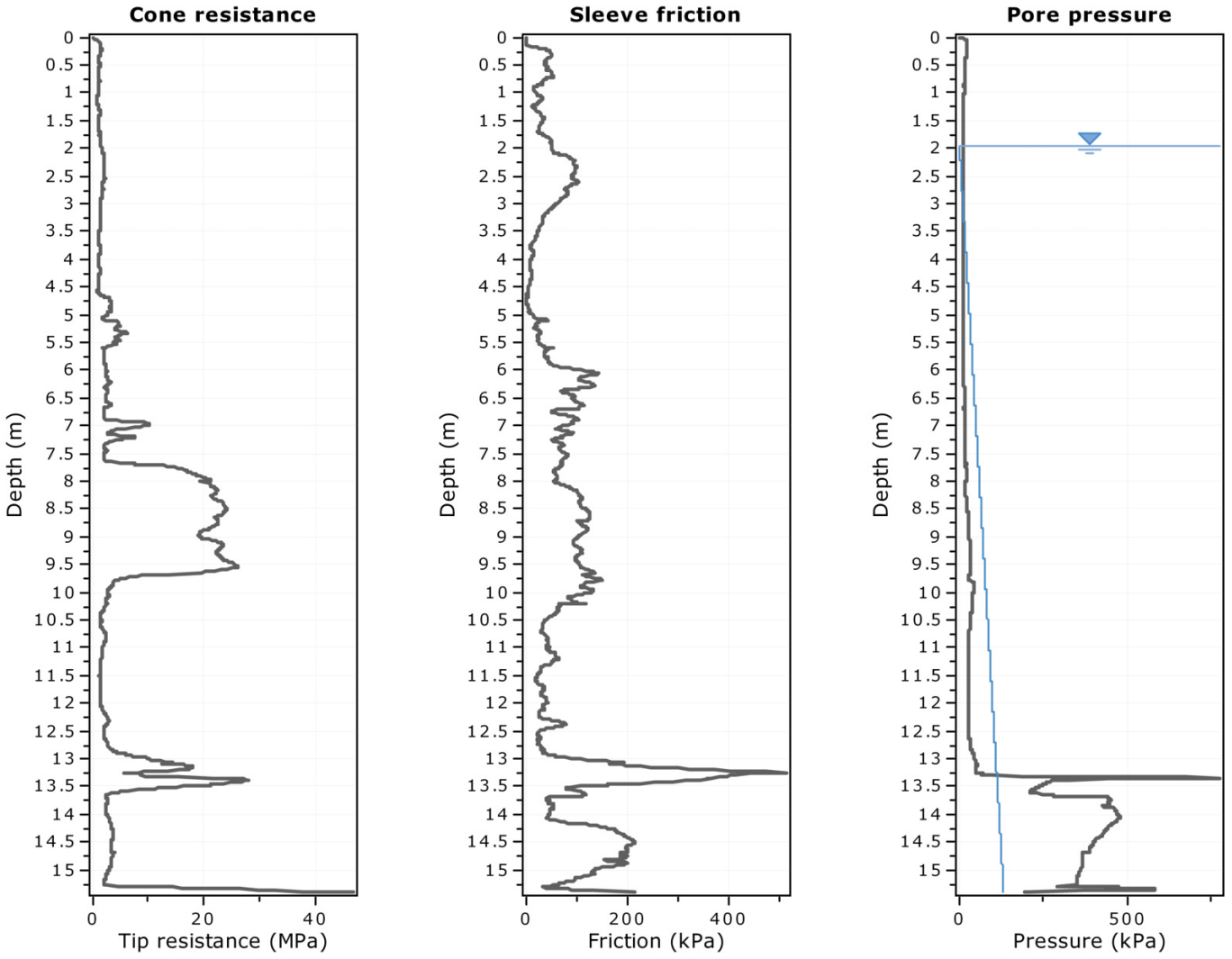


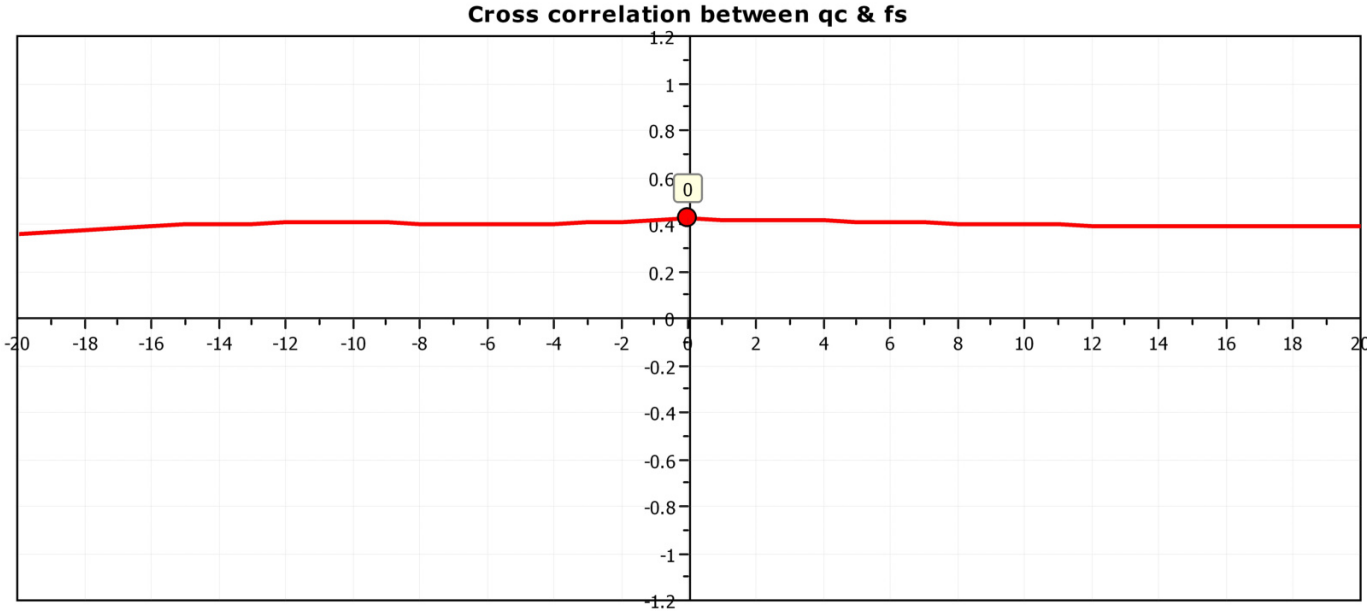




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

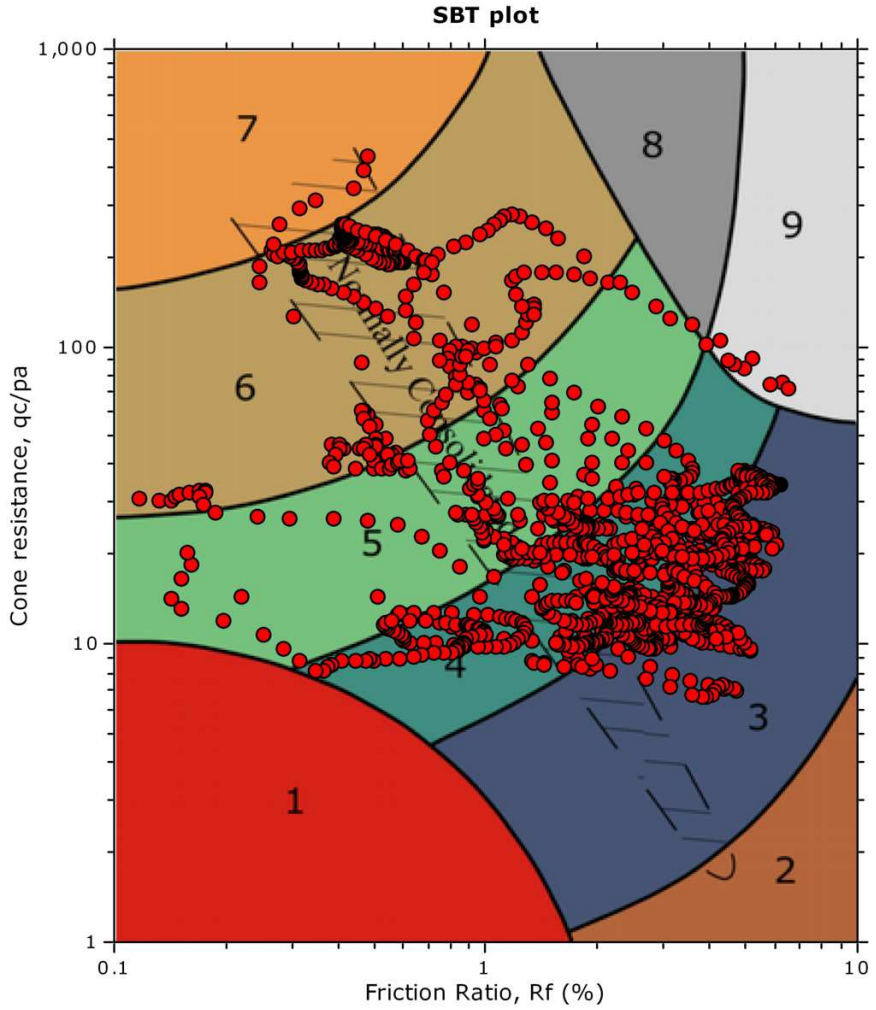
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

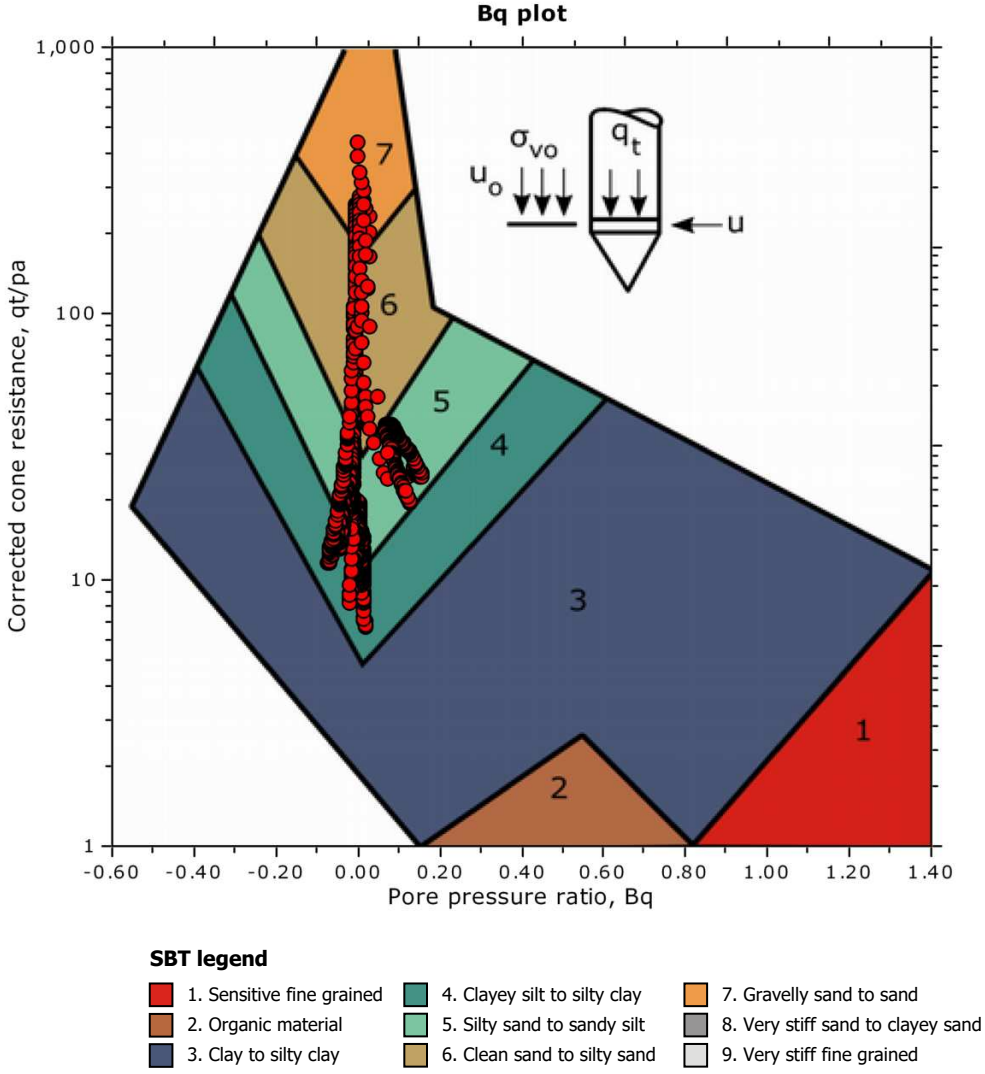



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

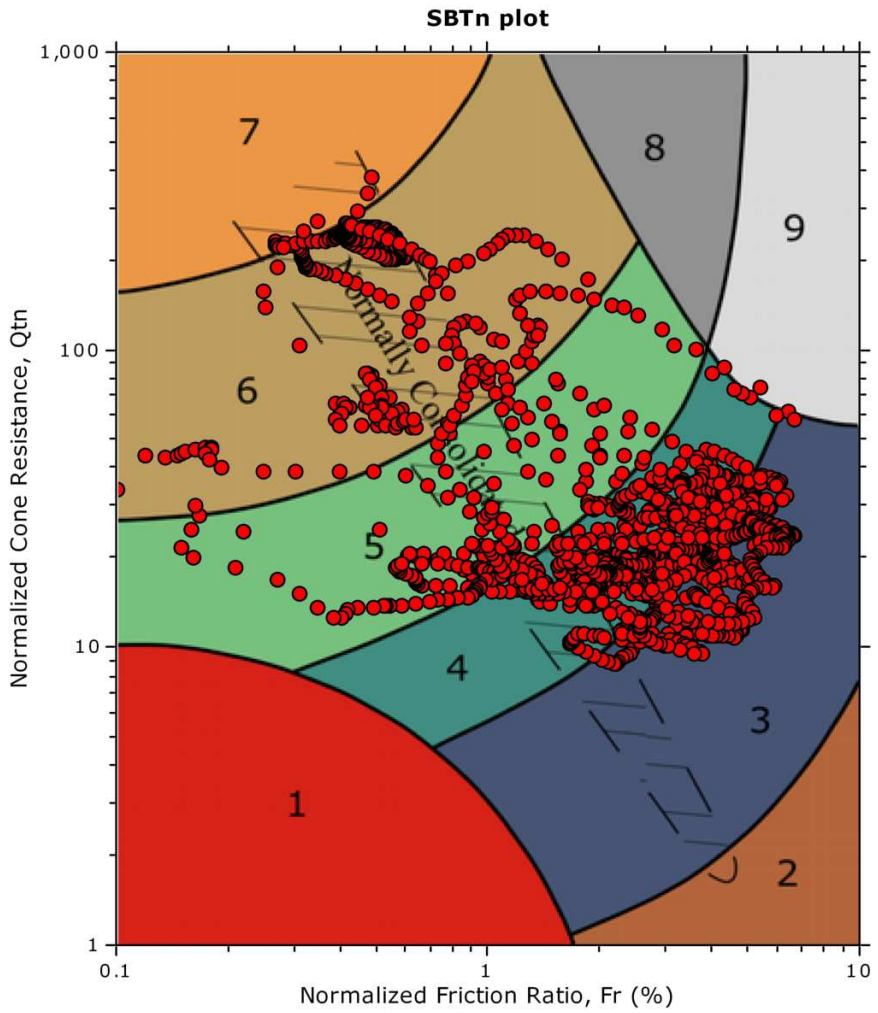


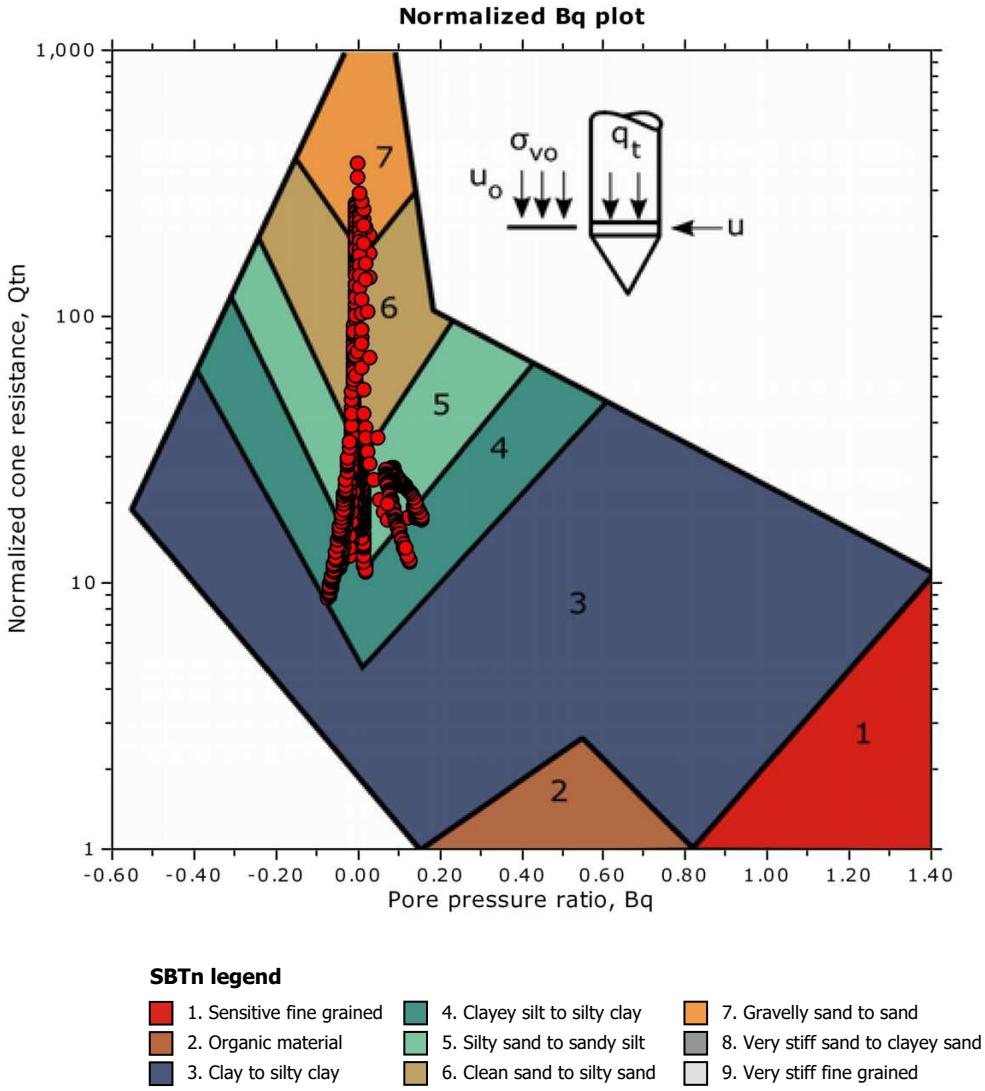
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
1
2
3
4
5
6
7
8
9
Normally Consolidated Soils


Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
3
4
5
6
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

## SBT - Bq plots (normalized)

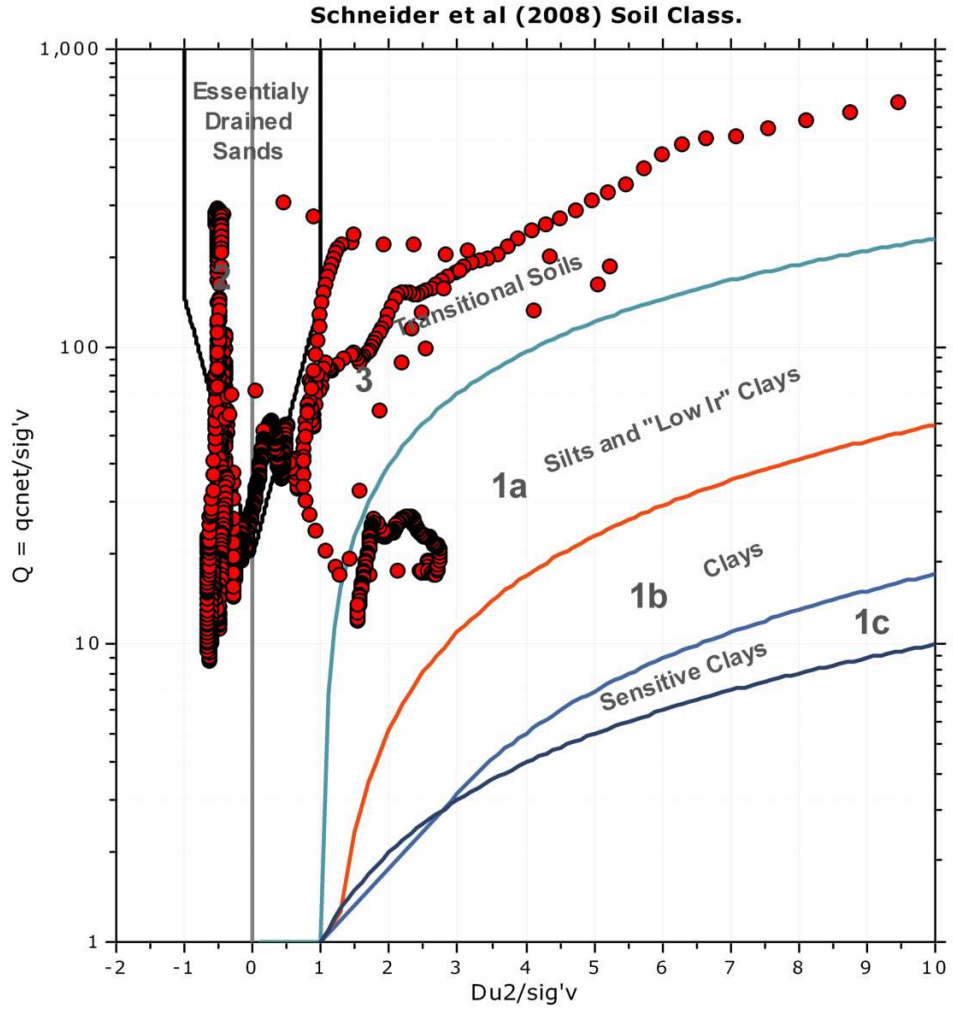


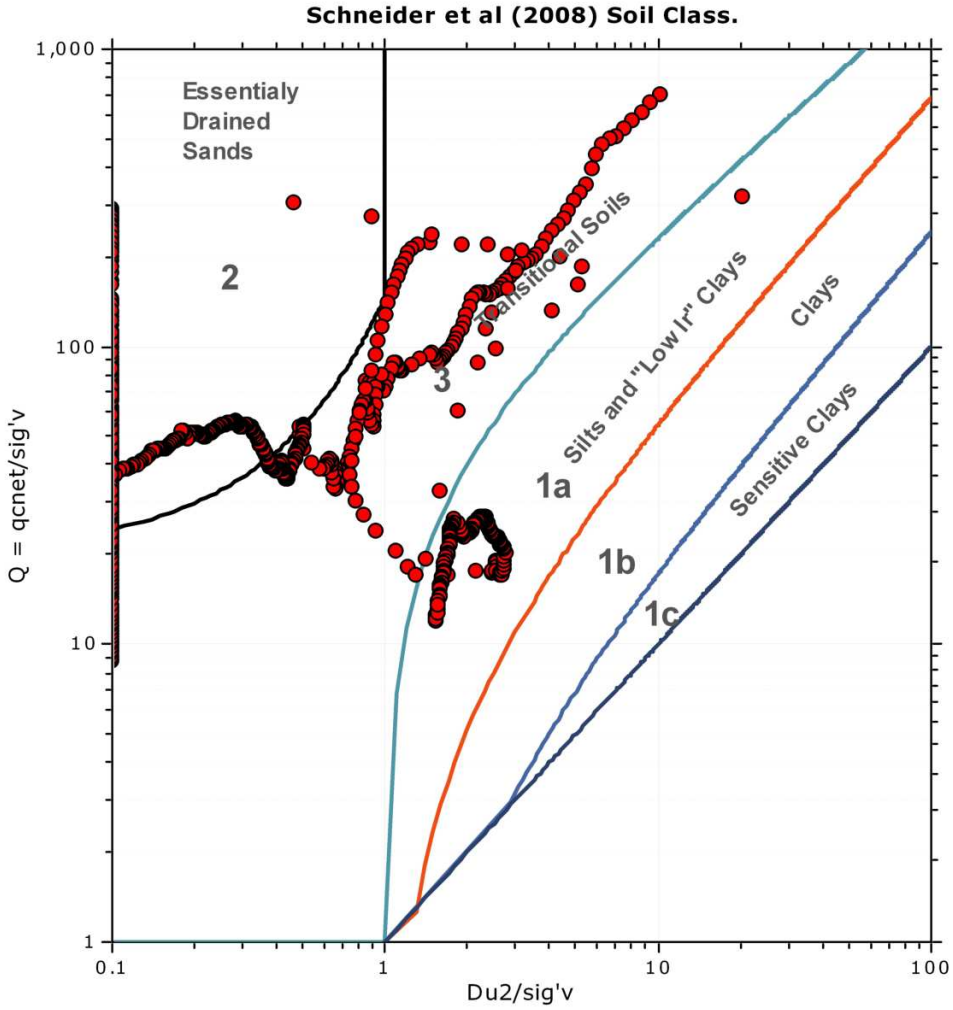



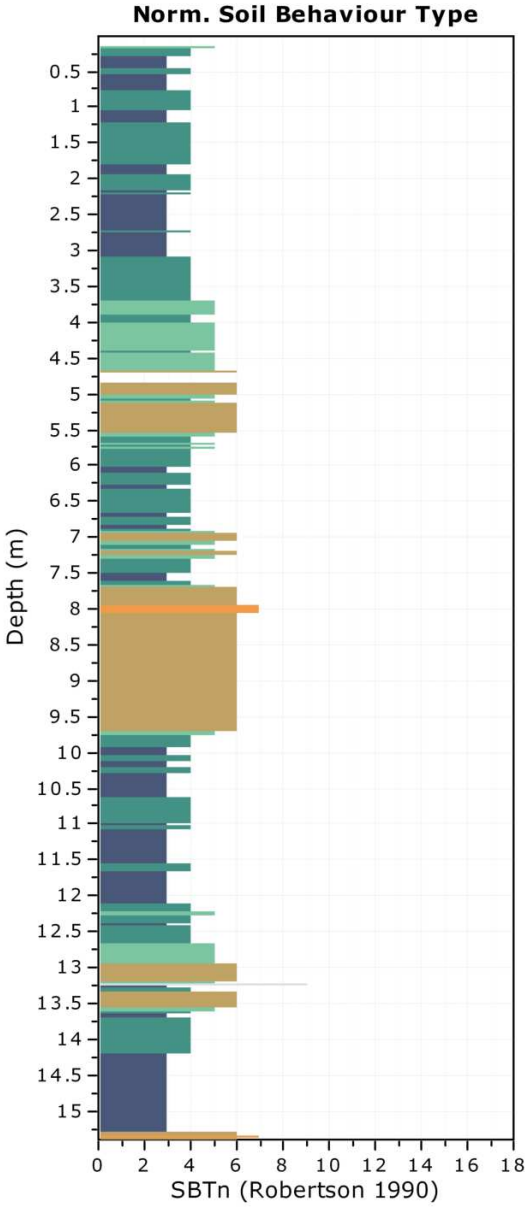

**SBTn legend**

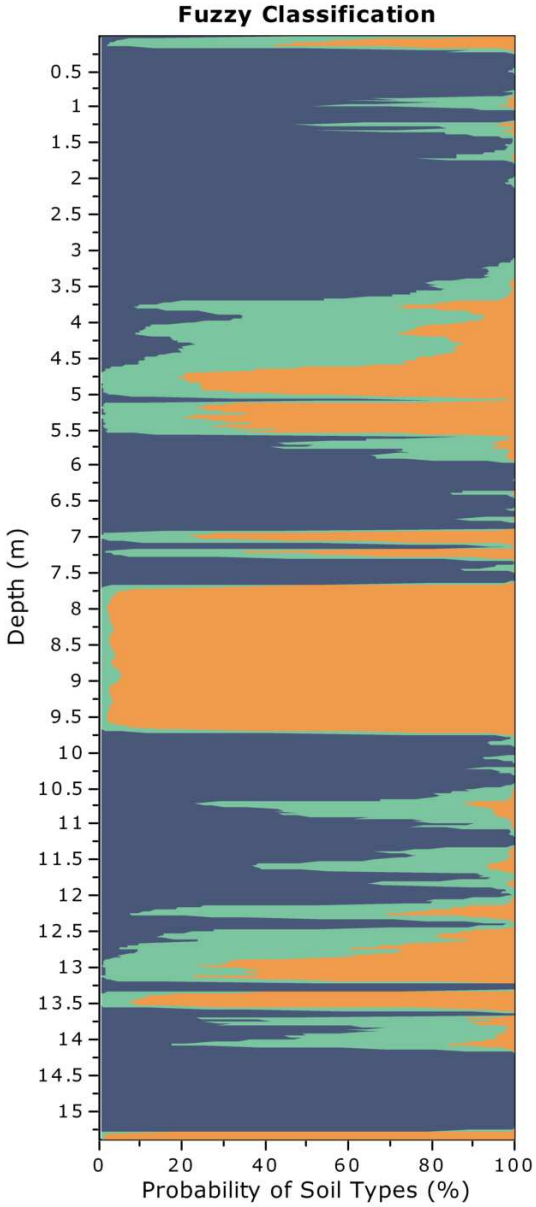
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



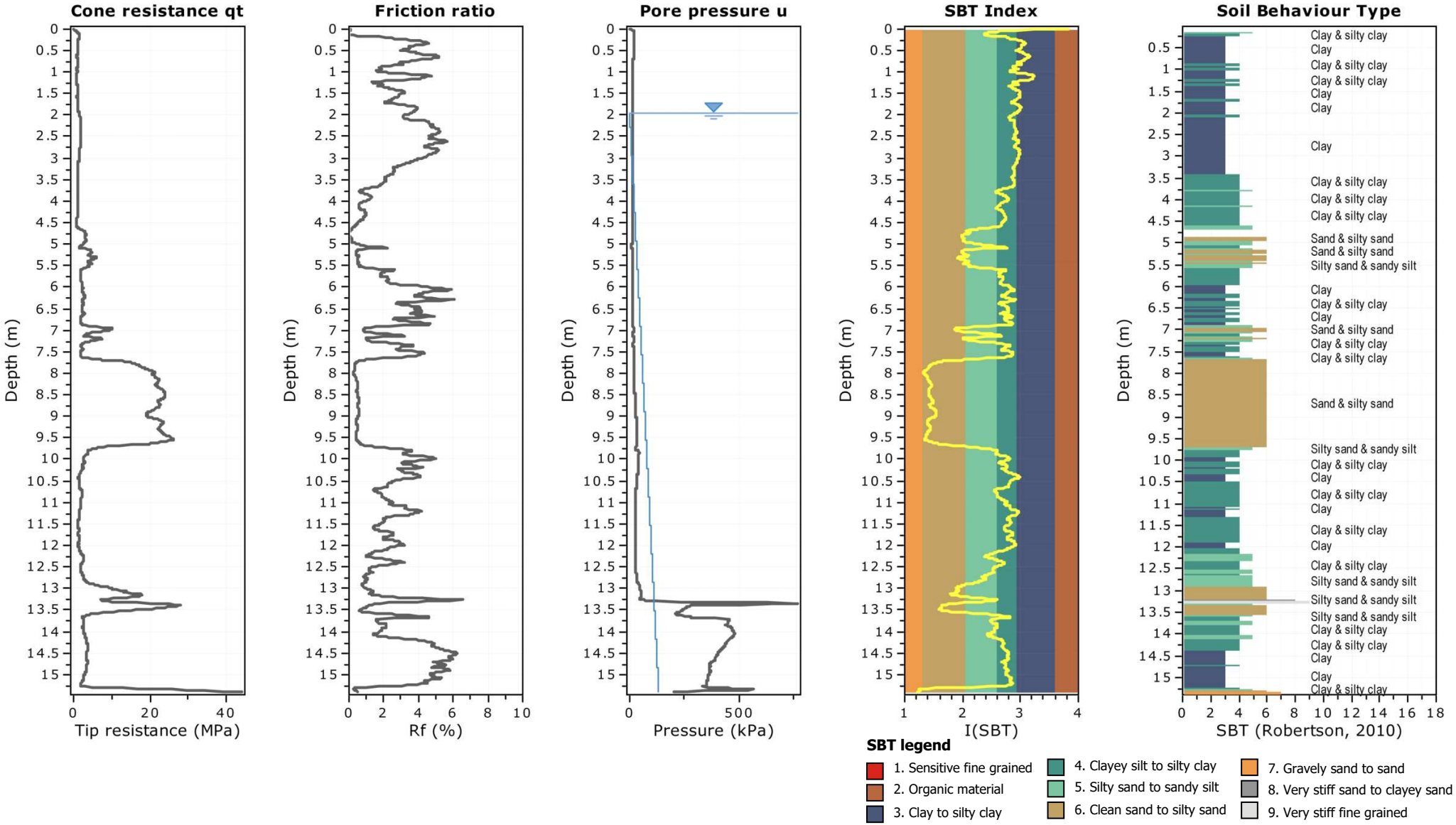



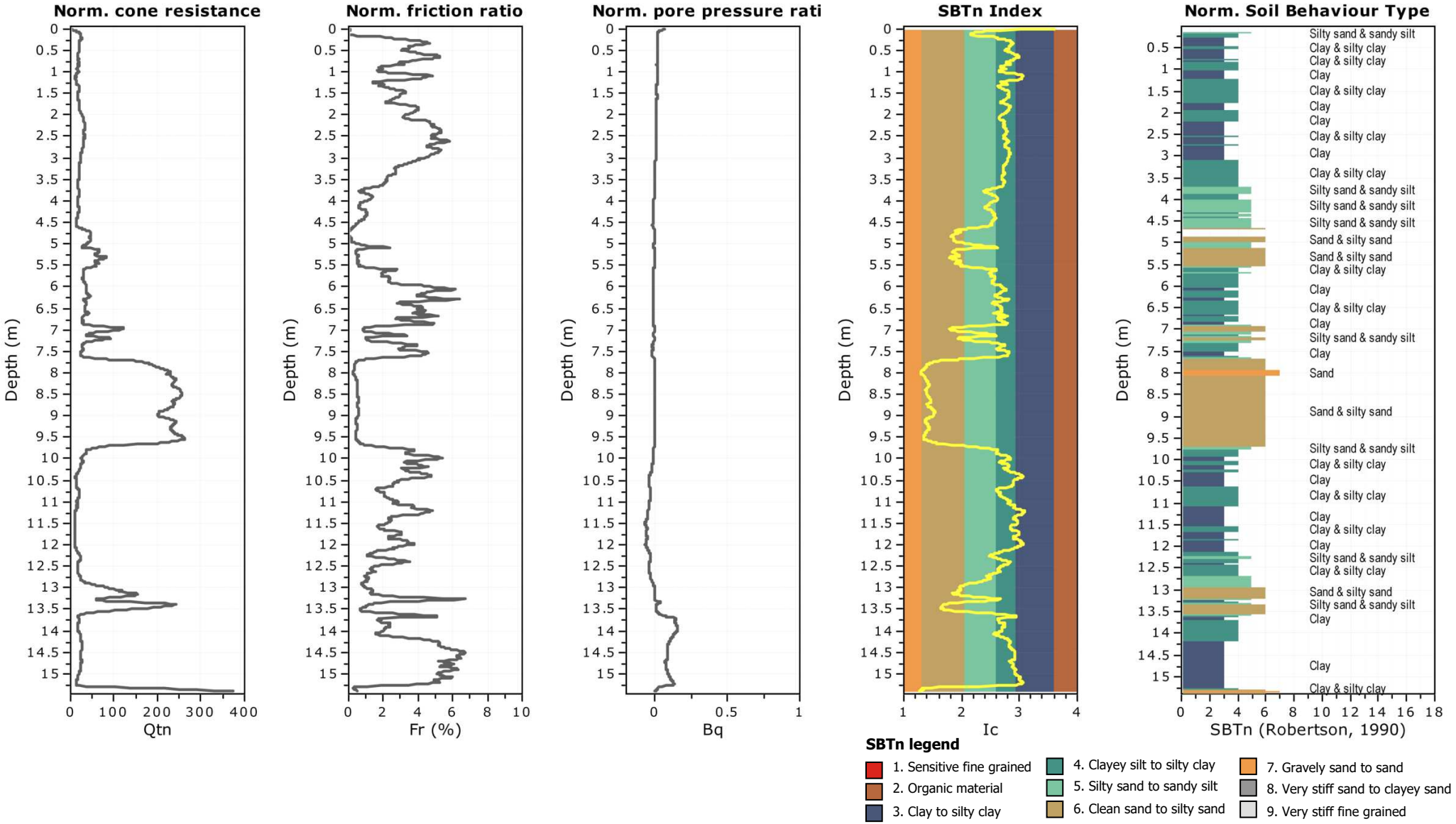


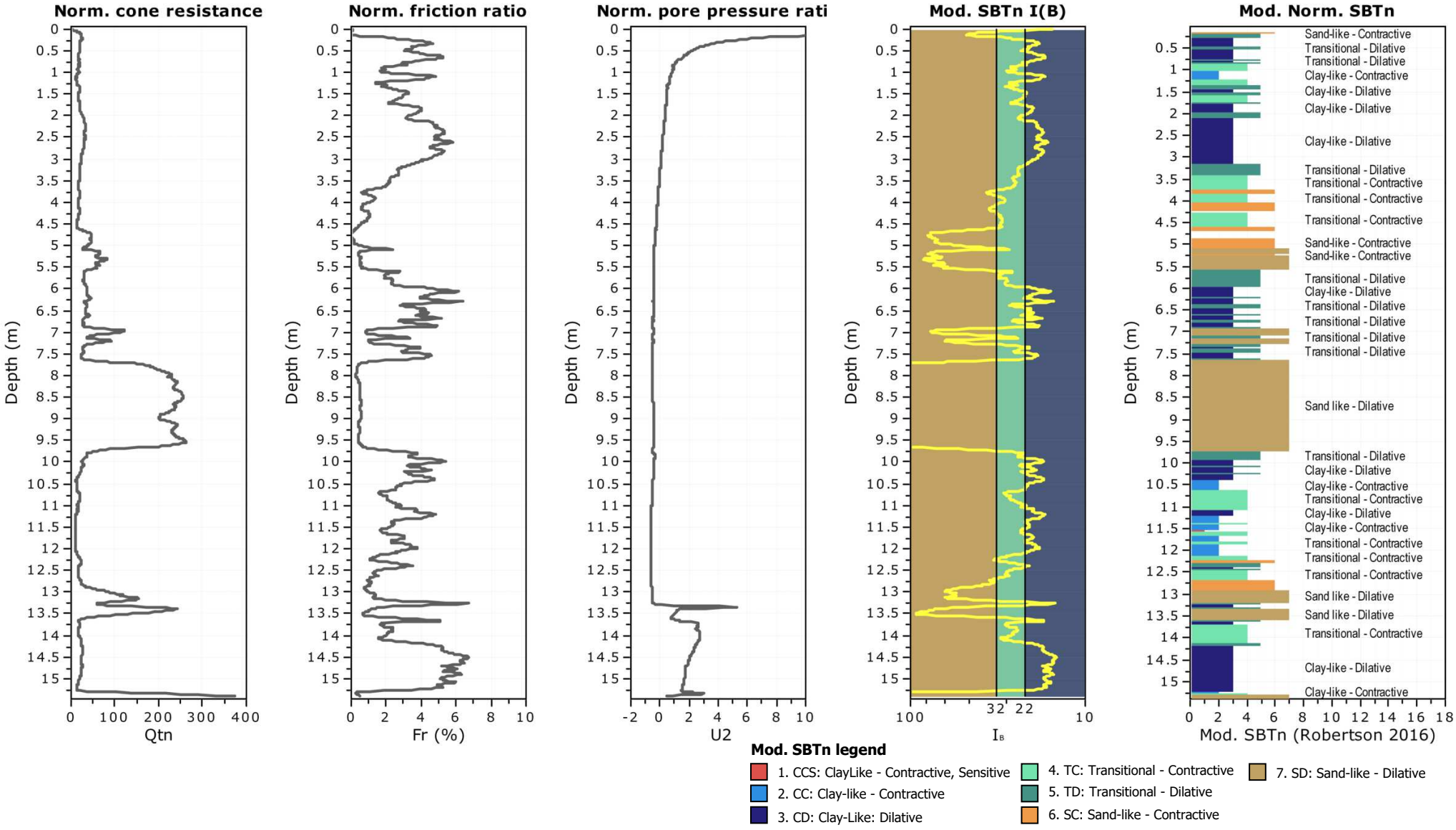




**Fuzzy classifiaction legend**

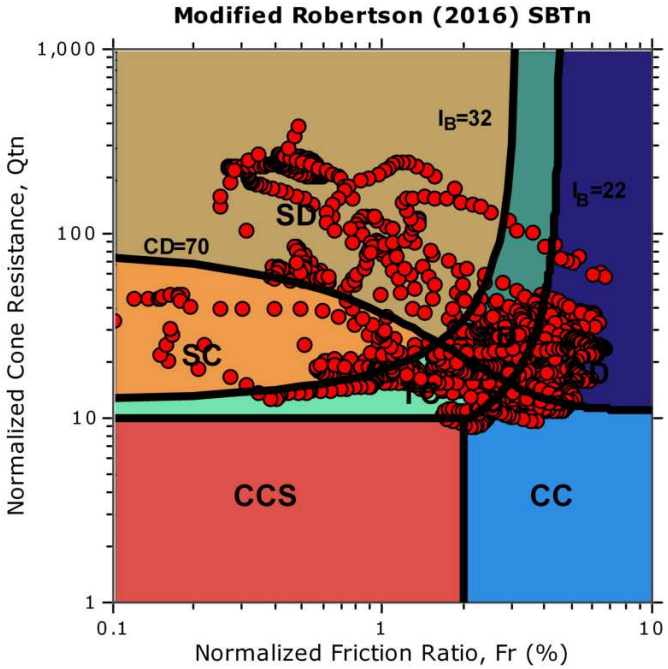
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

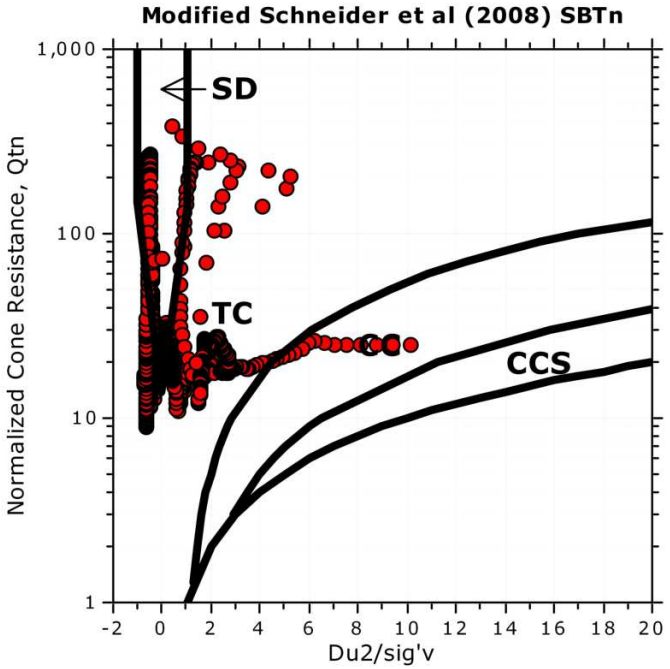

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Clay & silty clay
Clay
Sand & silty sand
Silty sand & sandy silt
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

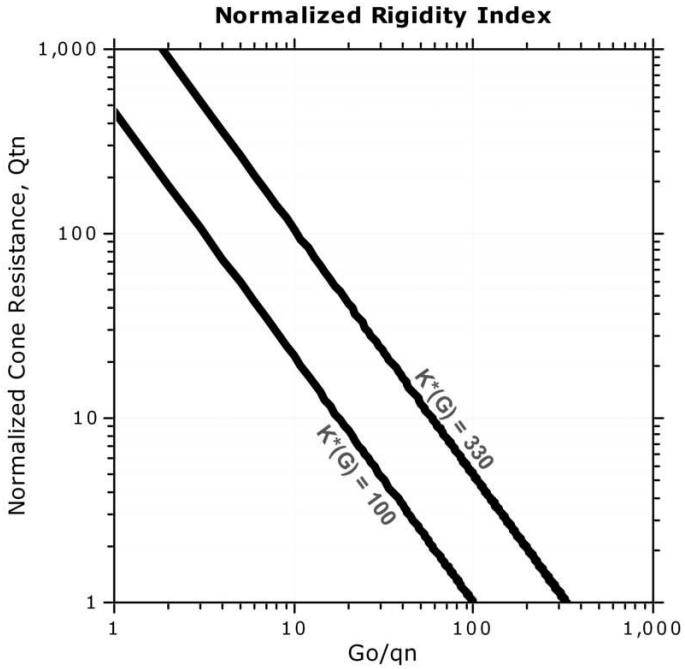

Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Depth (m)
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
Depth (m)
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

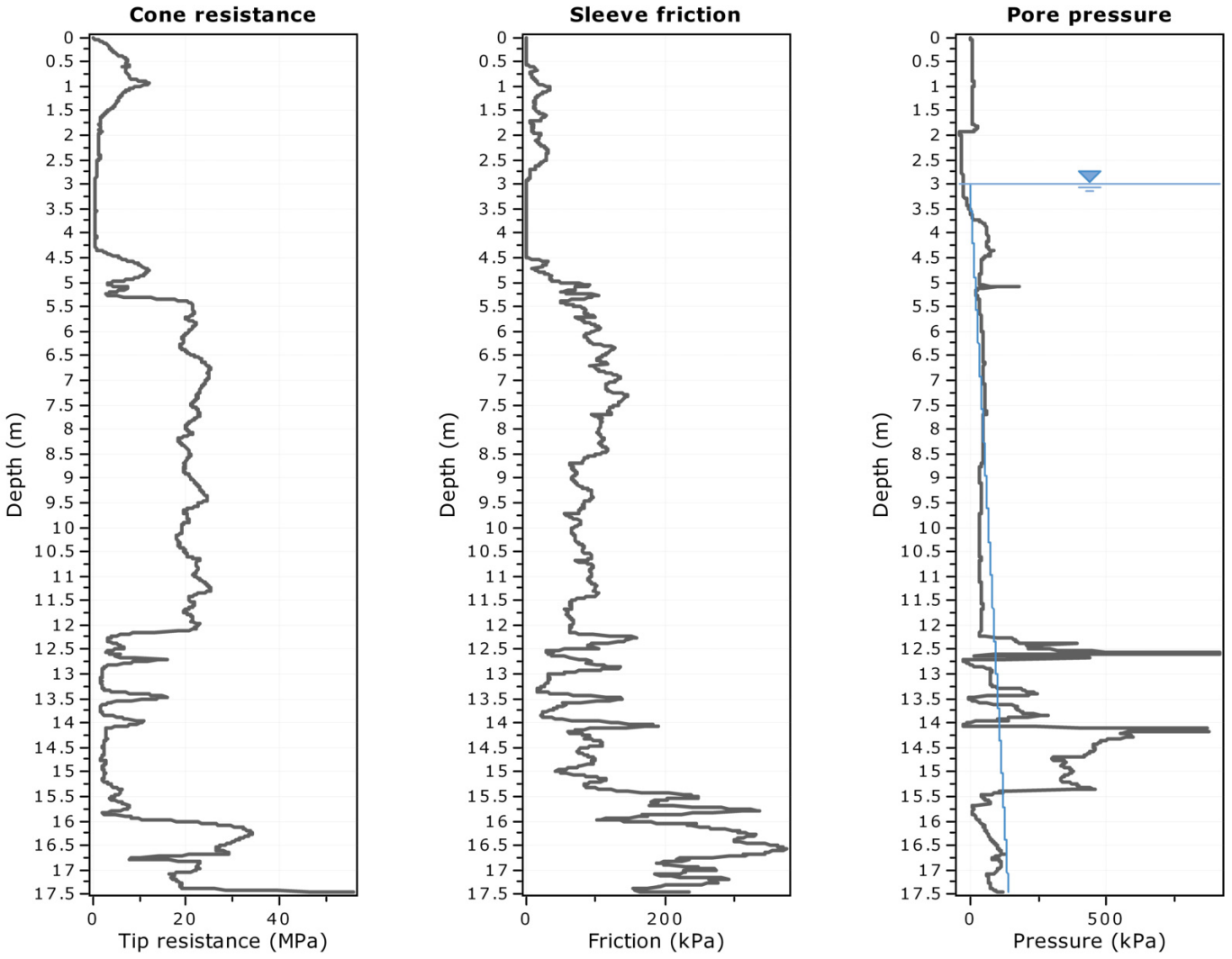


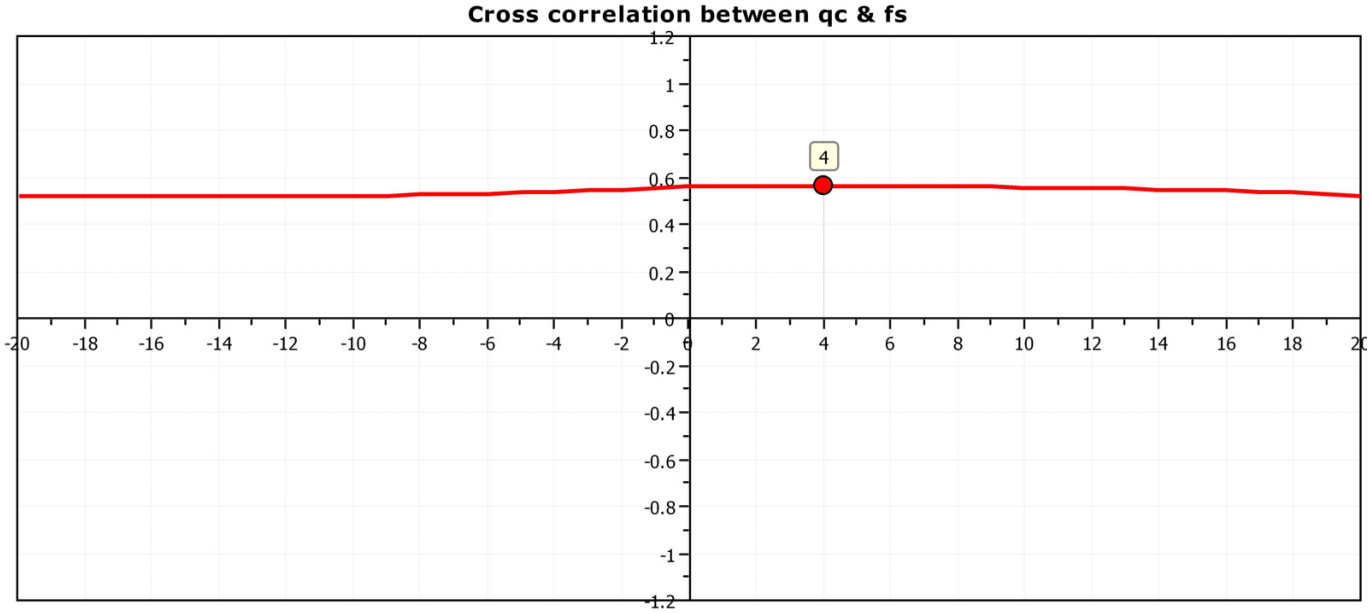




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

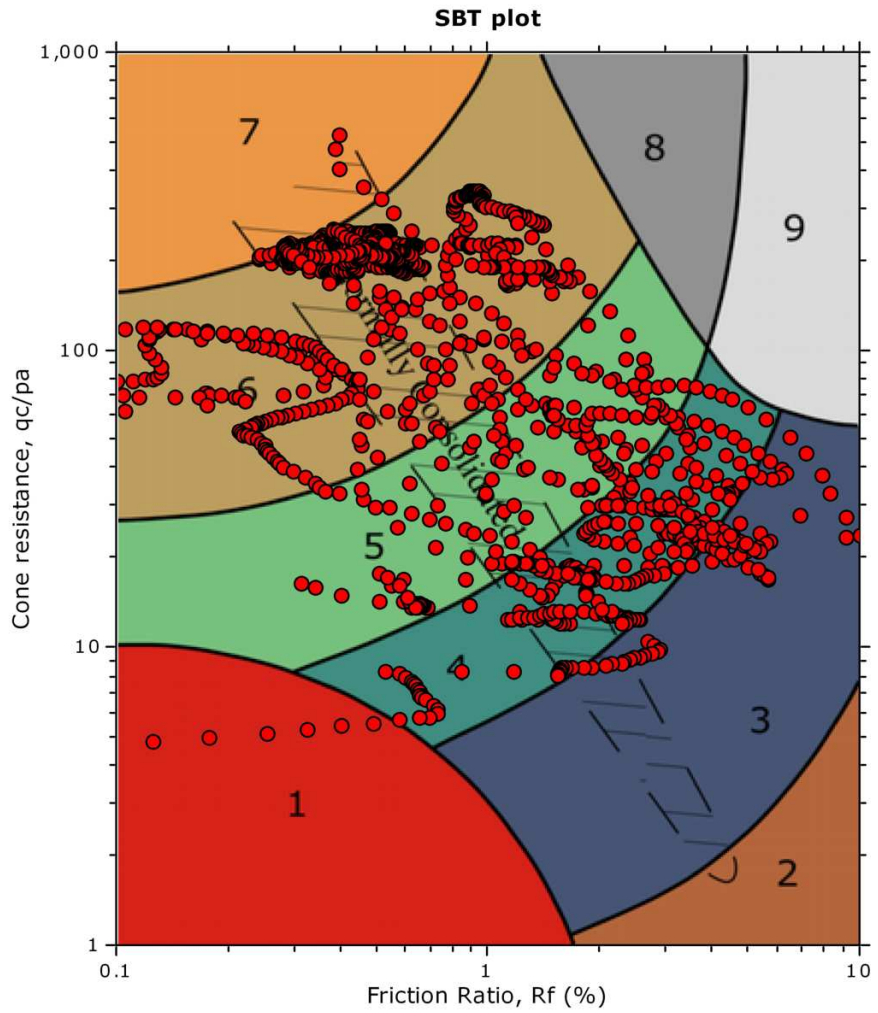
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

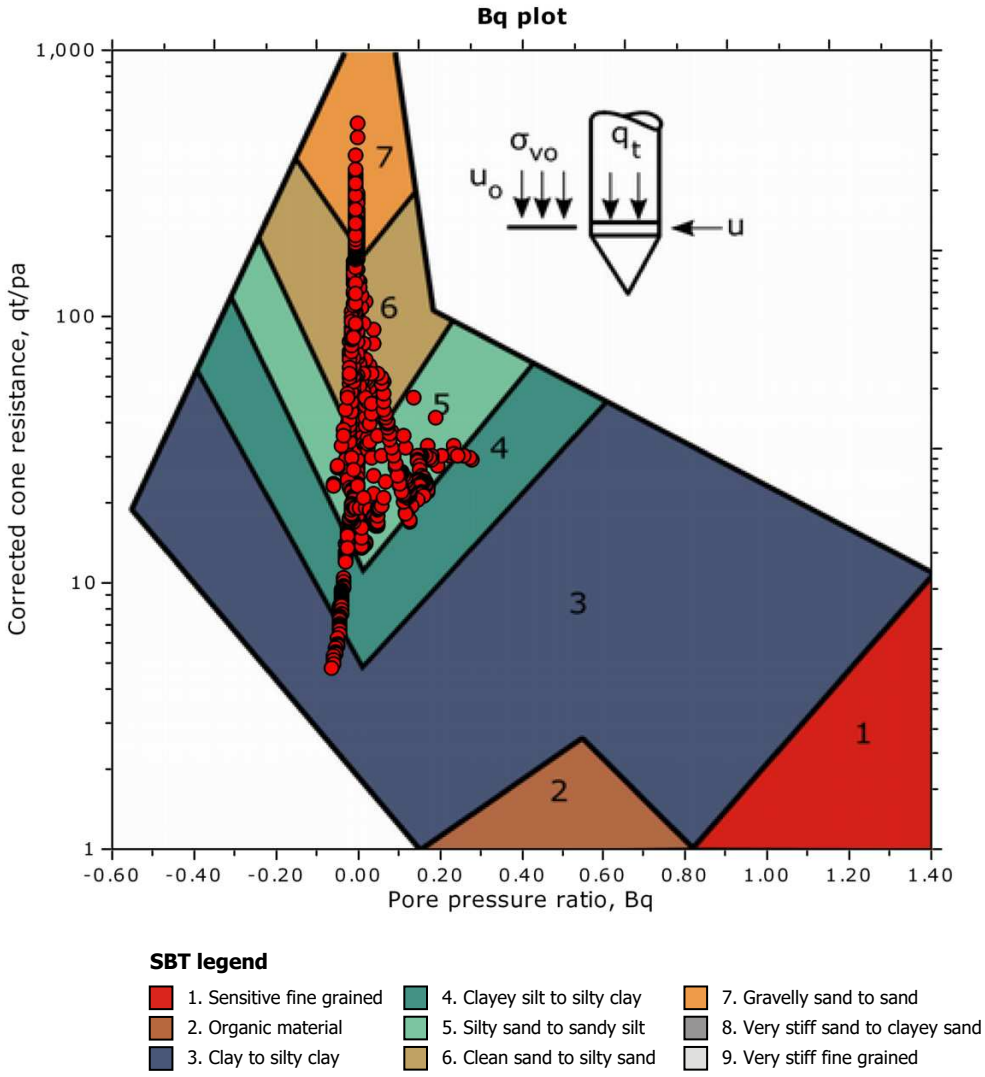



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

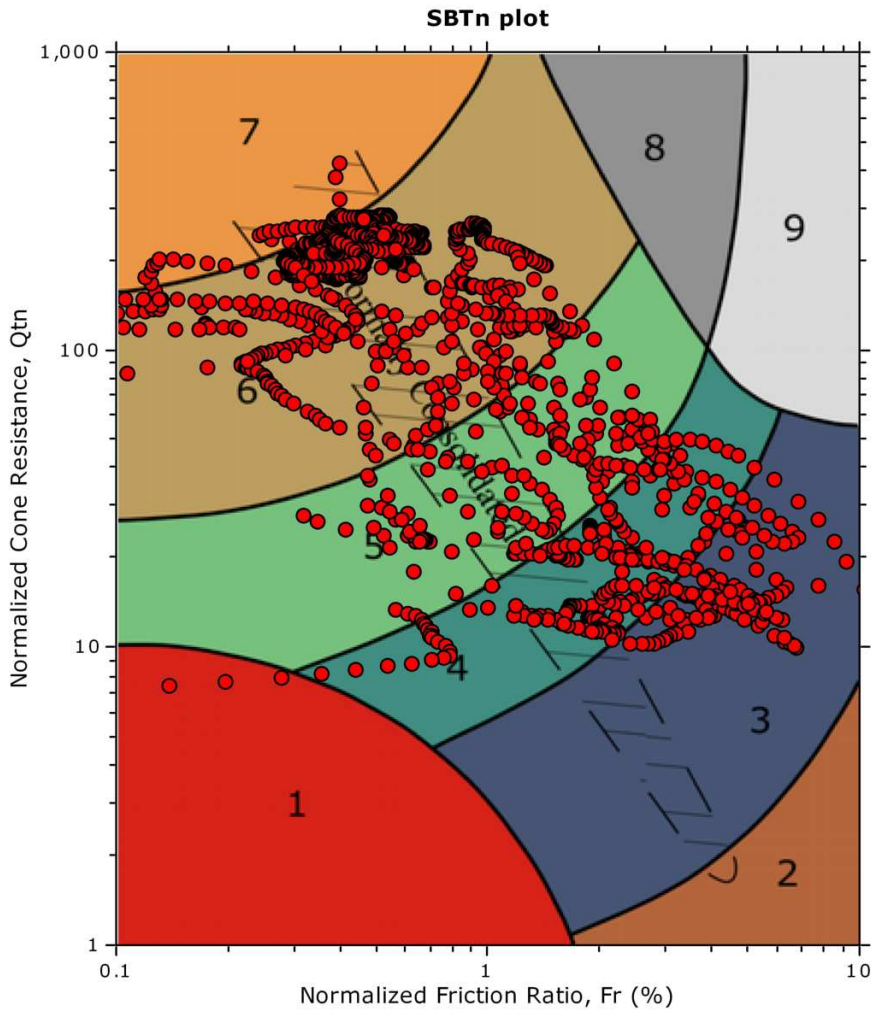


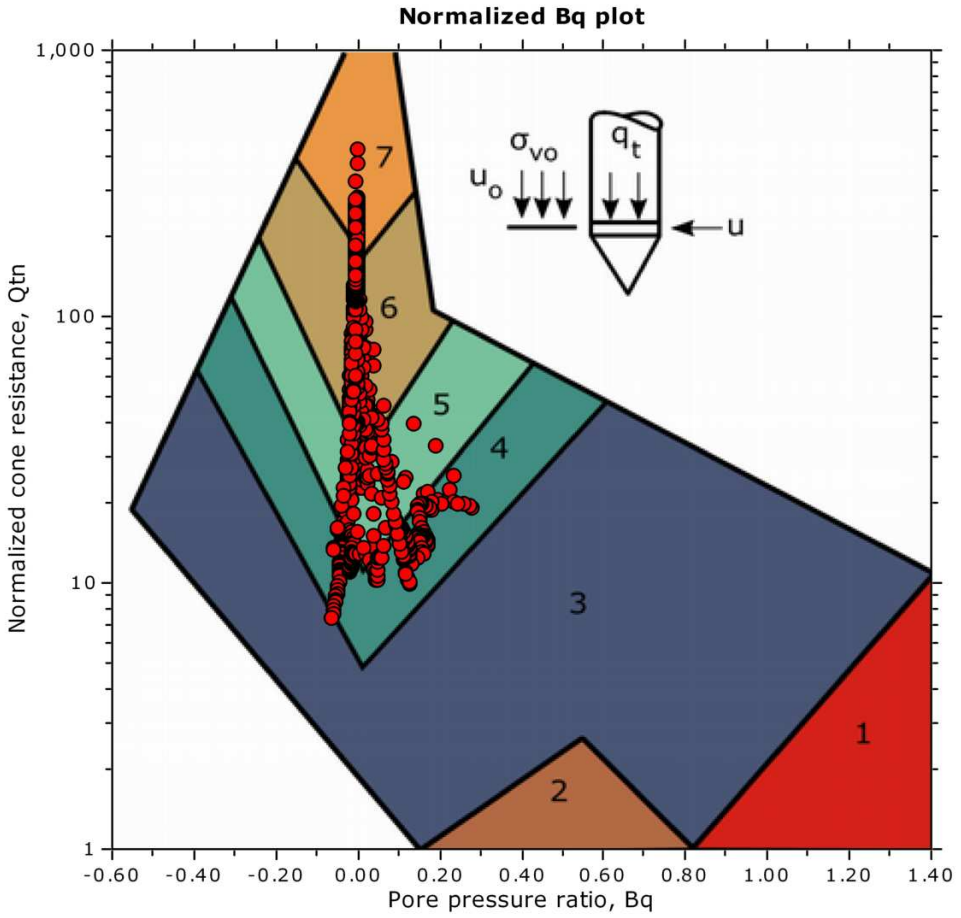
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
1
2
3
4
5
6
7
8
9
Normally consolidated


Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
3
4
5
6
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

## SBT - Bq plots (normalized)

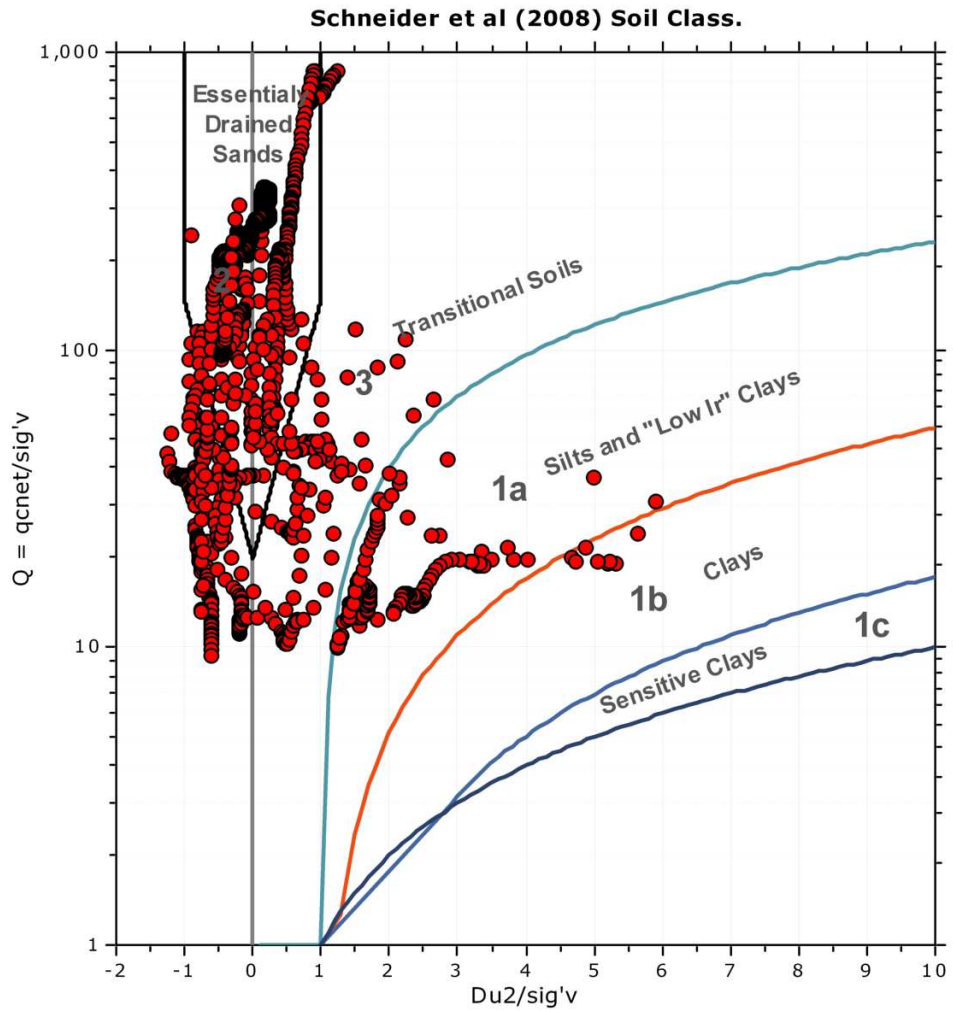


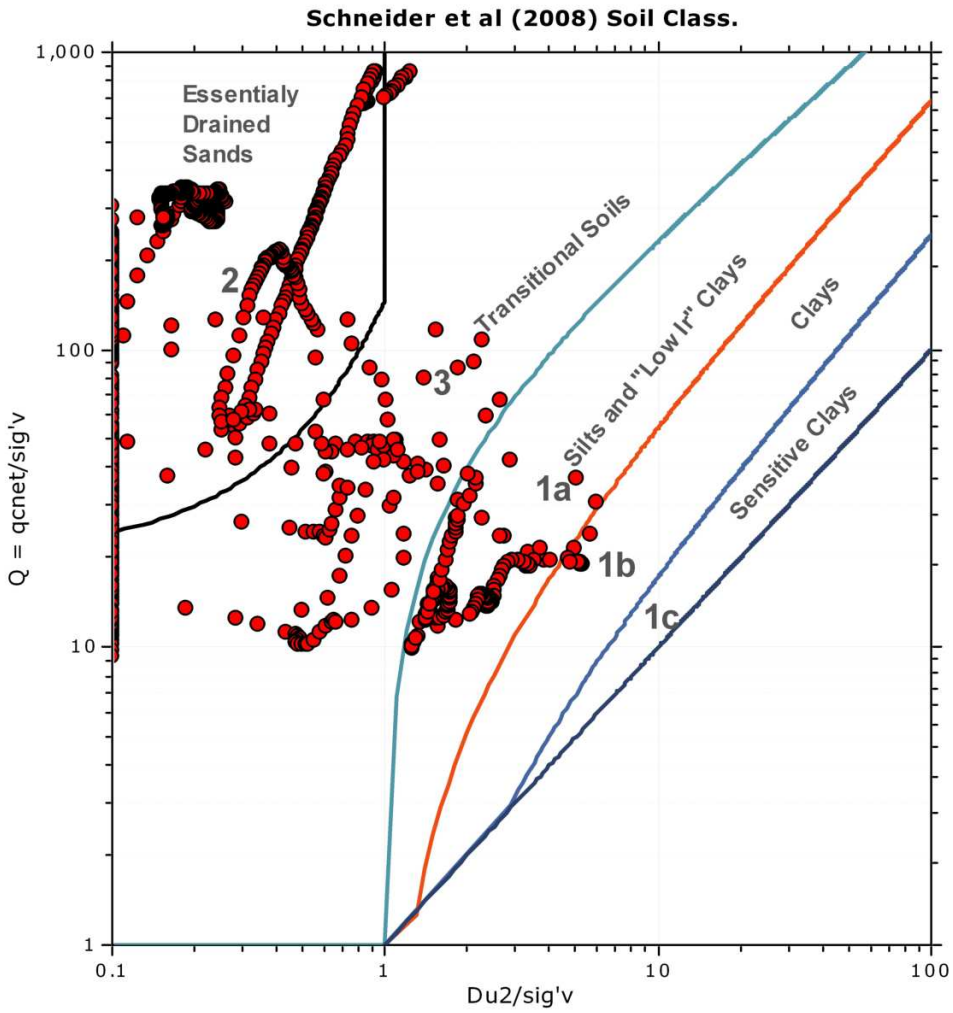



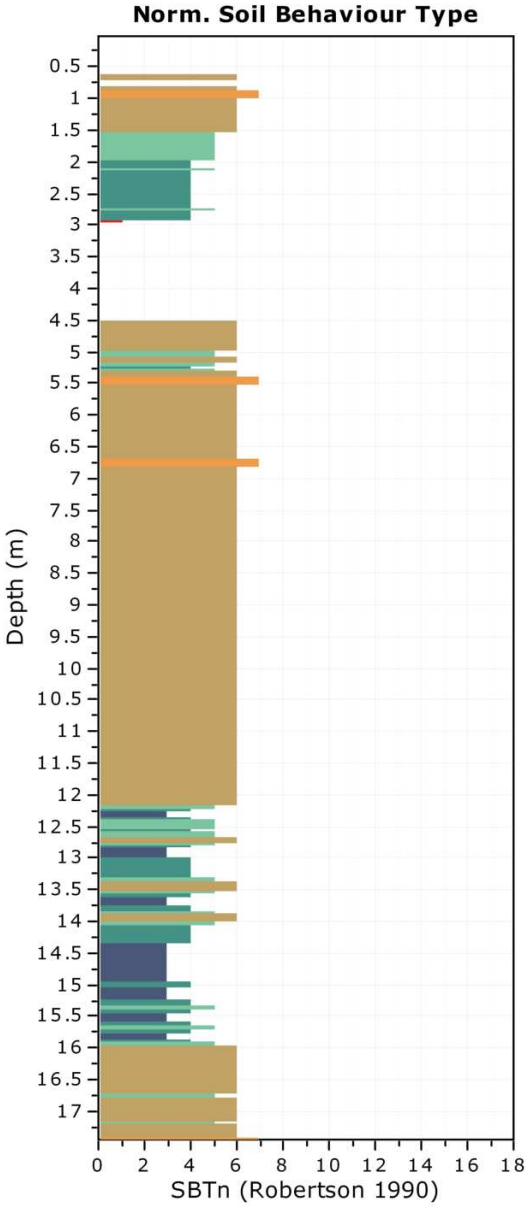

**SBTn legend**

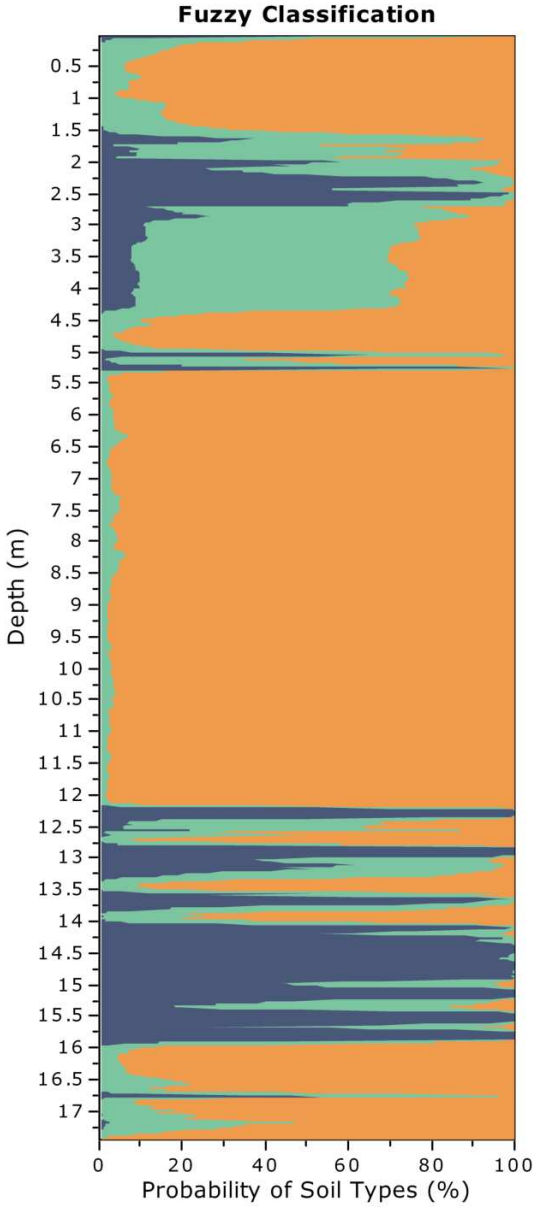
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



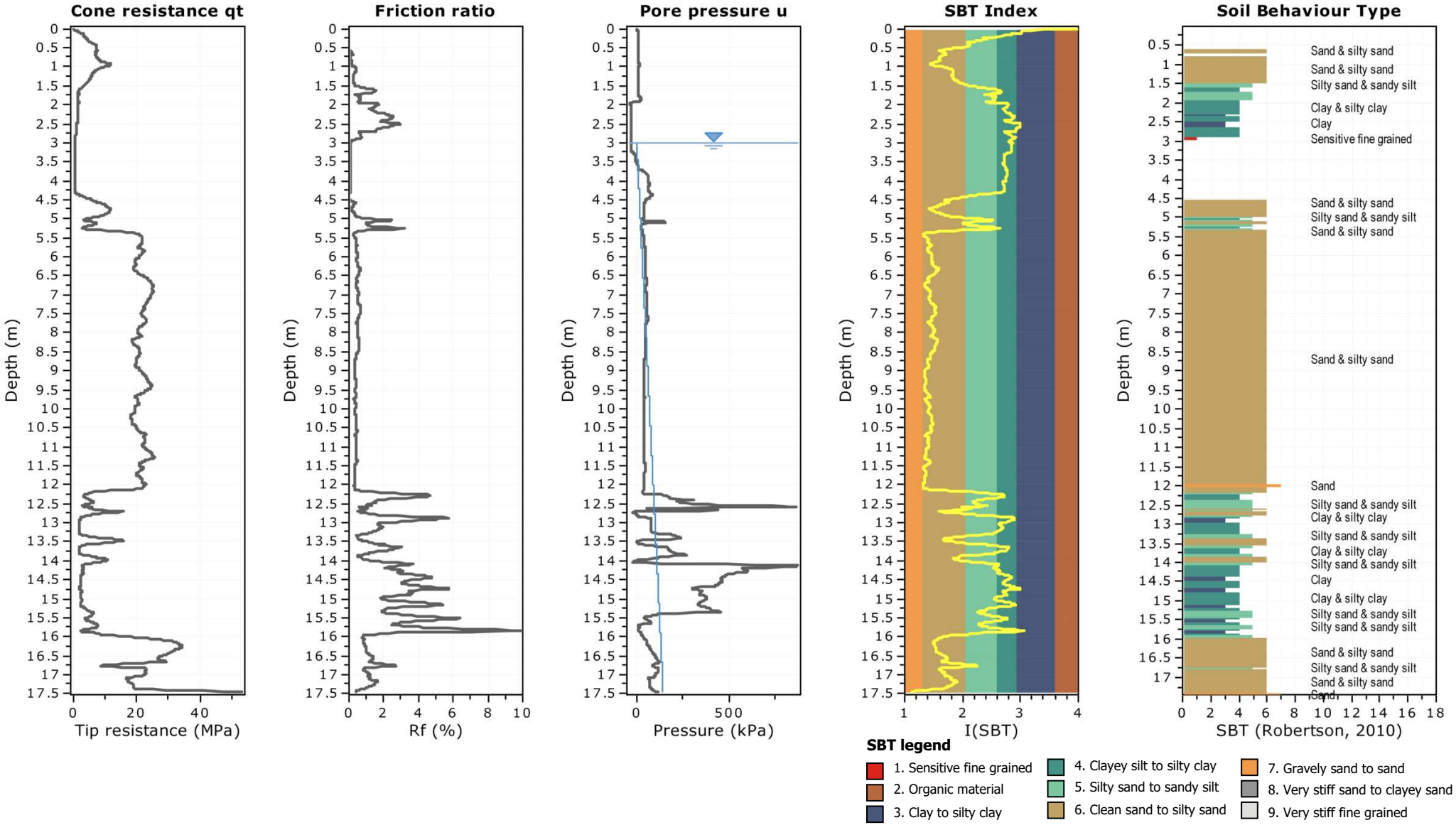



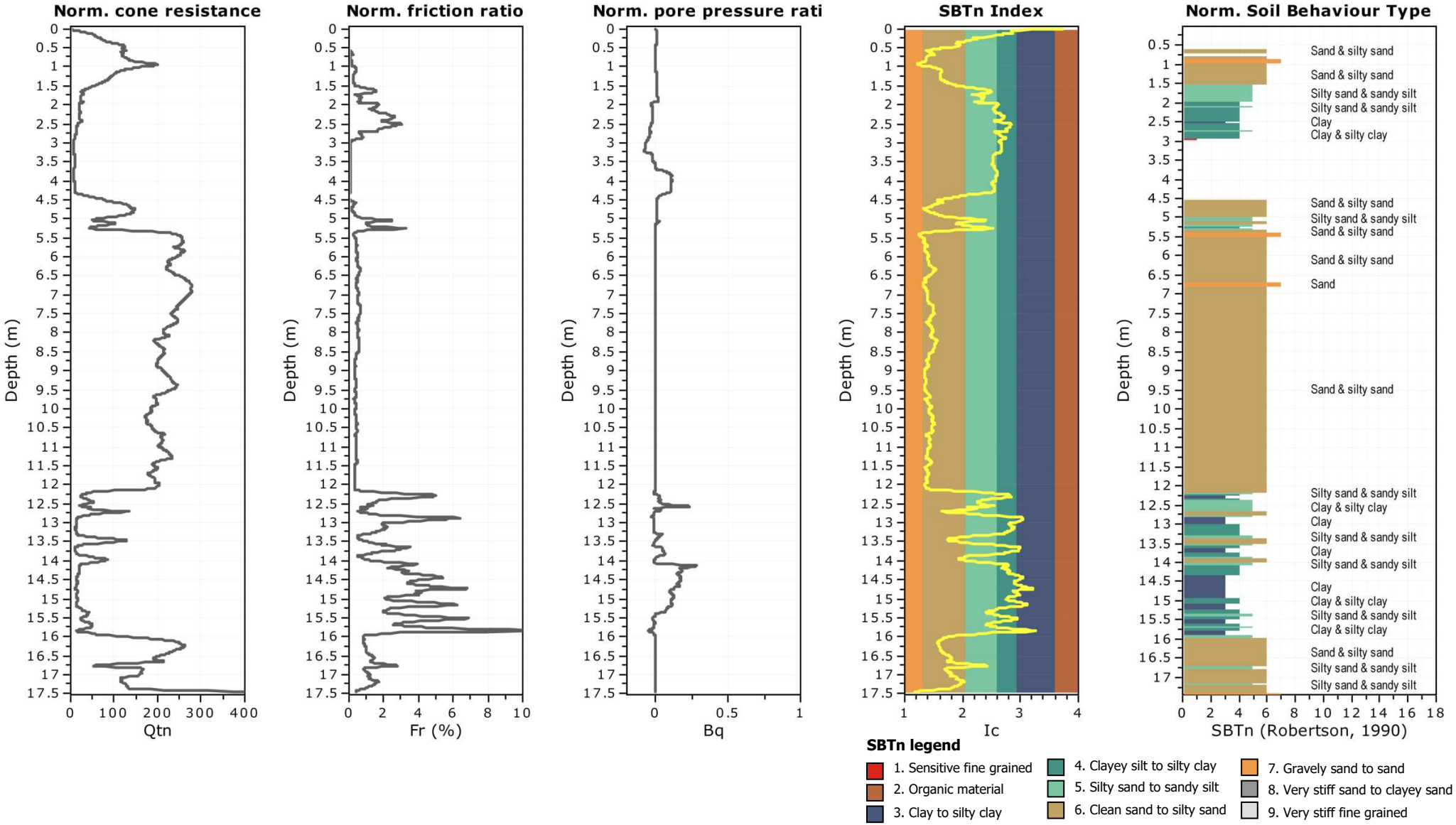


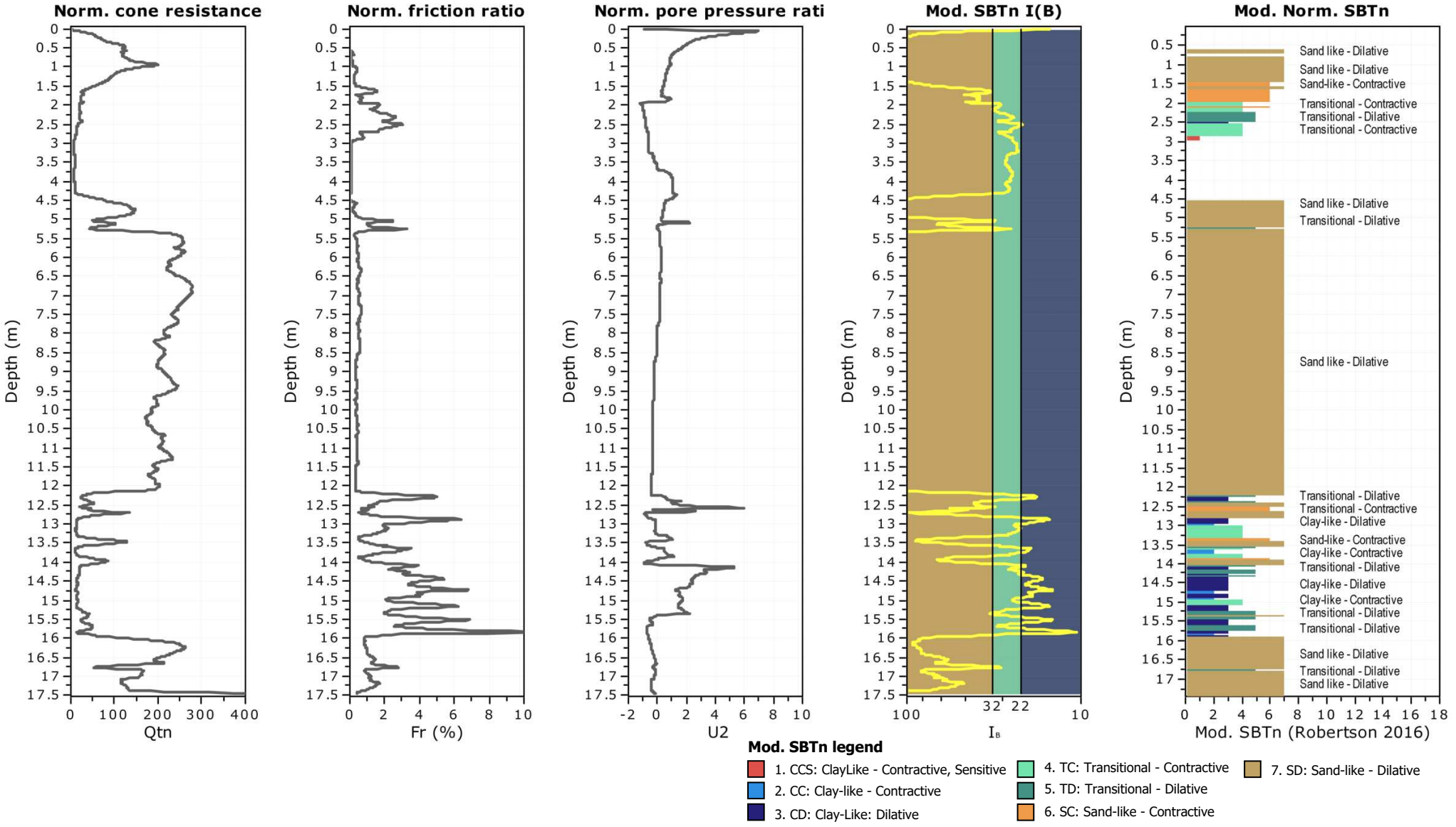




**Fuzzy classifiaction legend**

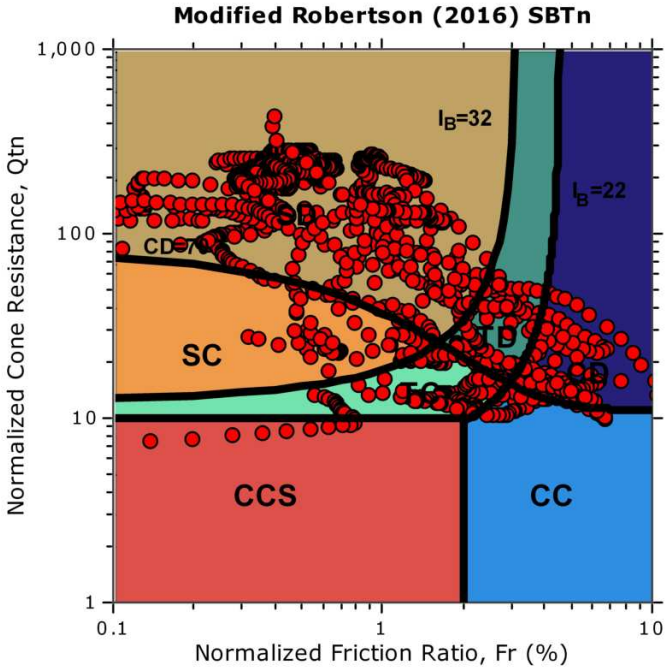
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

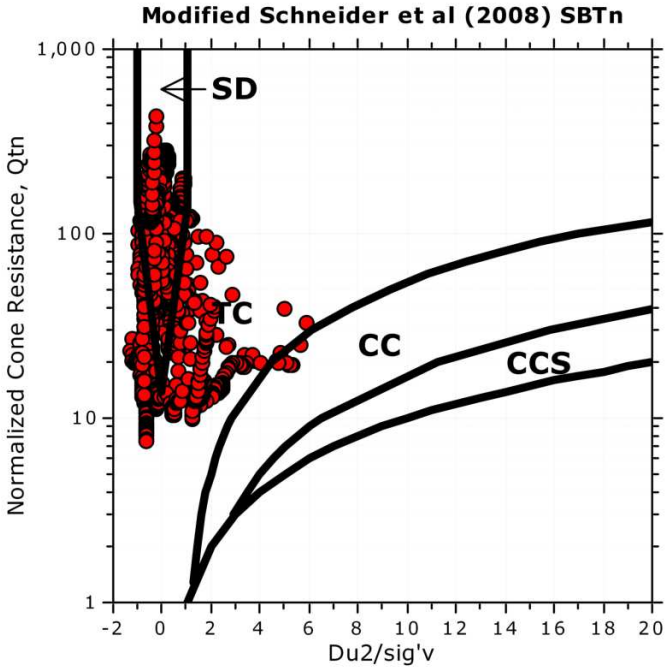

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Sensitive fine grained
Sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

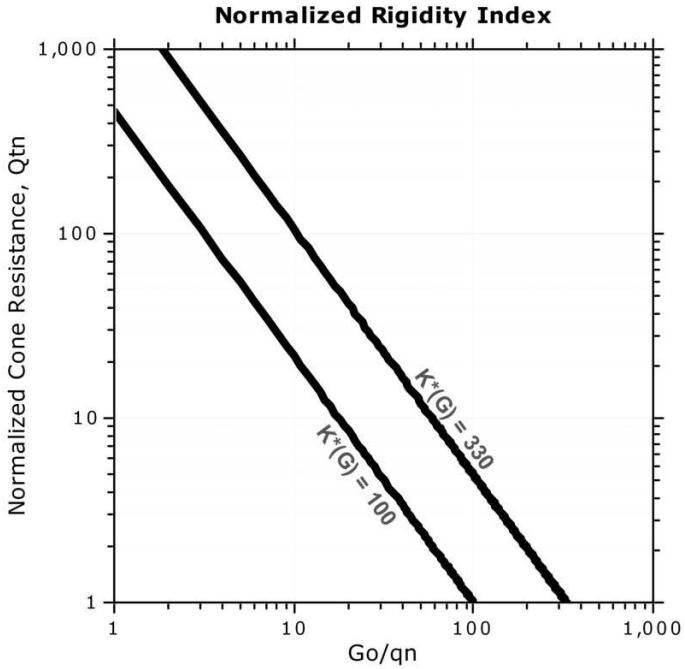

Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Depth (m)
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
Sand
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand like - Dilative
Sand like - Dilative
Sand-like - Contractive
Transitional - Contractive
Transitional - Dilative
Transitional - Contractive
Sand like - Dilative
Transitional - Dilative
Sand like - Dilative
Transitional - Dilative
Transitional - Contractive
Clay-like - Dilative
Sand-like - Contractive
Clay-like - Contractive
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Transitional - Dilative
Transitional - Dilative
Sand like - Dilative
Transitional - Dilative
Sand like - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

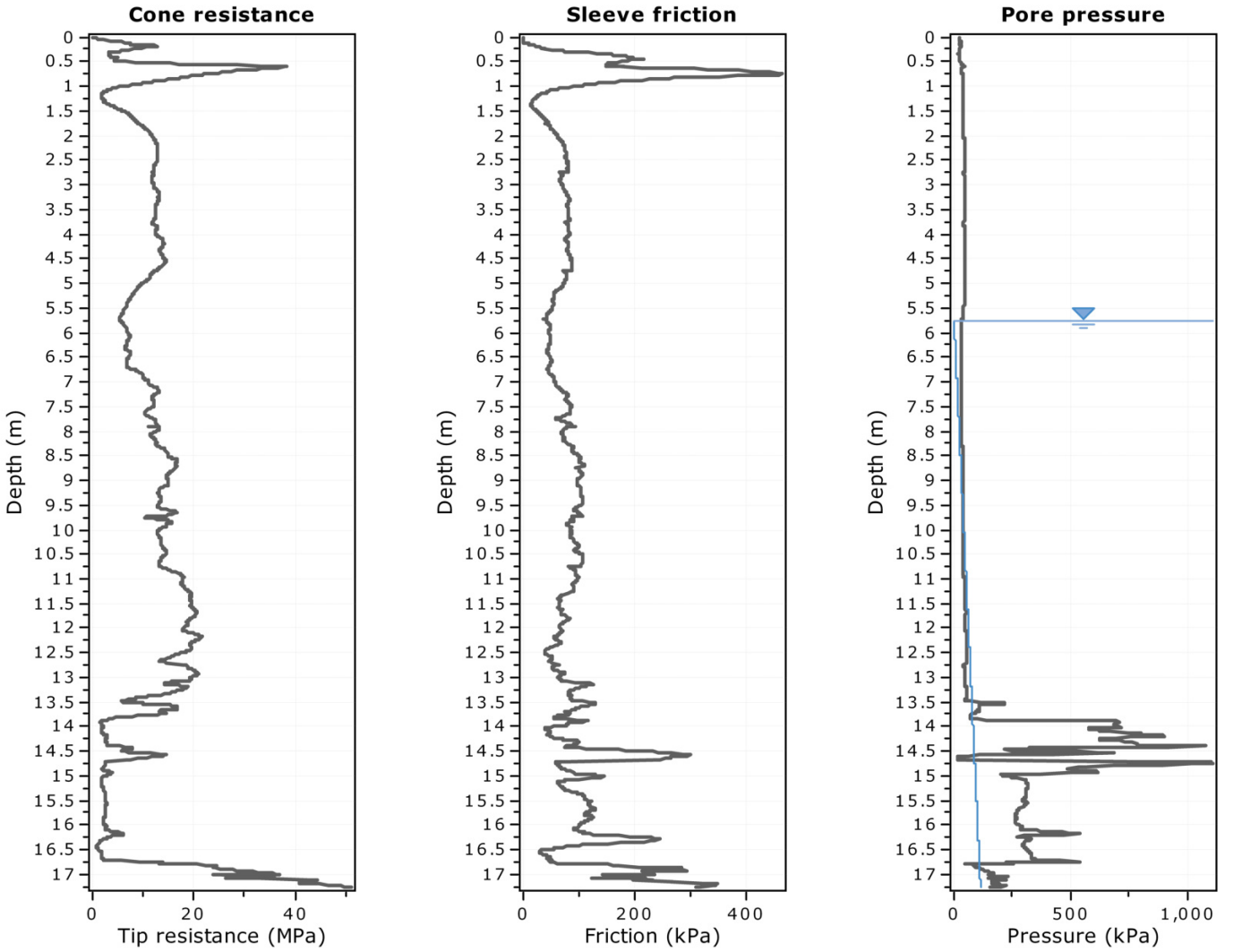


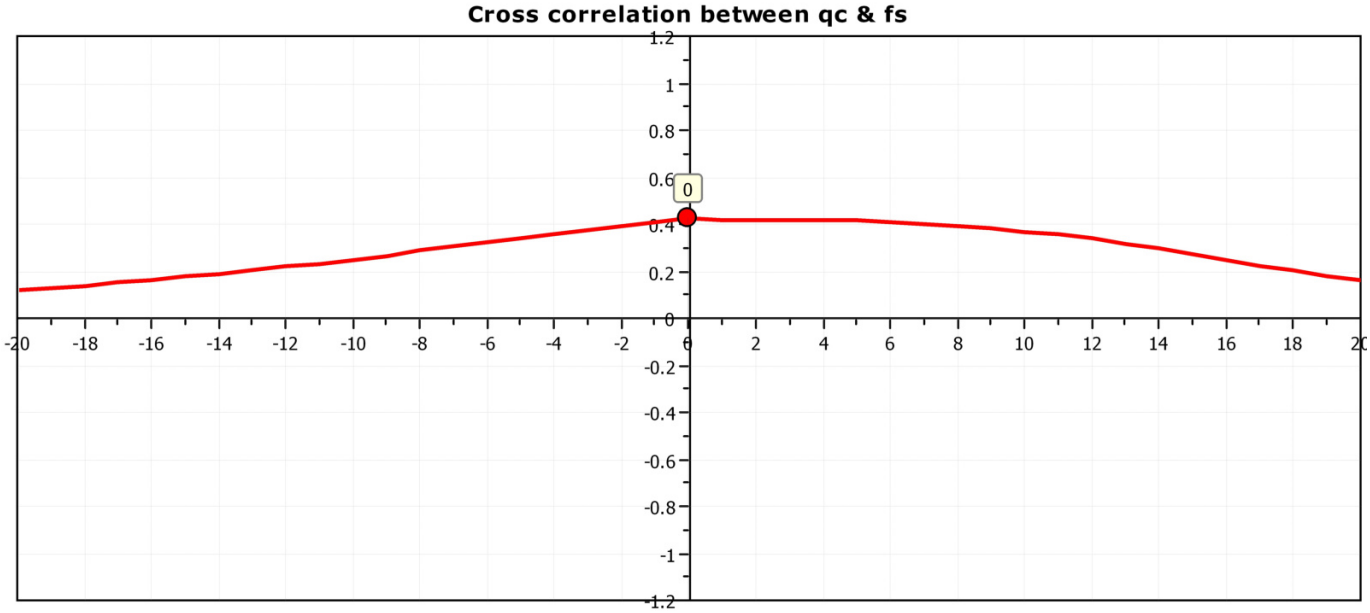




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

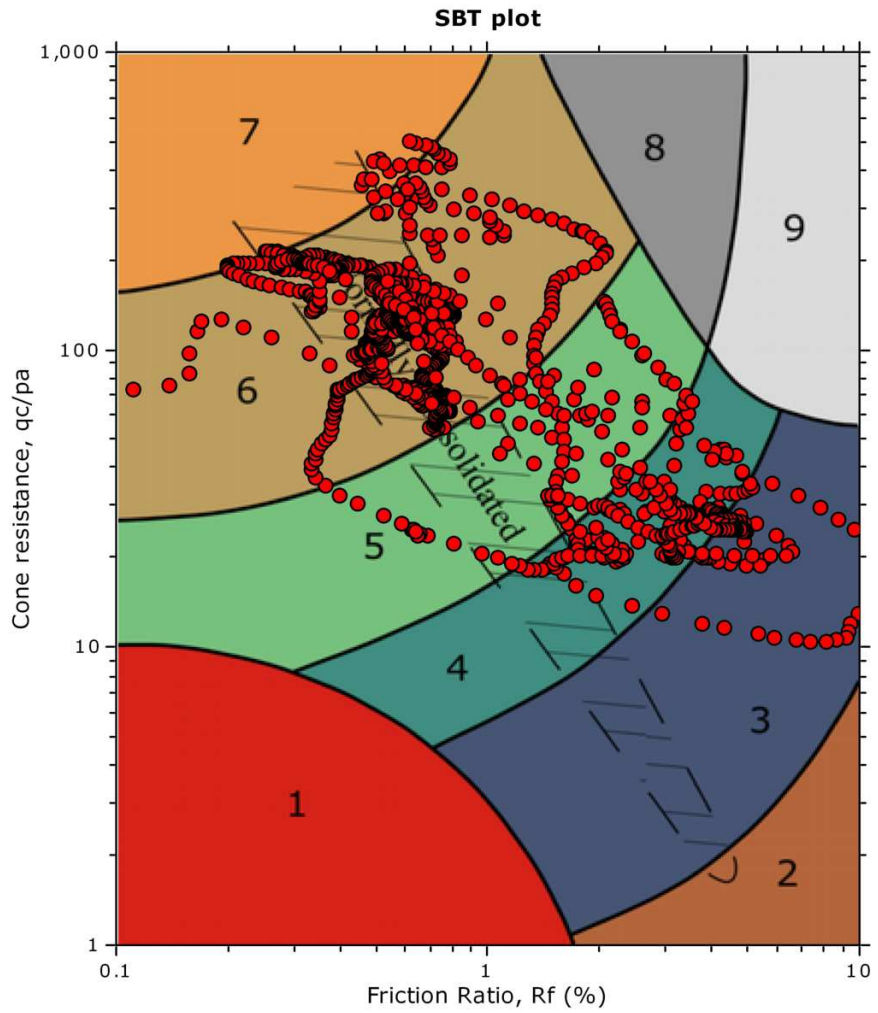
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

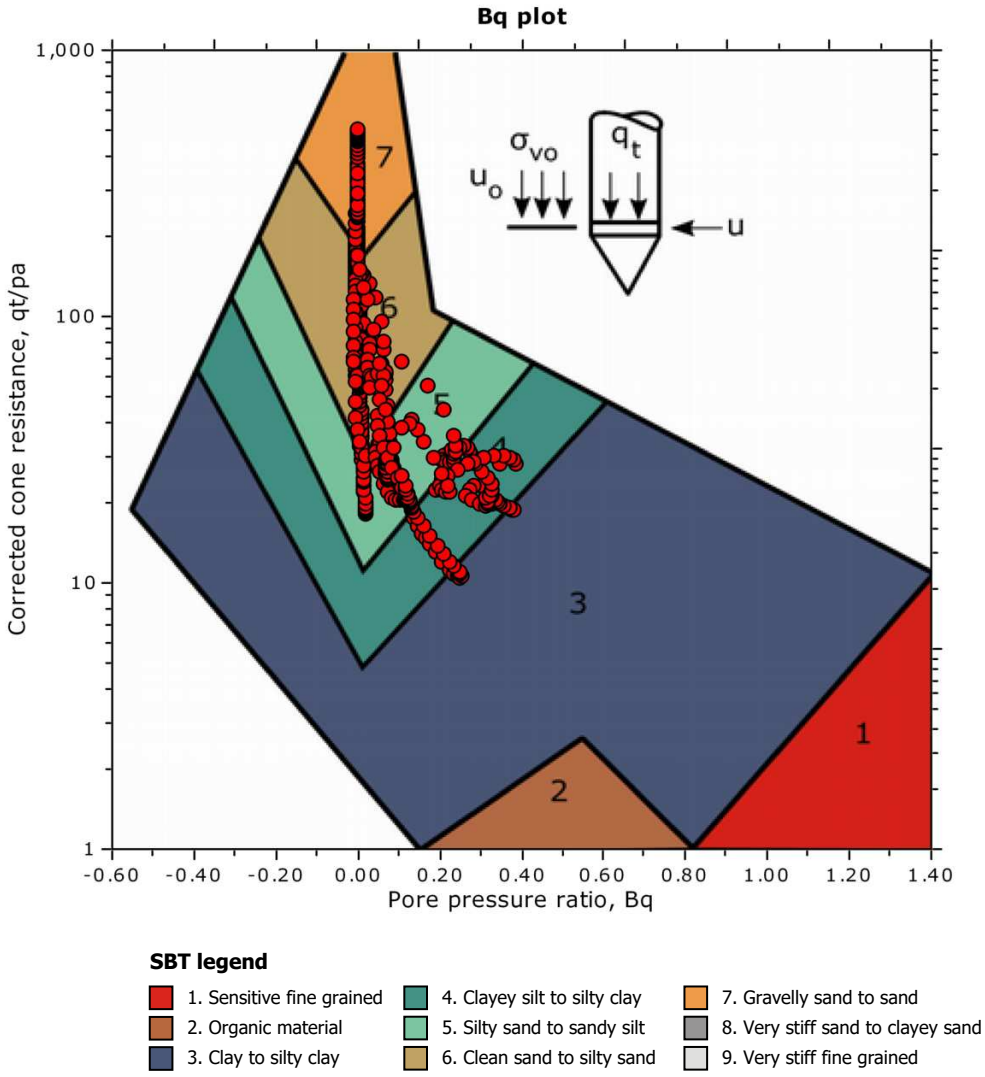



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

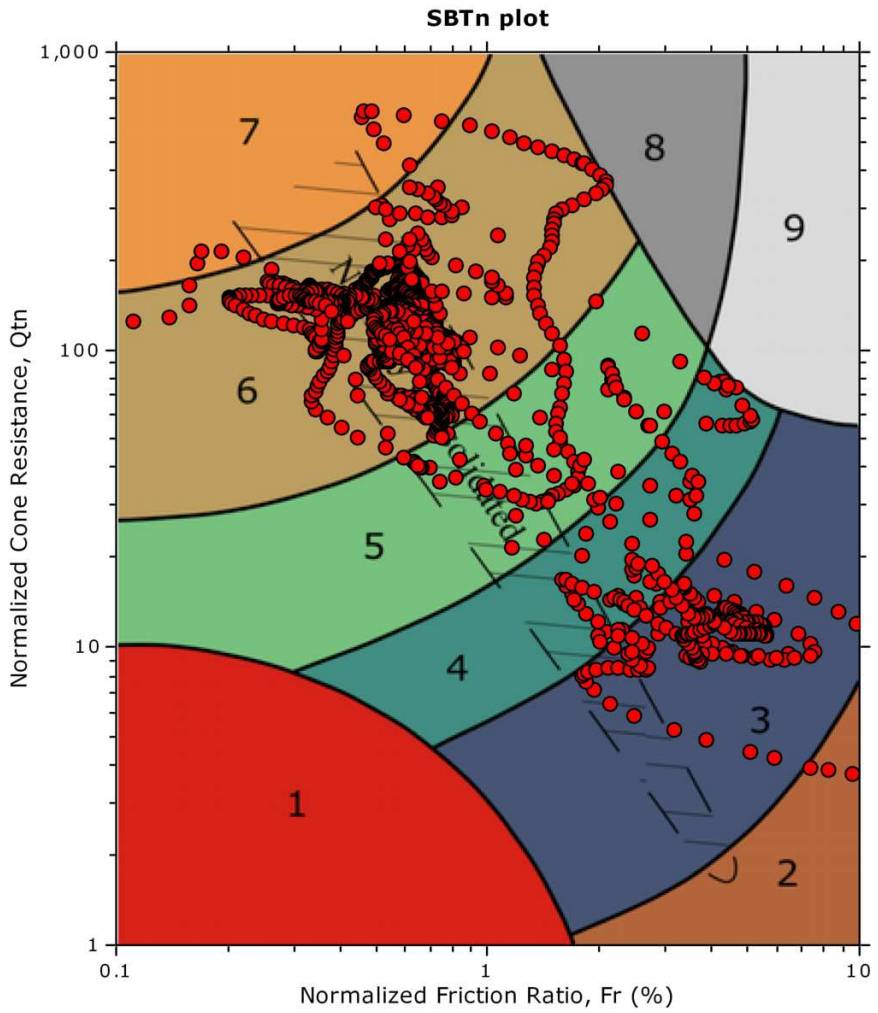


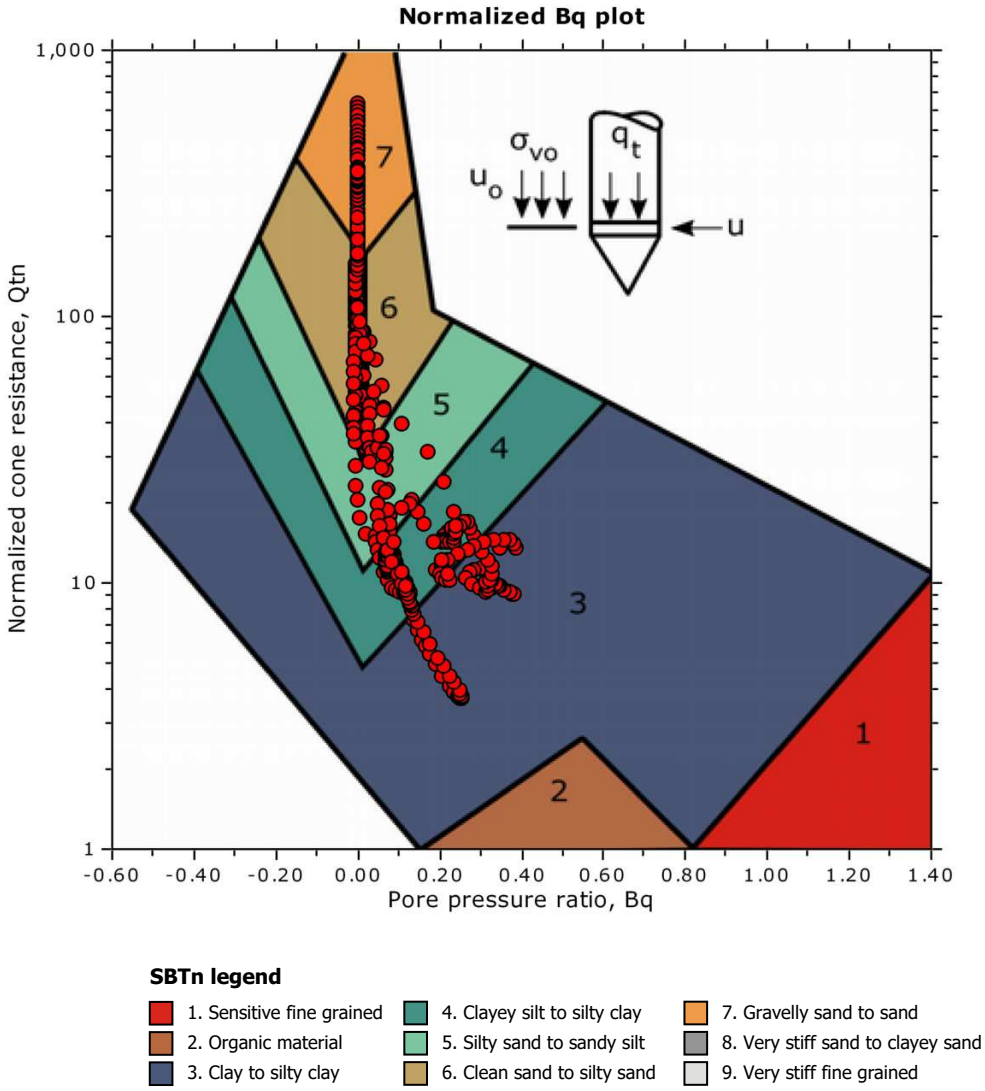
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
1
2
3
4
5
6
7
8
9
Overconsolidated


Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
3
4
5
6
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

## SBT - Bq plots (normalized)

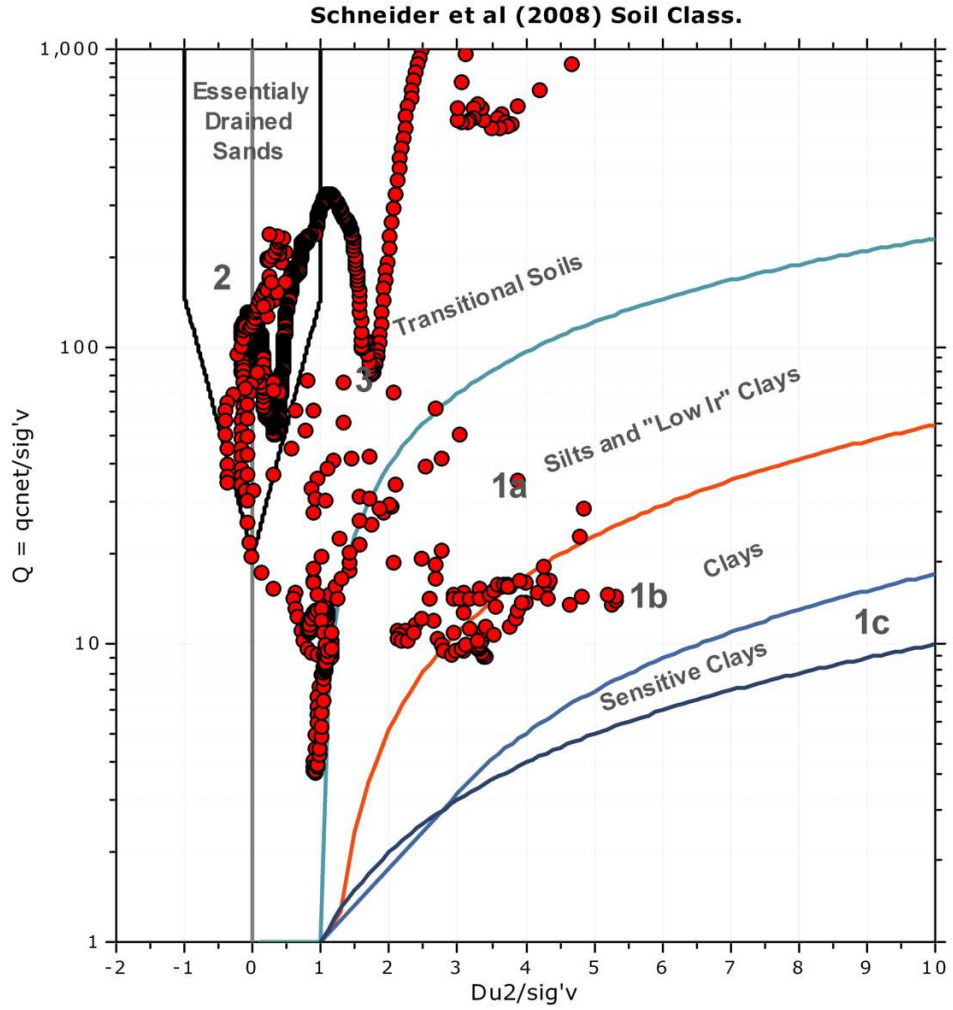


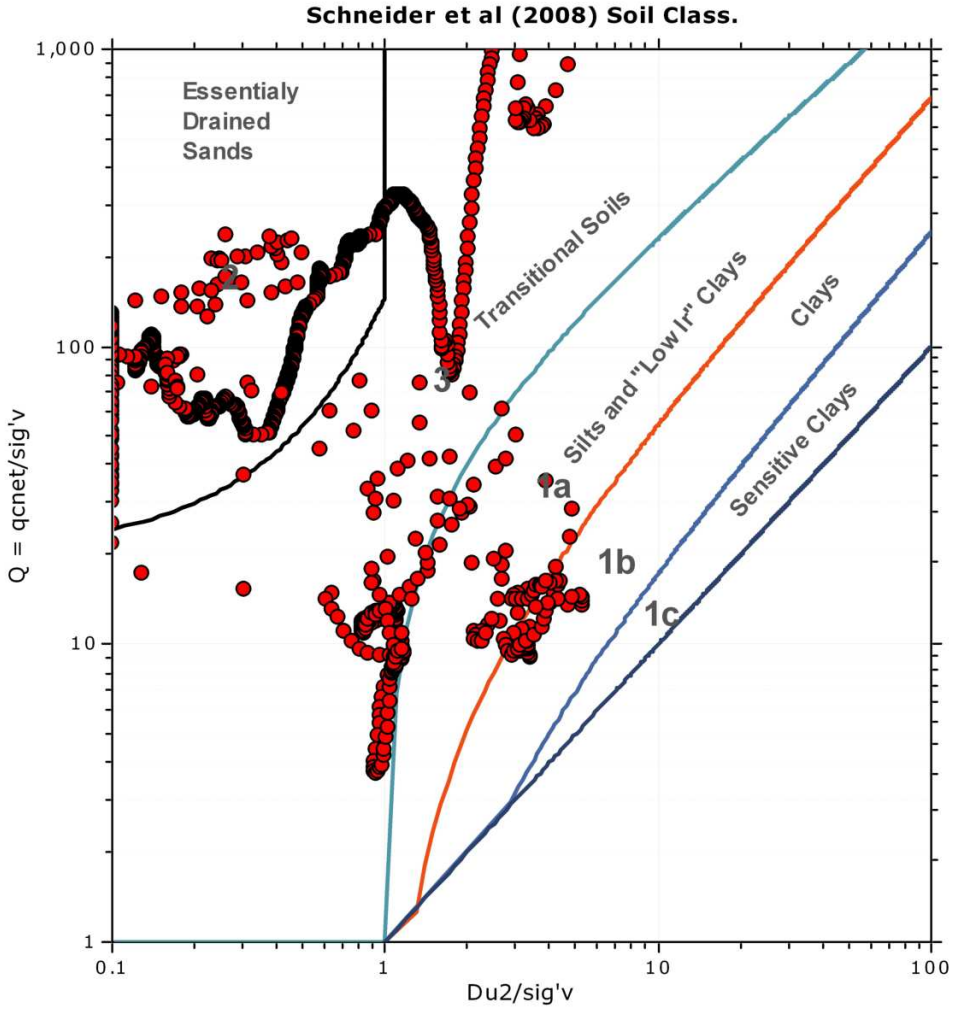



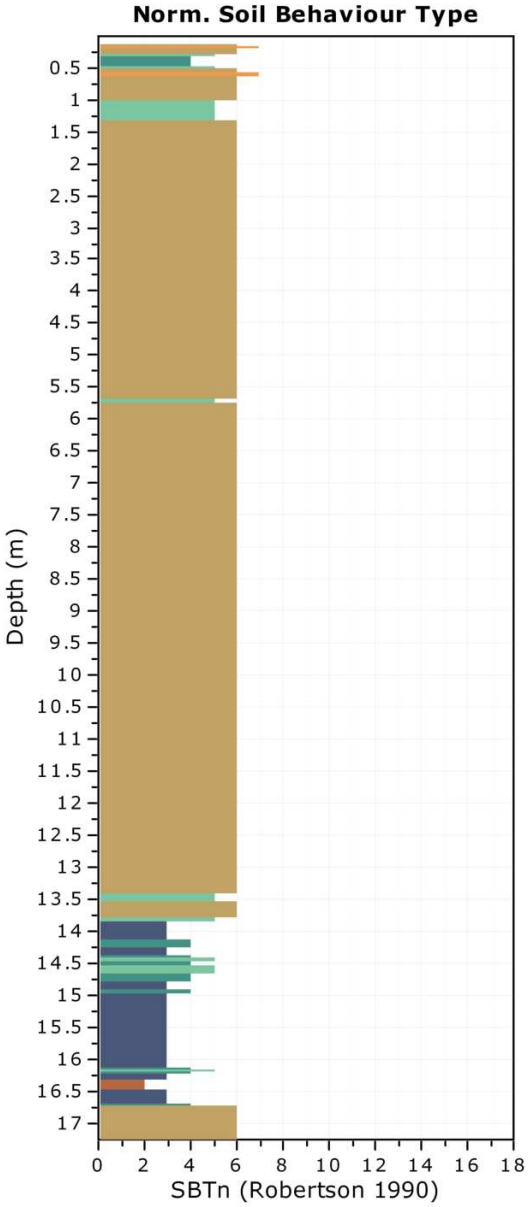

**SBTn legend**

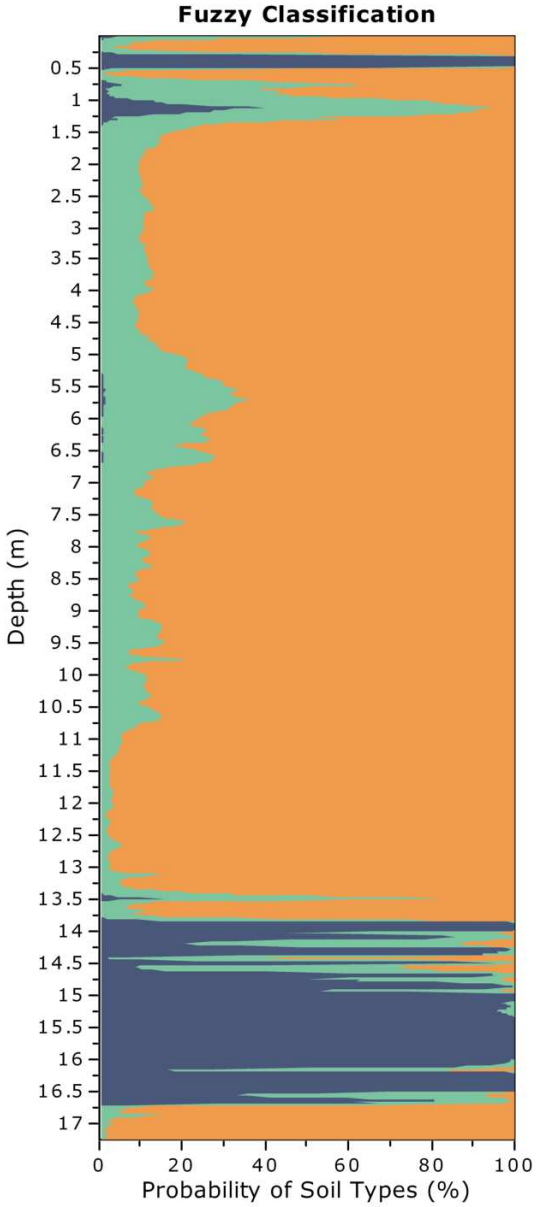
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



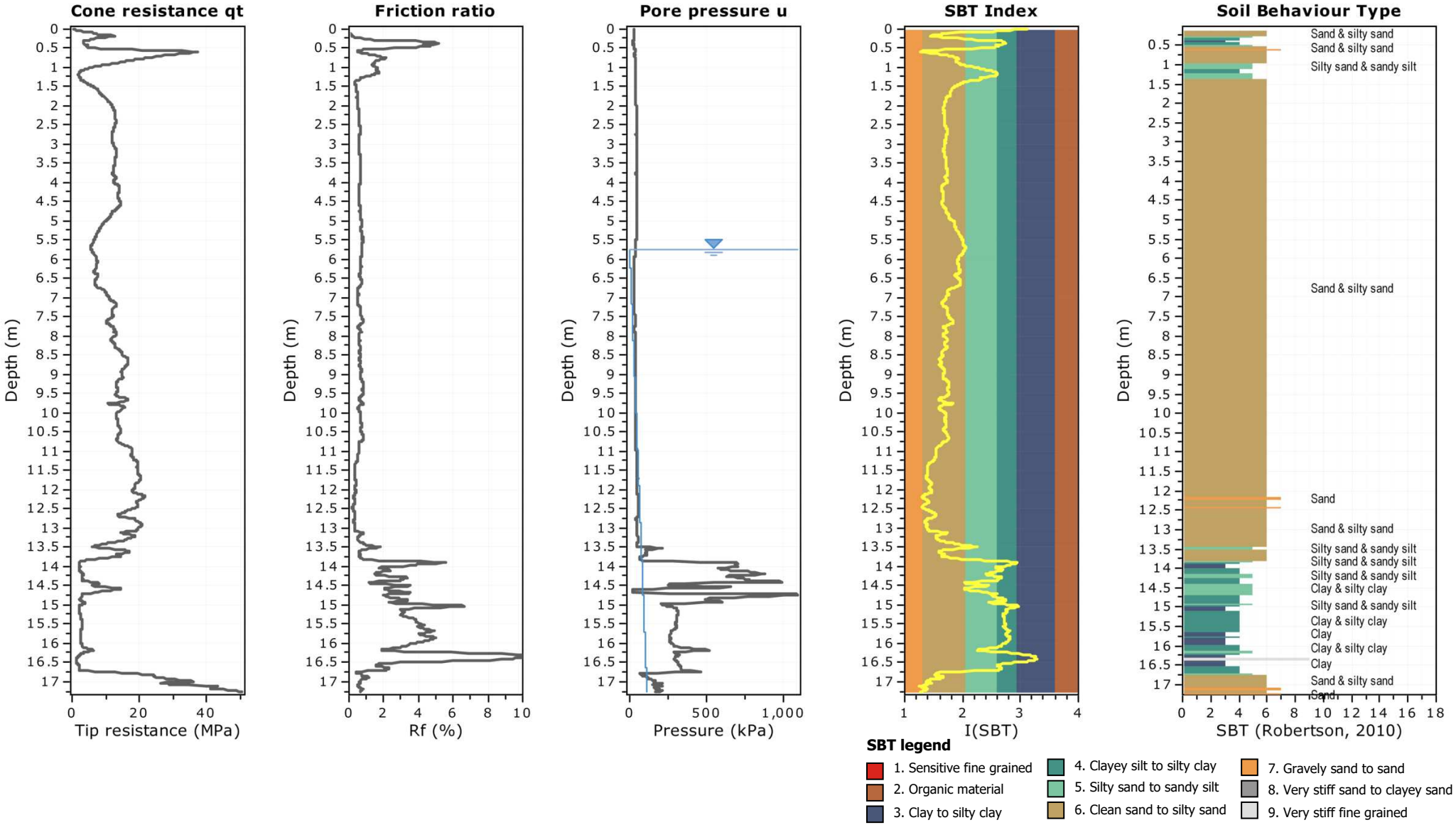



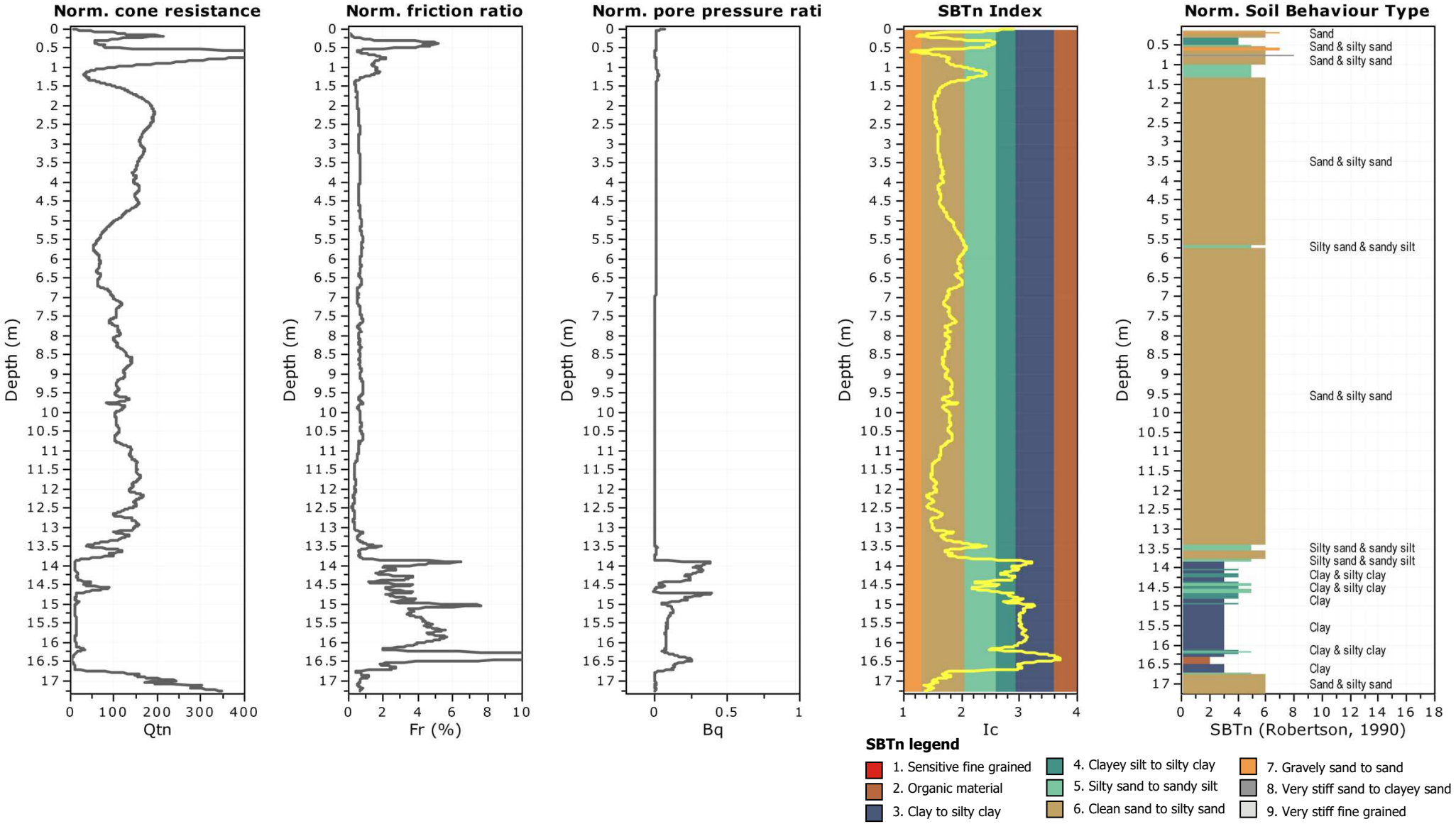


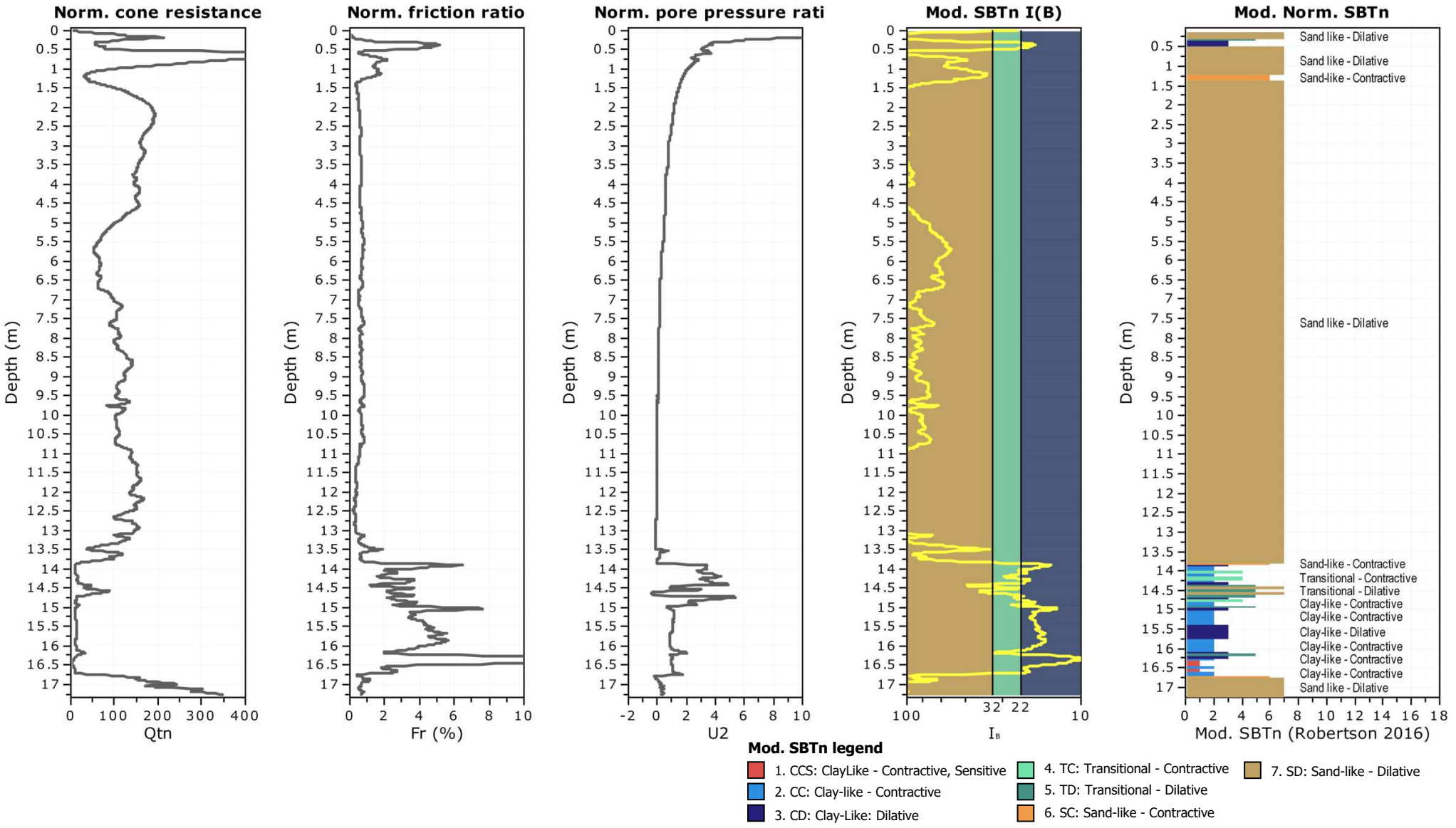




**Fuzzy classifiaction legend**

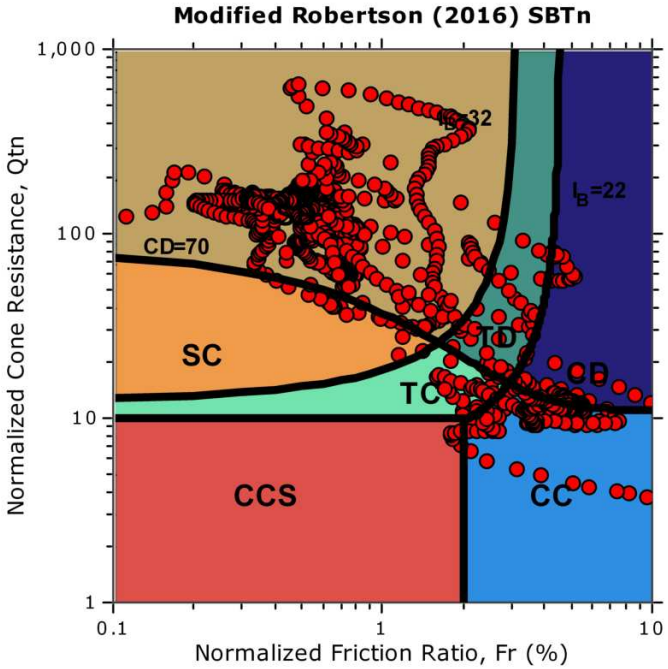
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

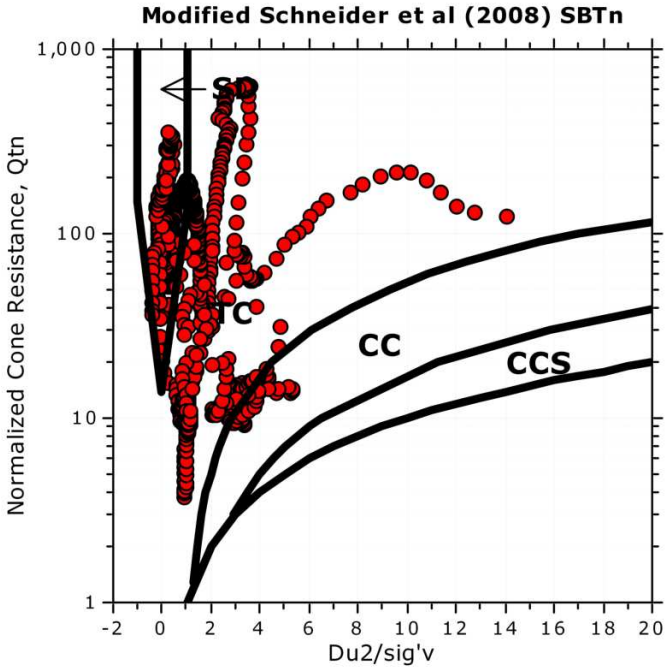

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Sand
Clay & silty clay
Clay
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

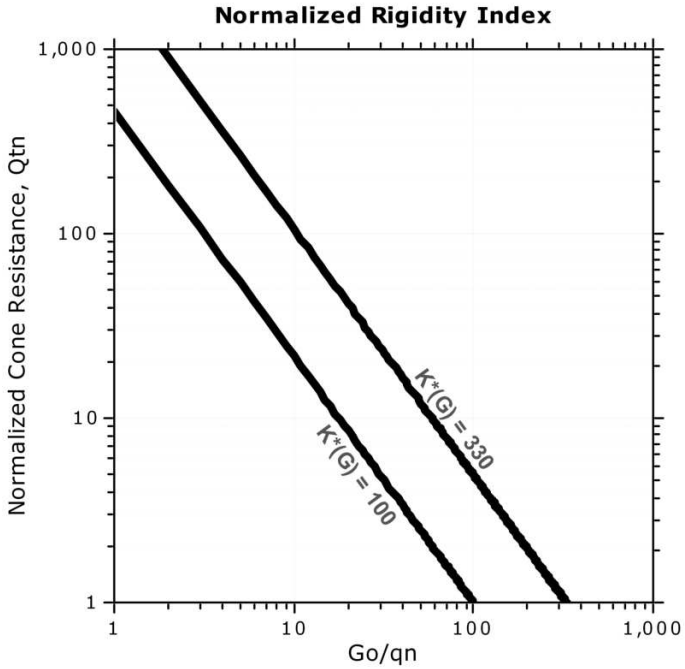

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand
Sand & silty sand
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Clay
Clay
Clay & silty clay
Clay
Sand & silty sand
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand like - Dilative
Sand like - Dilative
Sand-like - Contractive
Sand like - Dilative
Sand-like - Contractive
Transitional - Contractive
Transitional - Dilative
Clay-like - Contractive
Clay-like - Contractive
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive
Clay-like - Contractive
Sand like - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

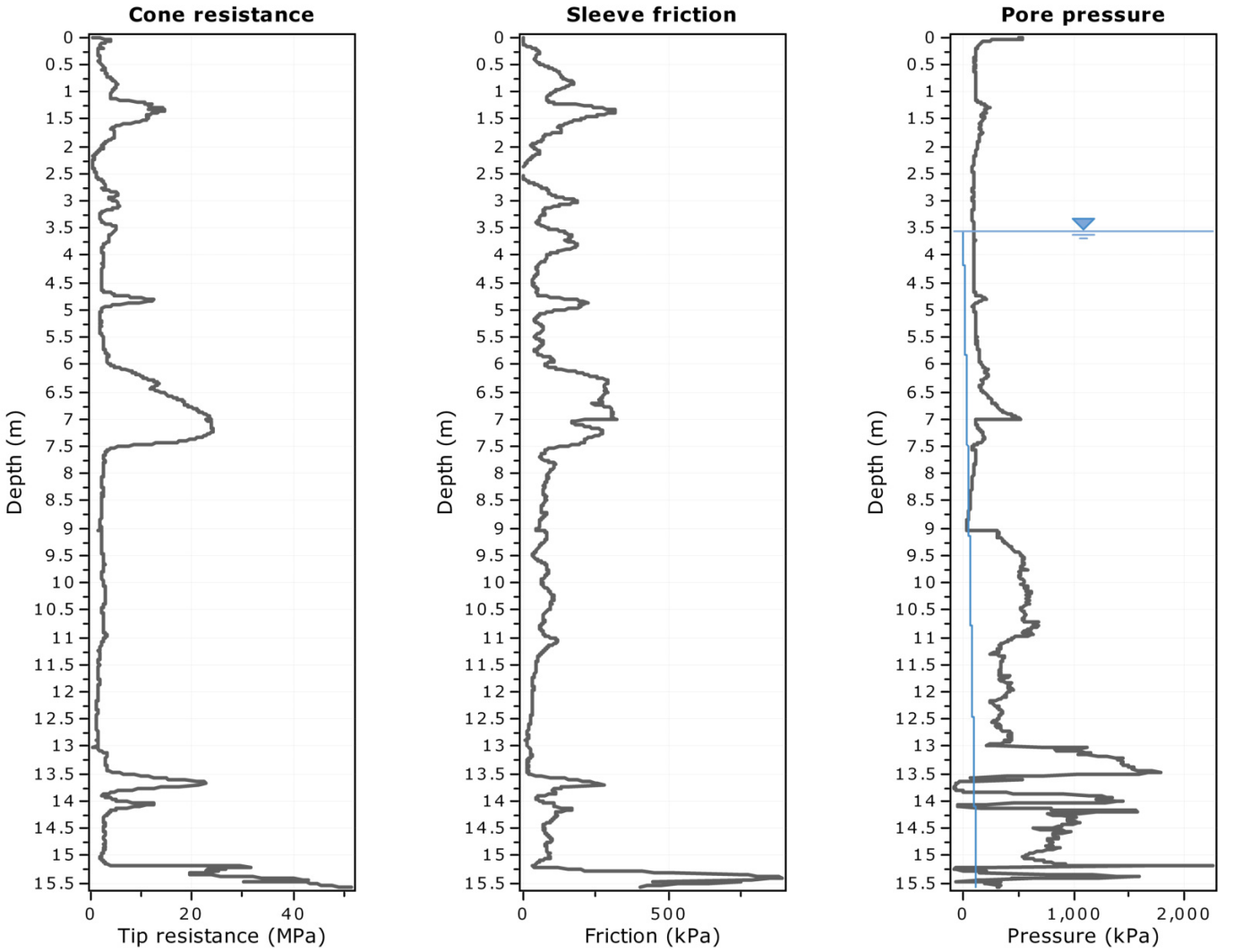


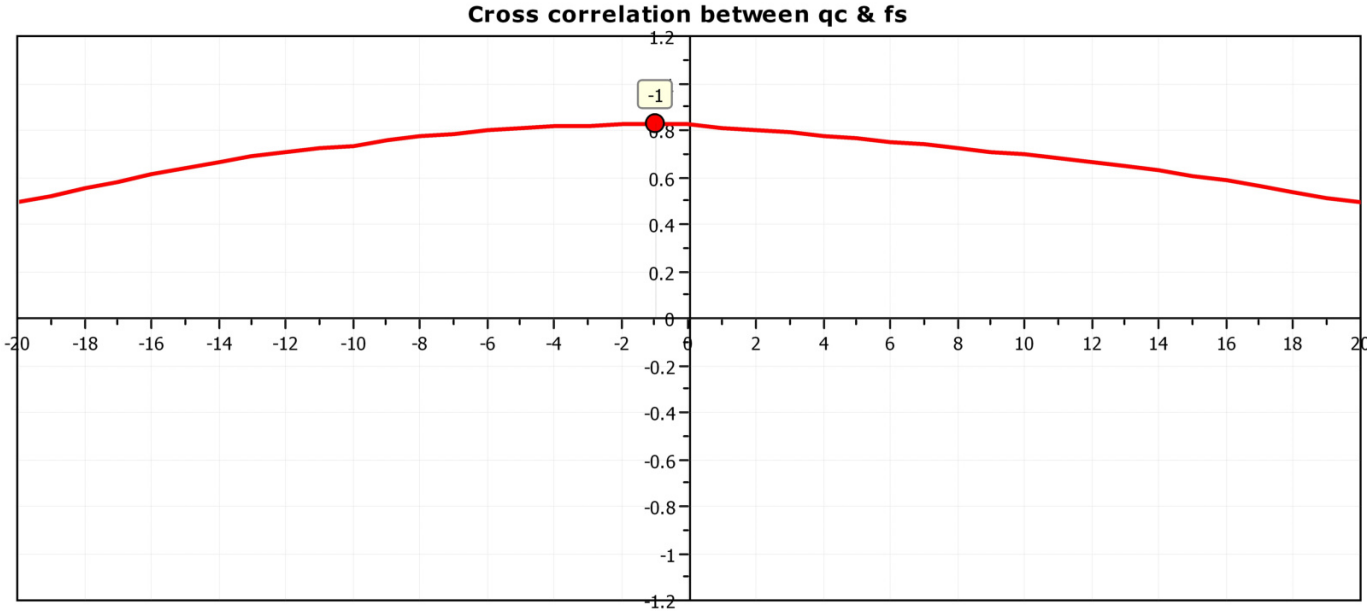




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

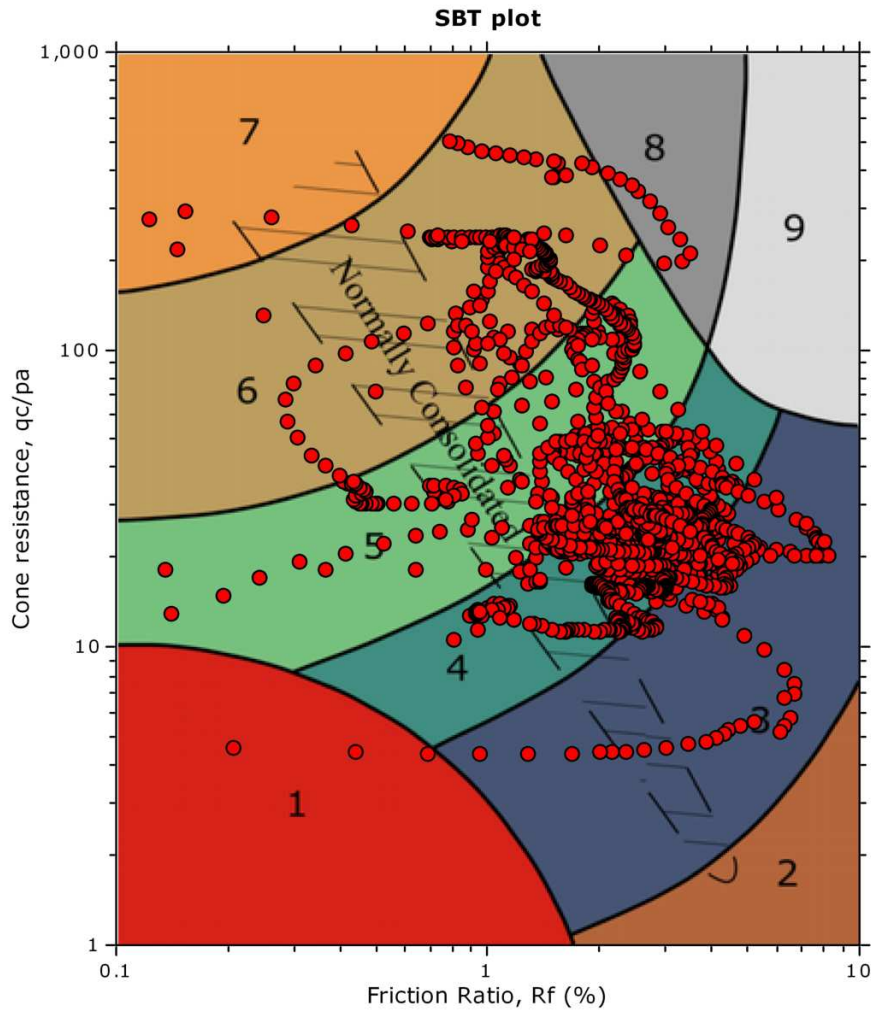
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

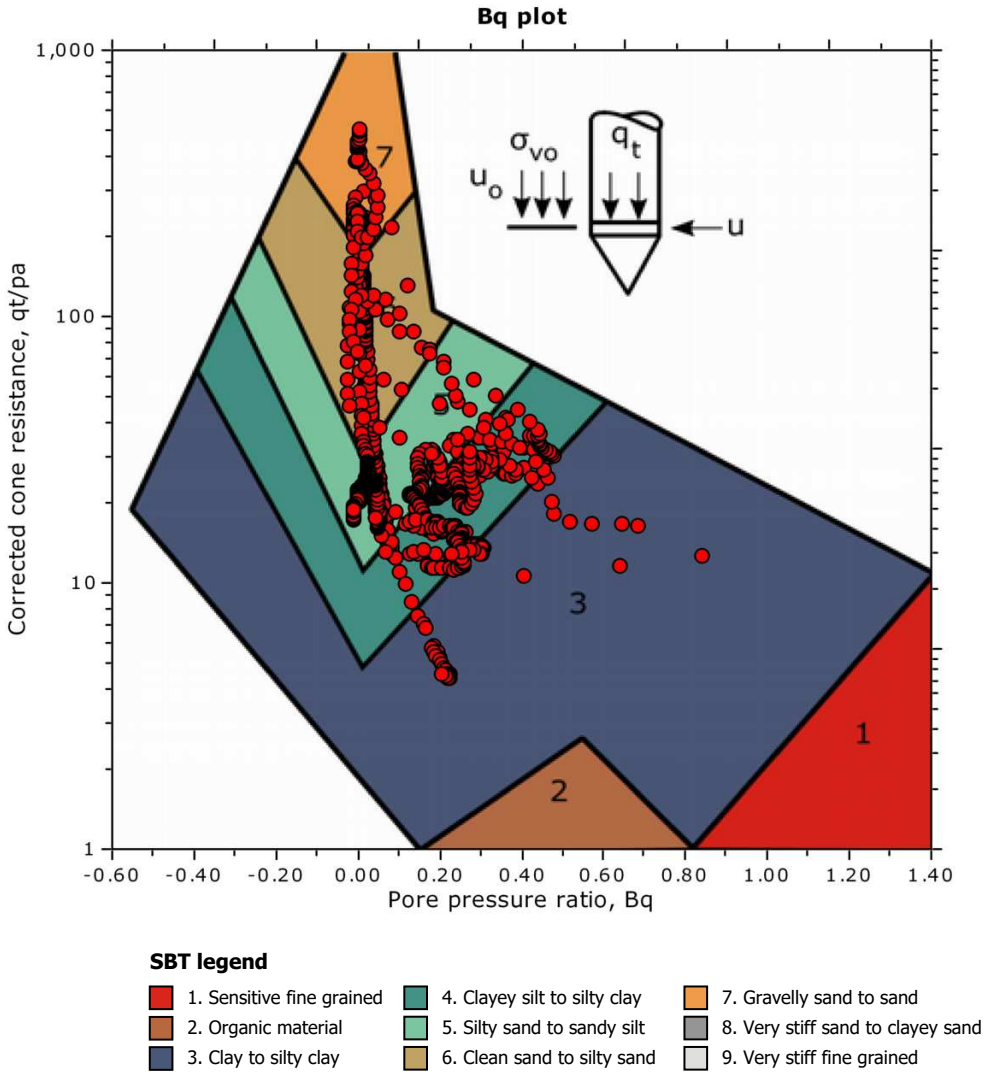



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

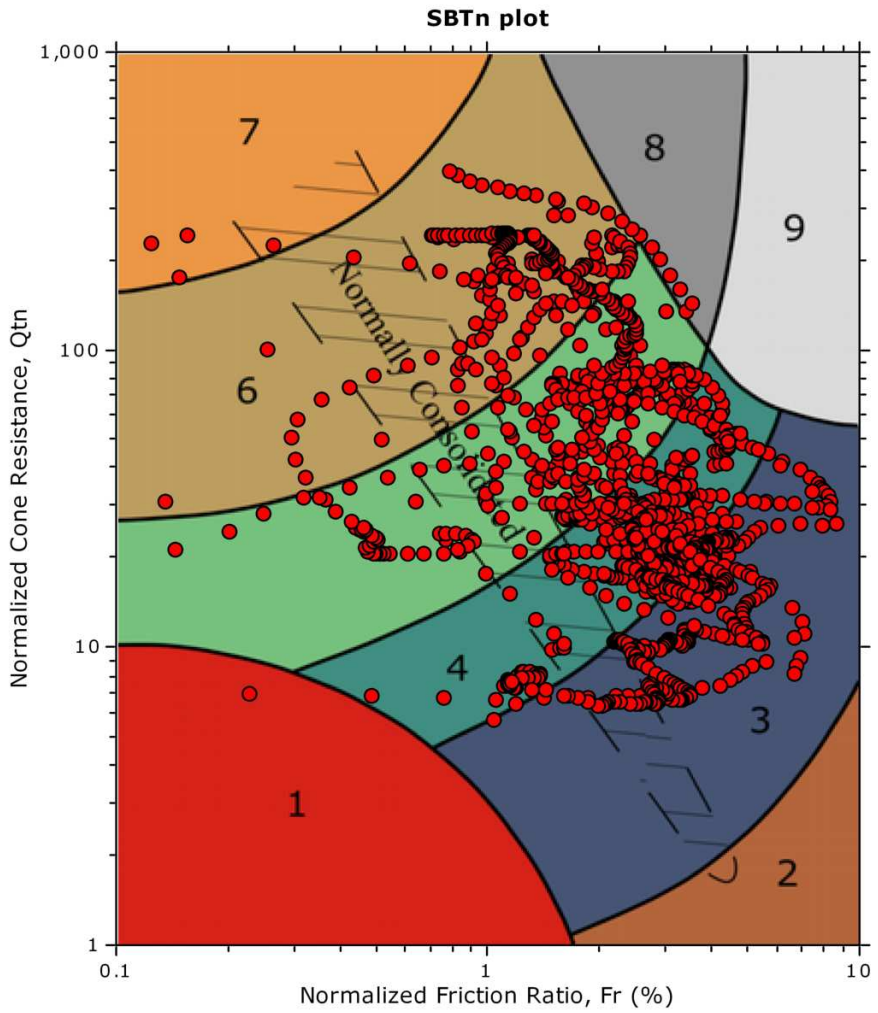


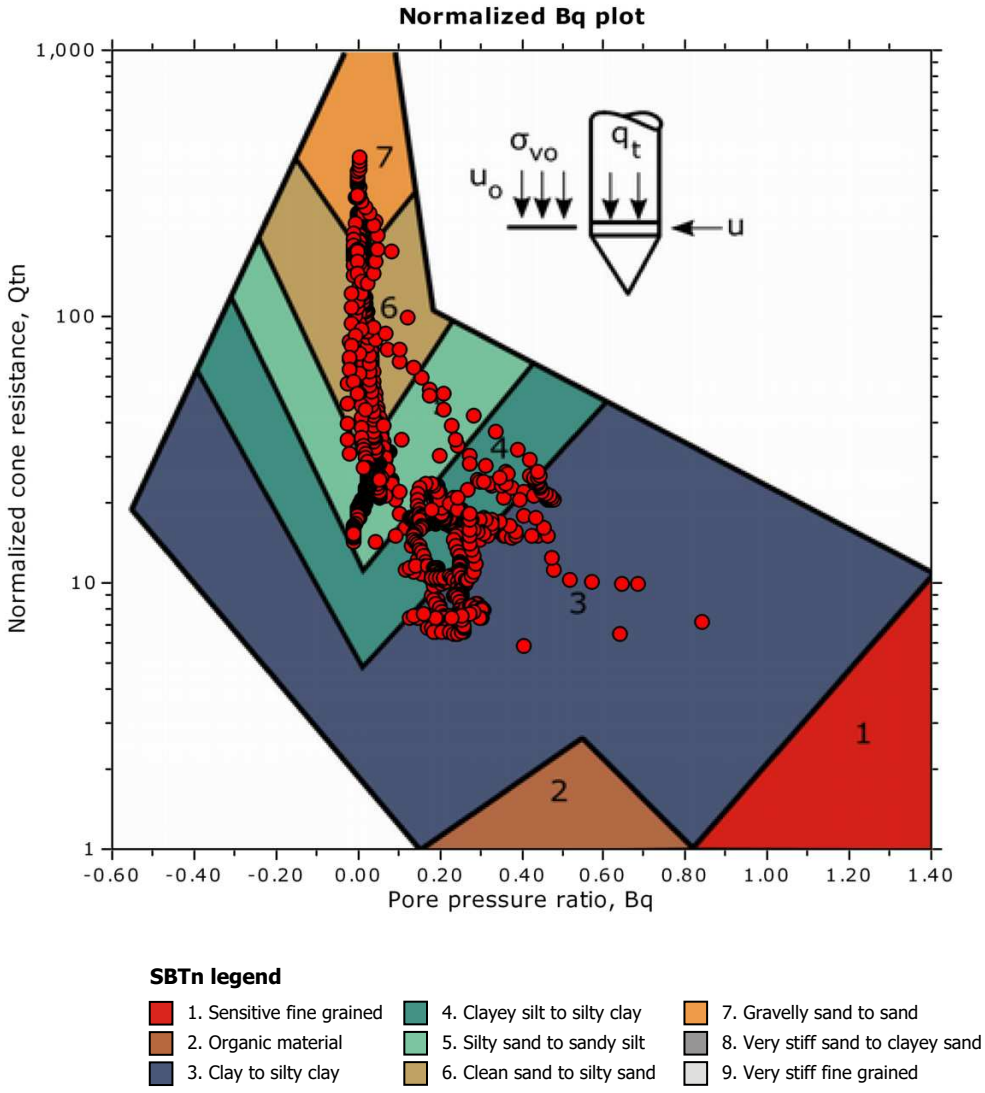
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
Normally Consolidated
1
2
3
4
5
6
7
8
9


Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
3
5
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

## SBT - Bq plots (normalized)

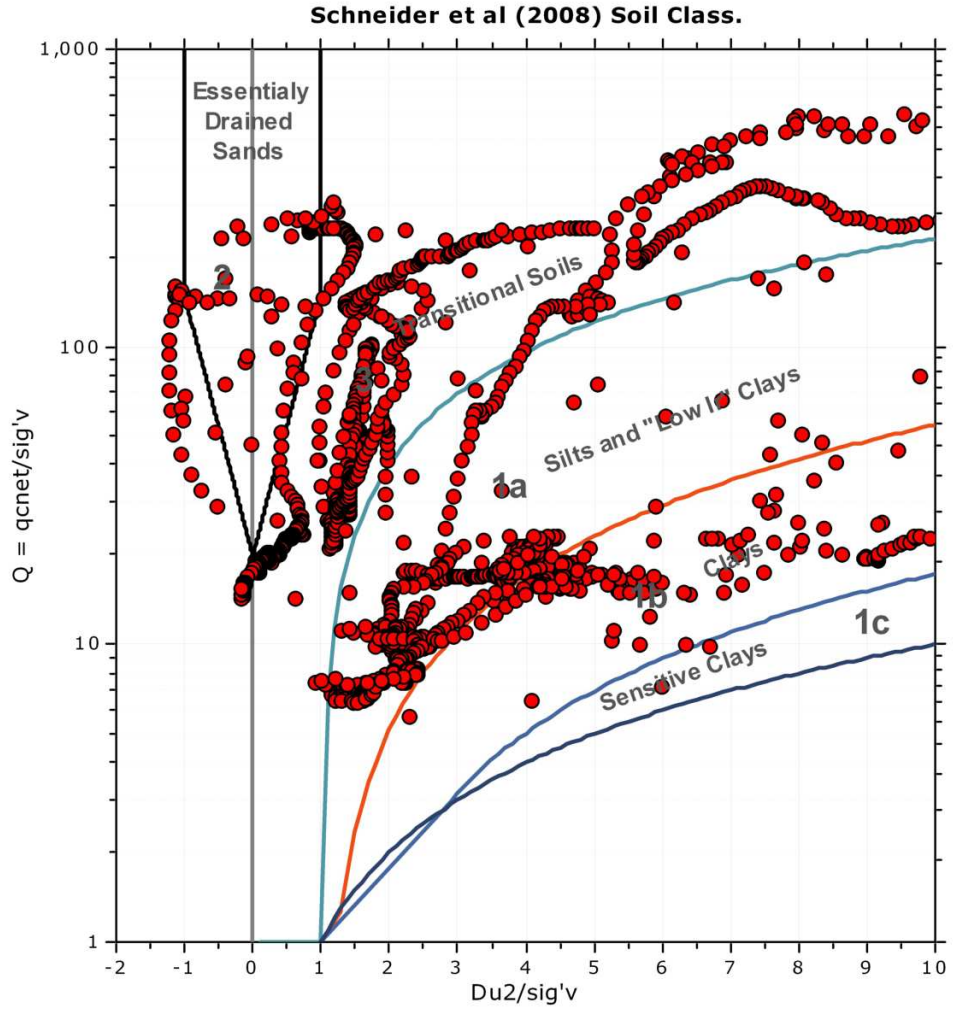


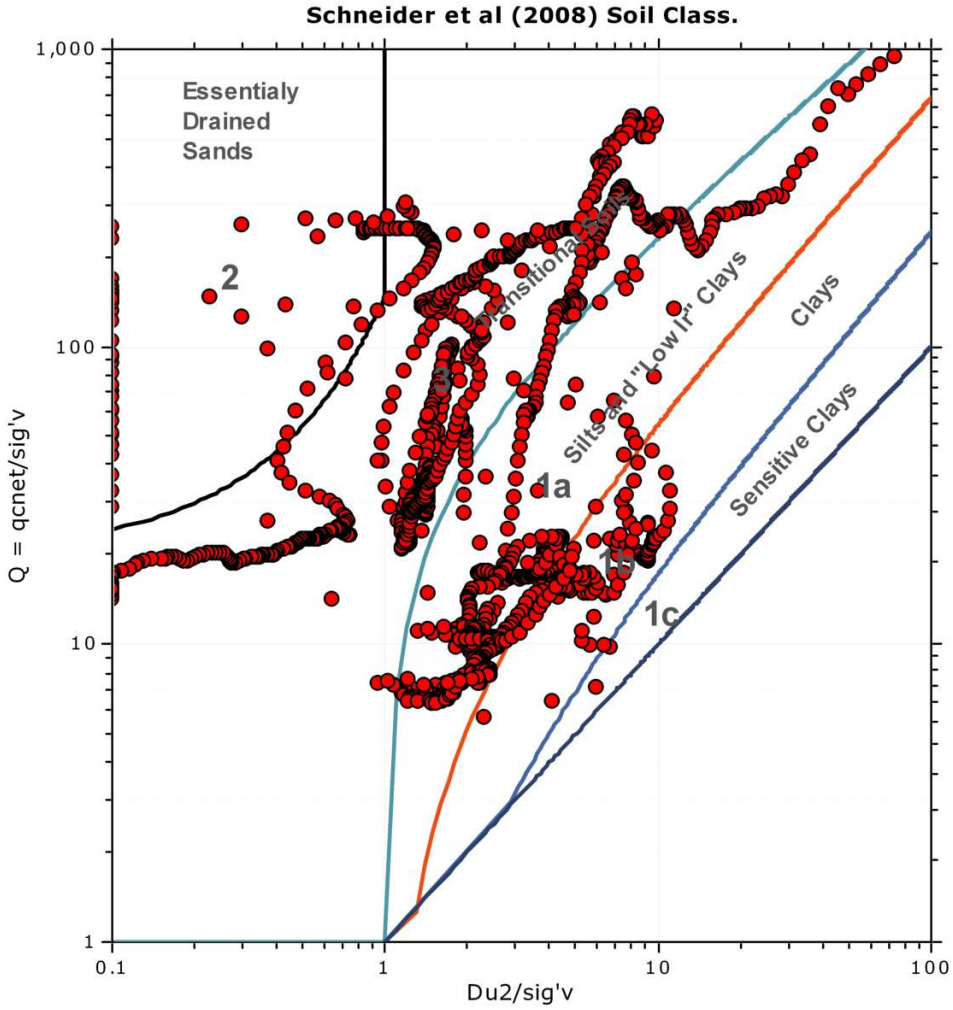



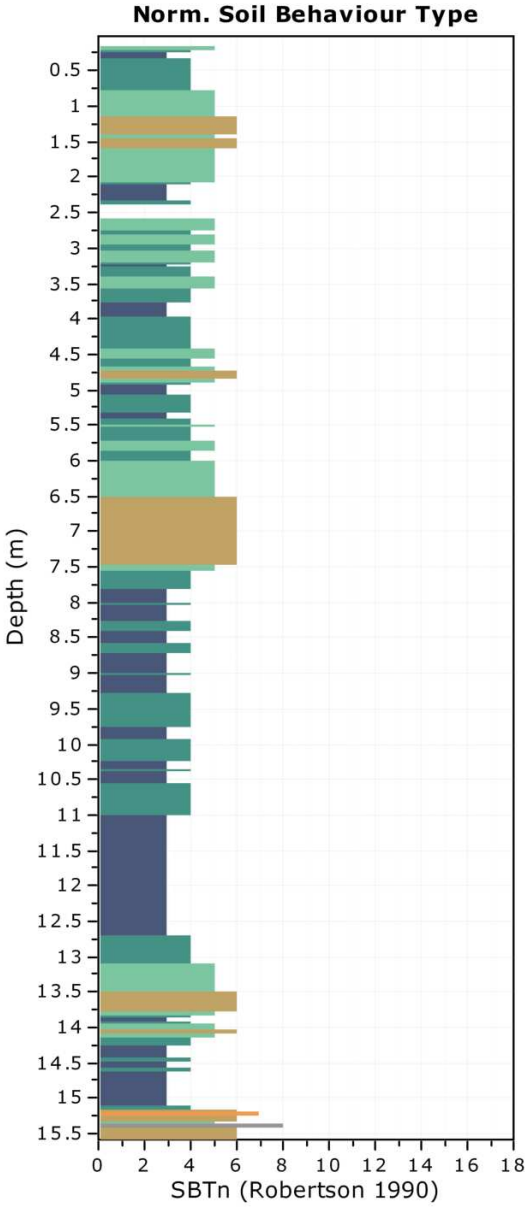

**SBTn legend**

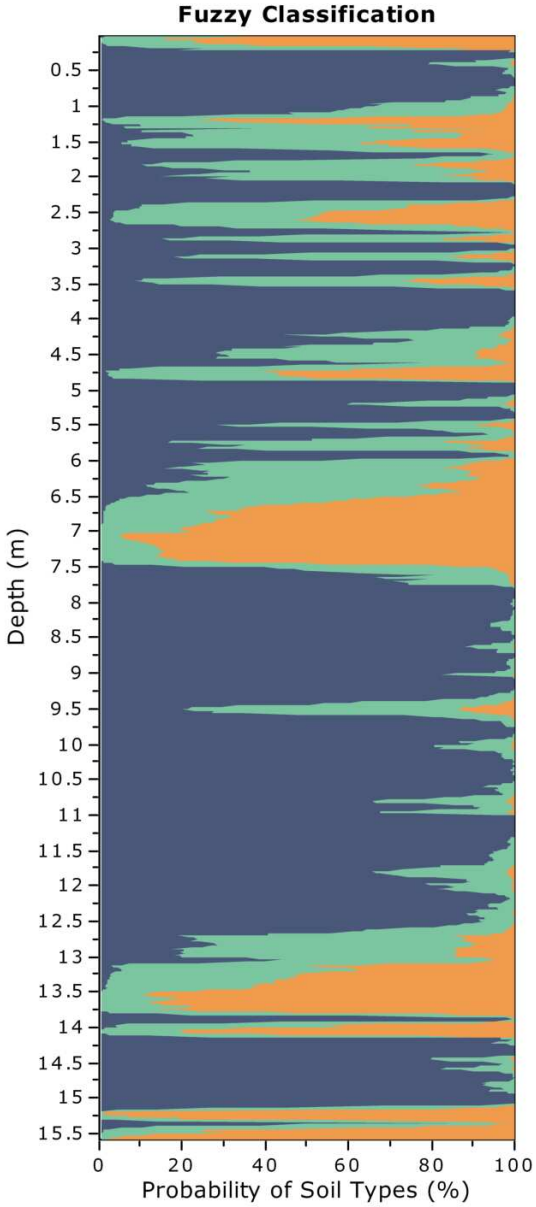
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



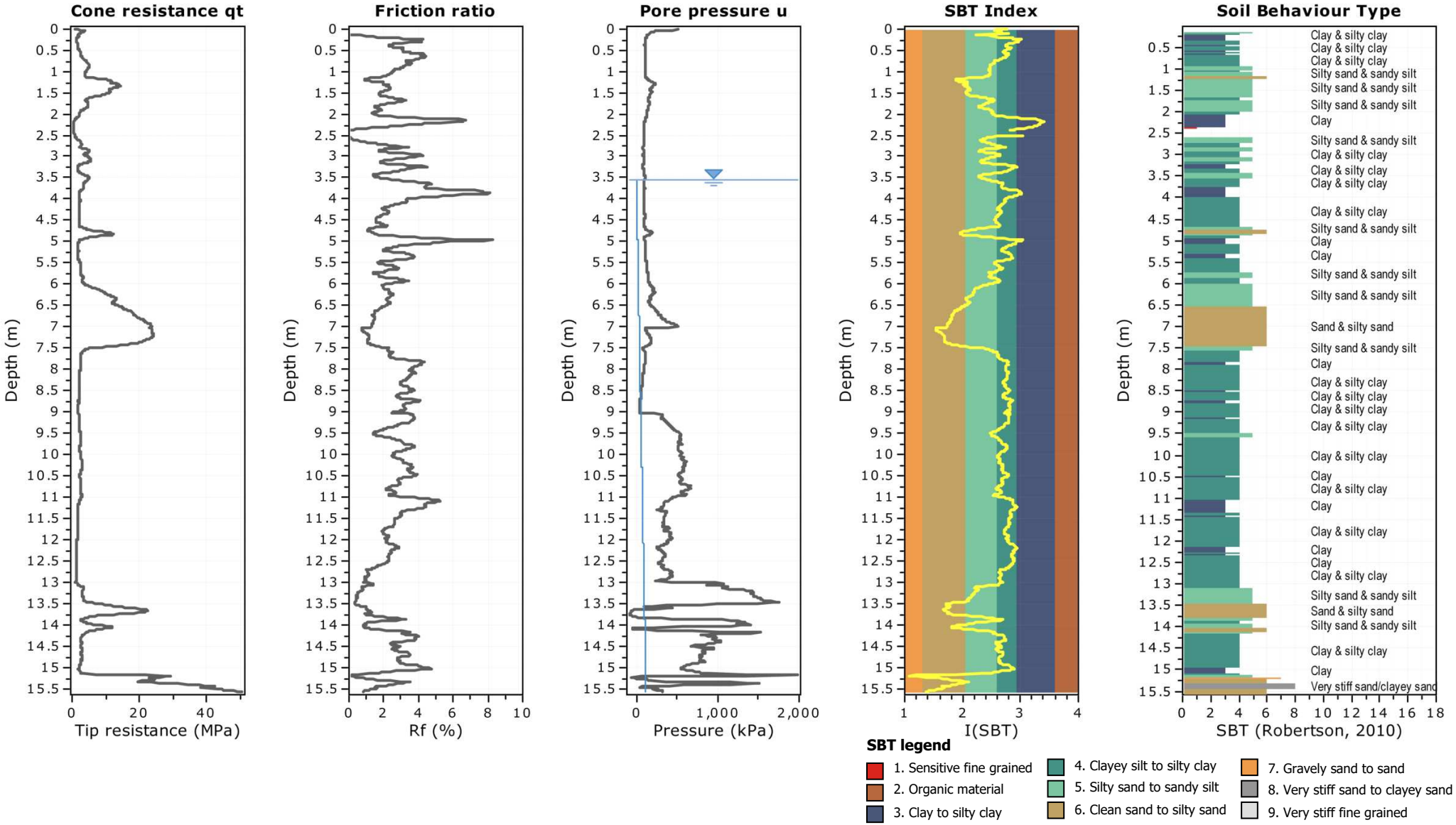



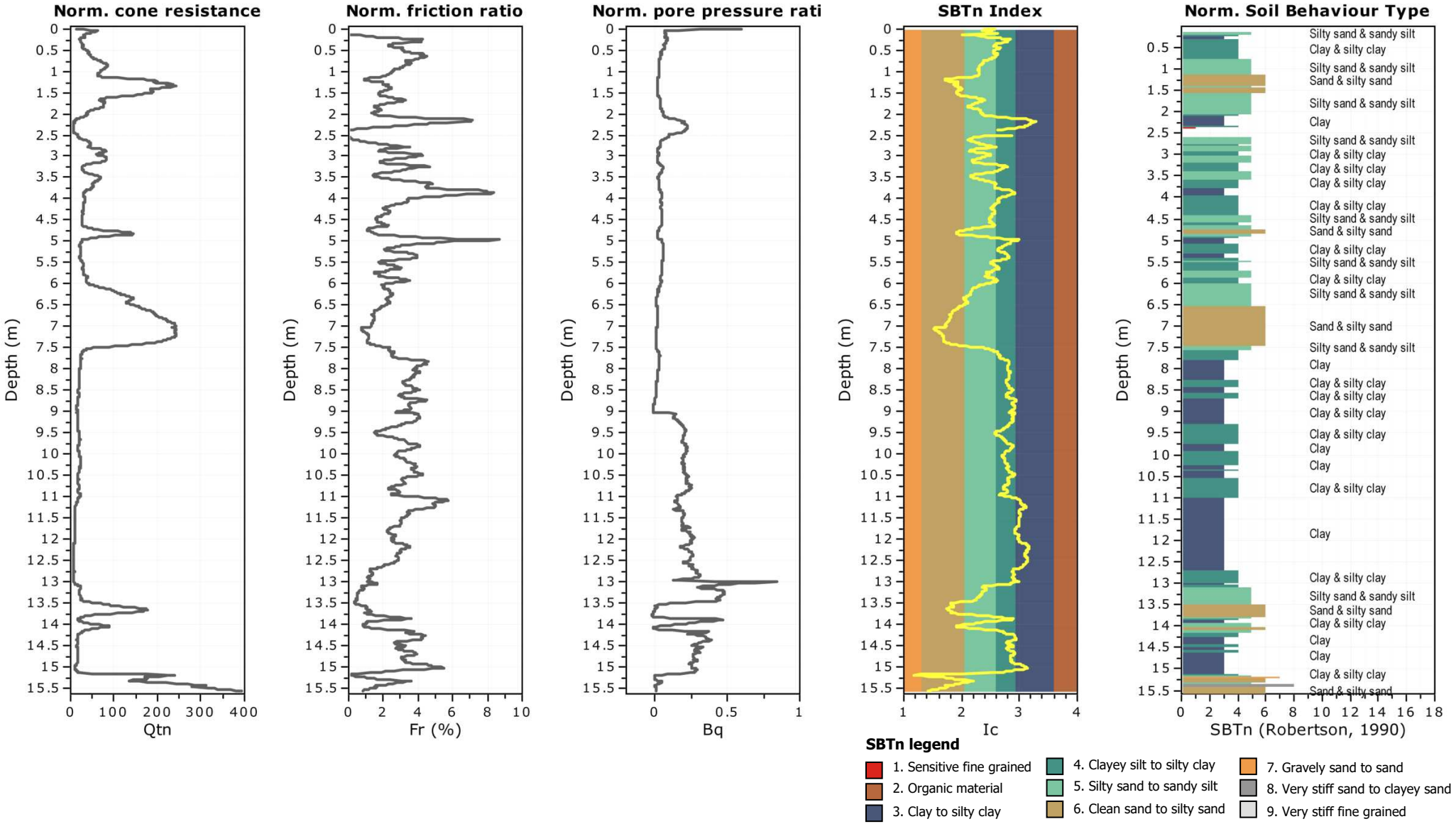


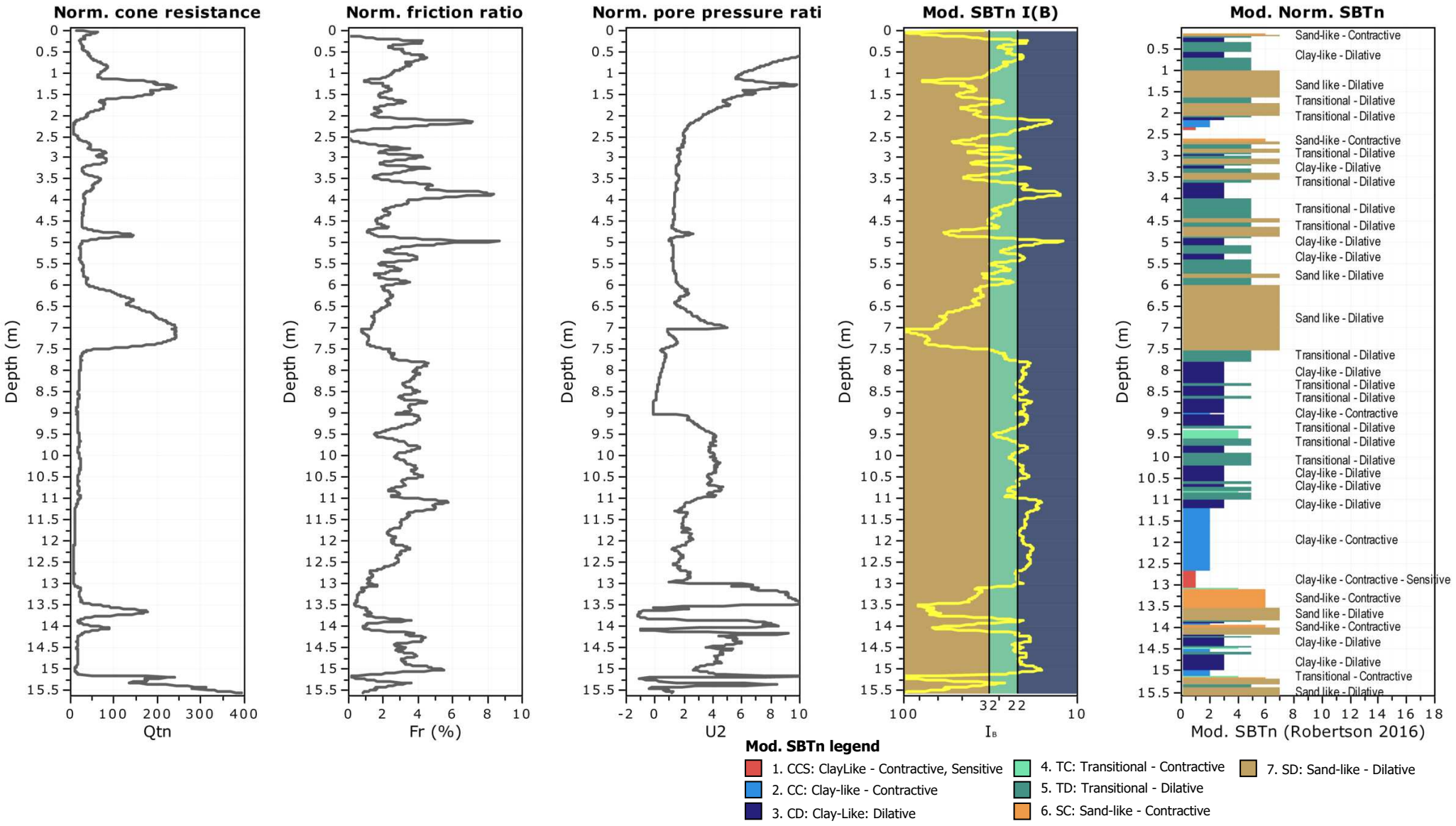




**Fuzzy classifiaction legend**

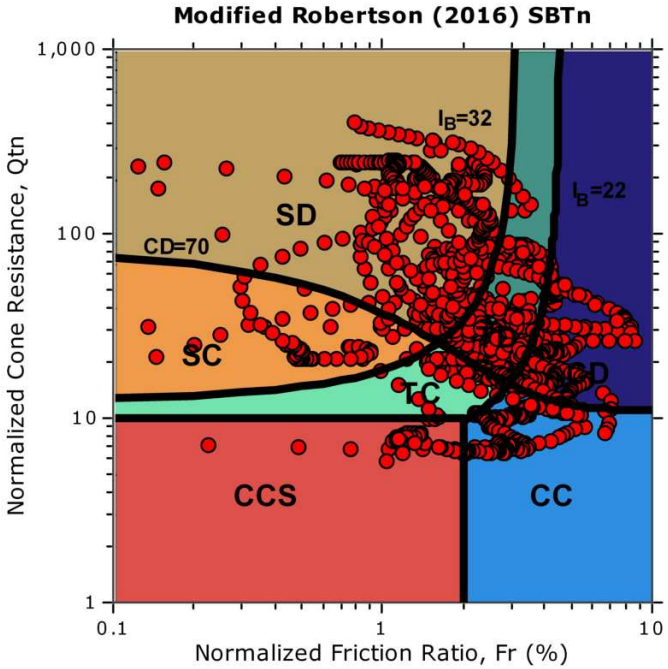
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

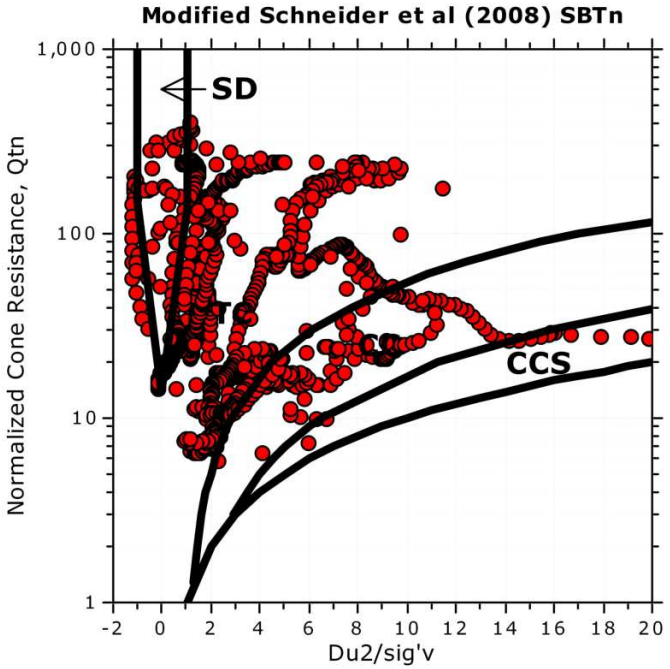

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Clay & silty clay
Silty sand & sandy silt
Sand & silty sand
Very stiff sand/clayey sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

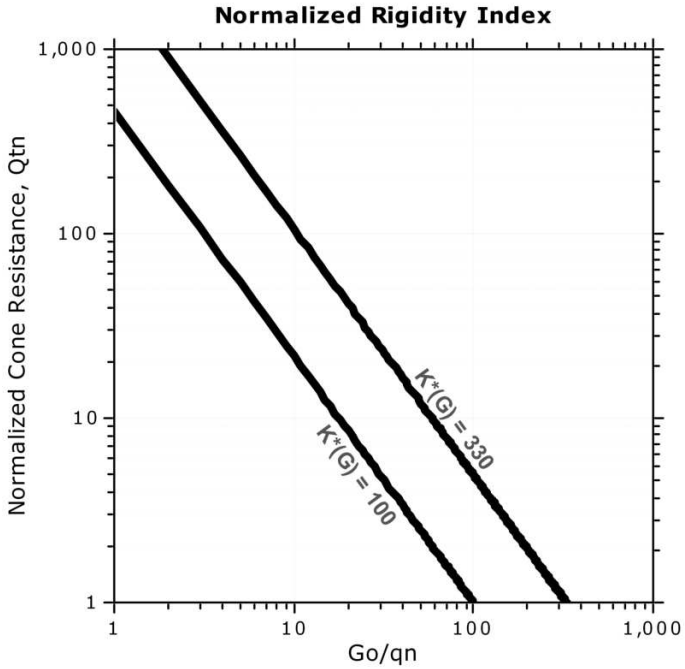

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Silty sand & sandy silt
Clay & silty clay
Sand & silty sand
Clay
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand-like - Contractive
Clay-like - Dilative
Sand like - Dilative
Transitional - Dilative
Transitional - Dilative
Sand-like - Contractive
Transitional - Dilative
Clay-like - Dilative
Transitional - Dilative
Transitional - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Dilative
Sand like - Dilative
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Transitional - Dilative
Transitional - Dilative
Clay-like - Contractive
Transitional - Dilative
Transitional - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Sand-like - Contractive
Sand like - Dilative
Sand-like - Contractive
Clay-like - Dilative
Clay-like - Dilative
Transitional - Contractive
Sand like - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

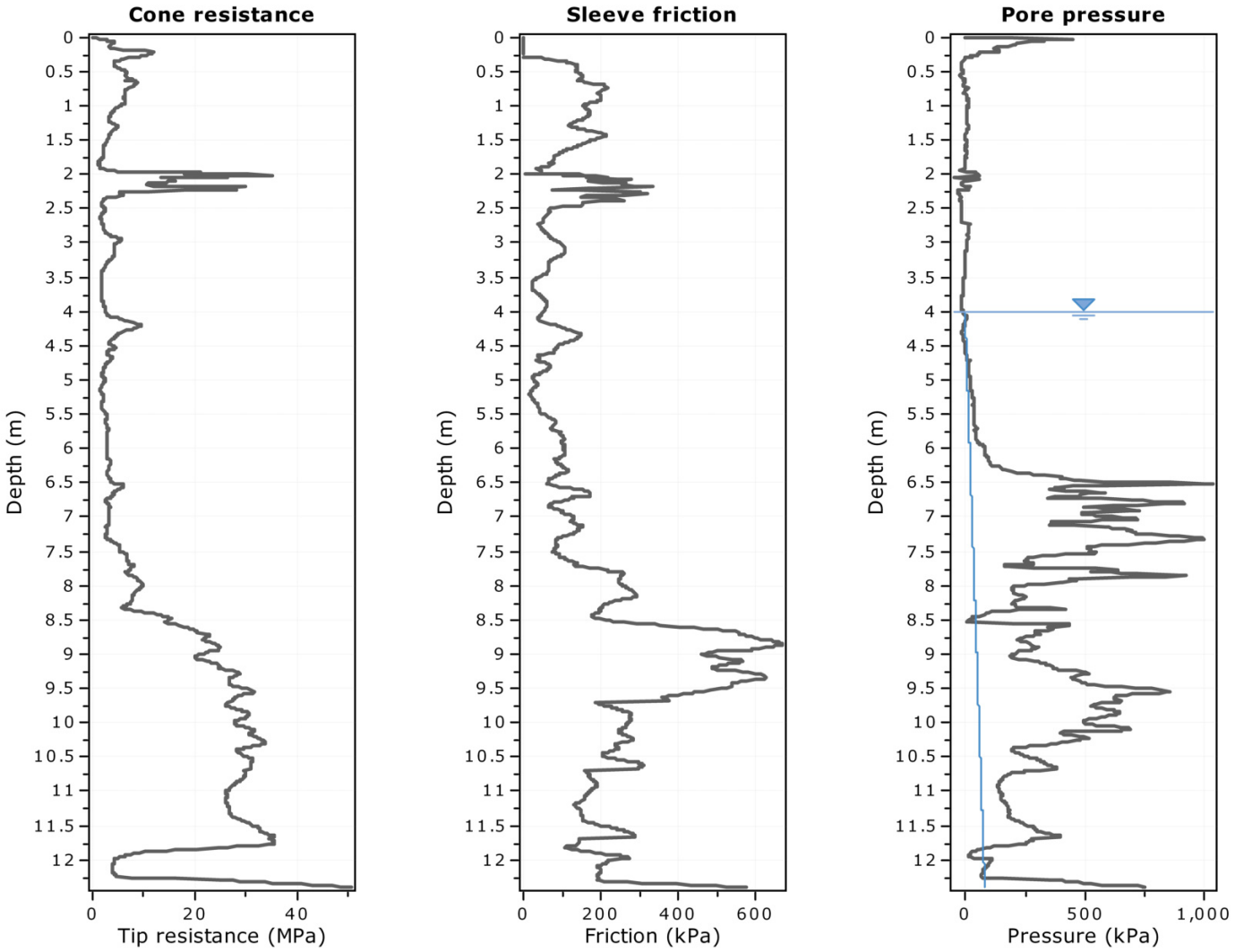


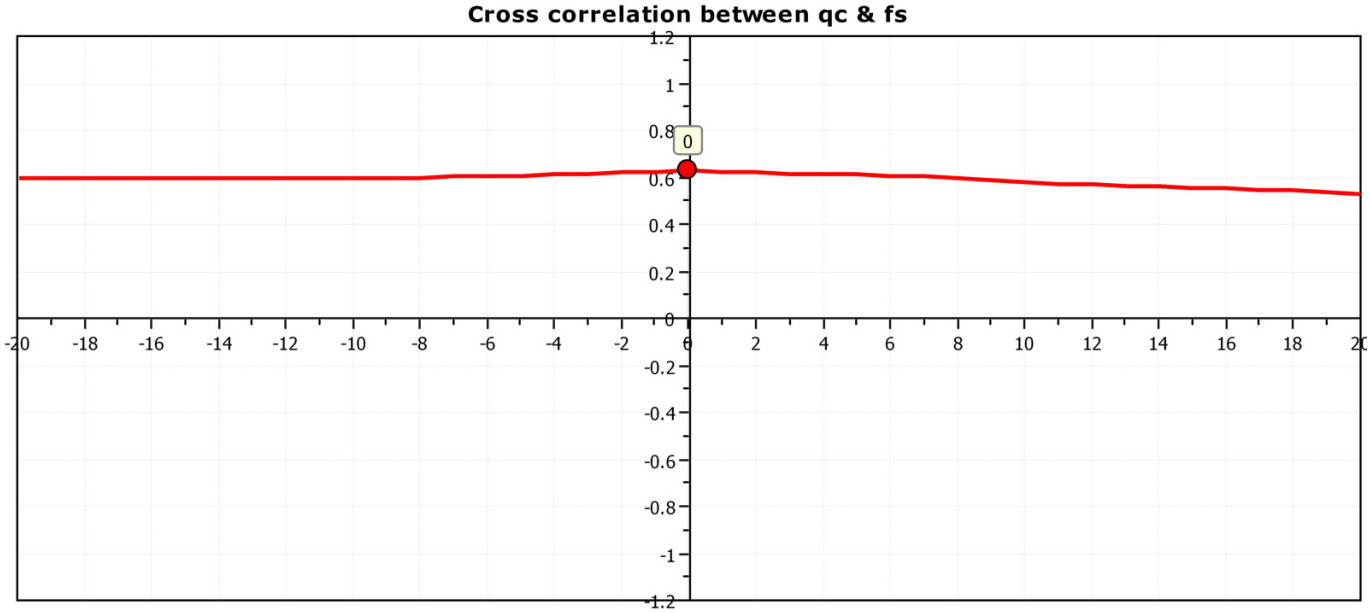




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

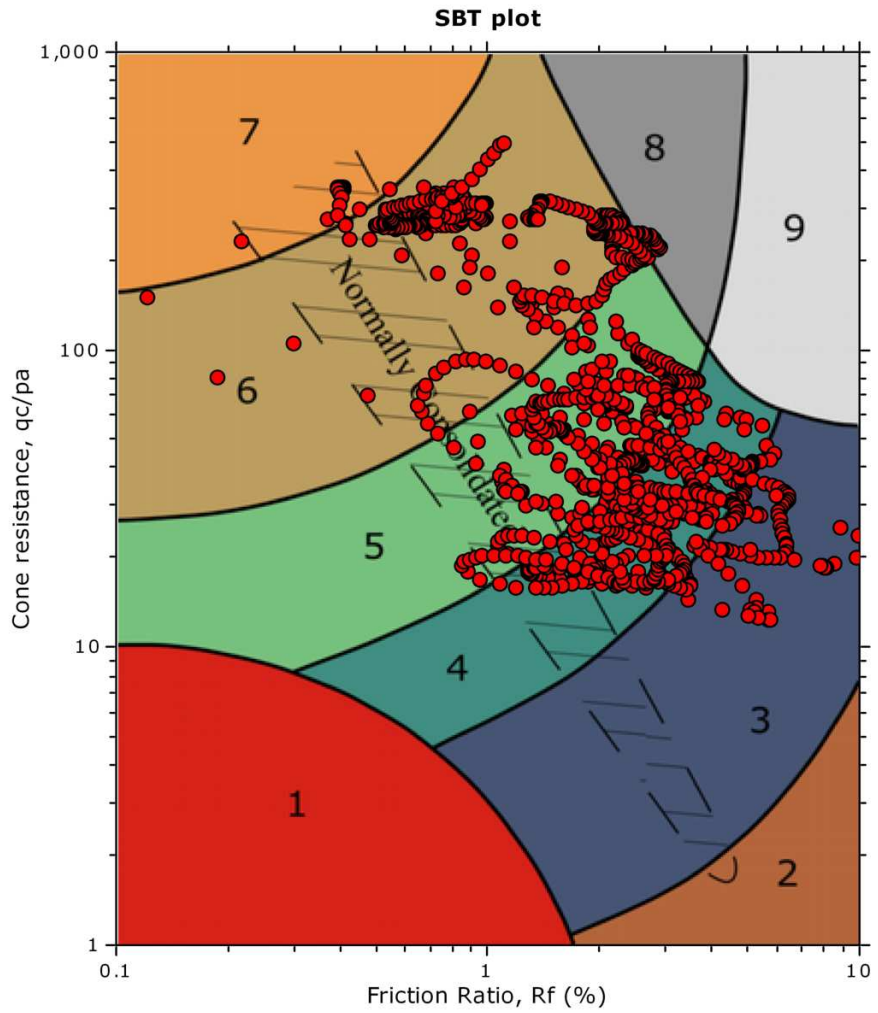
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

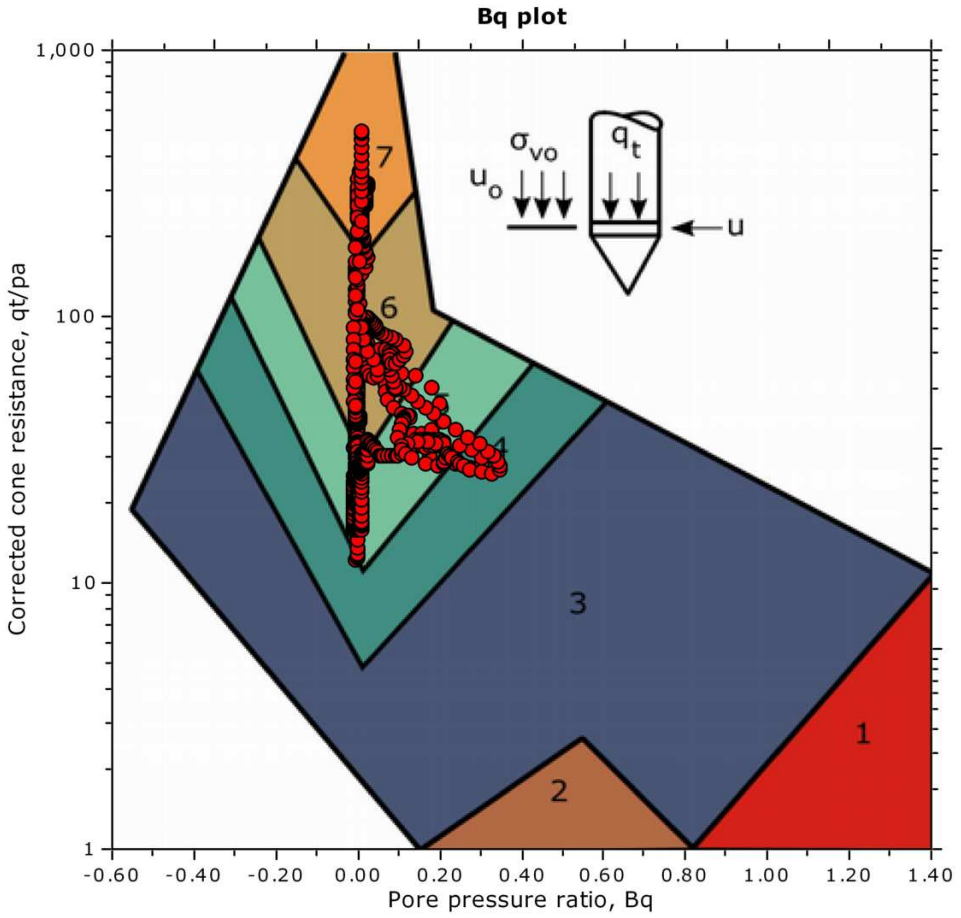



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

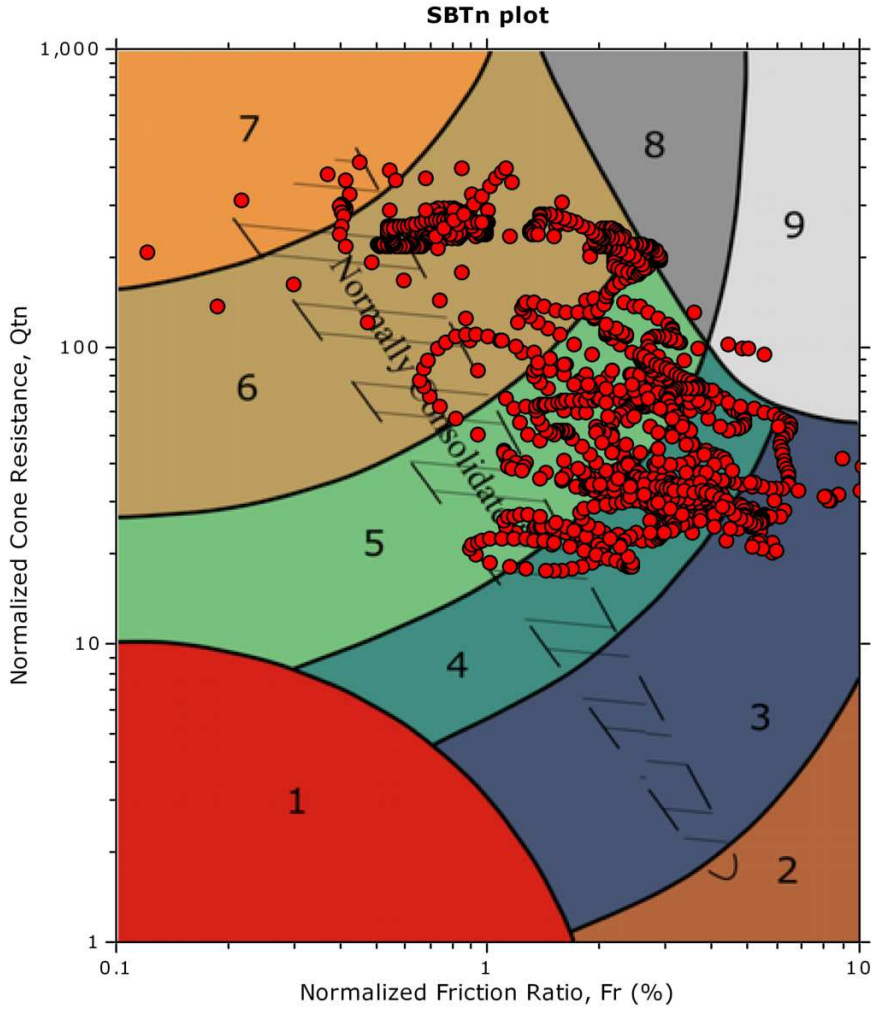


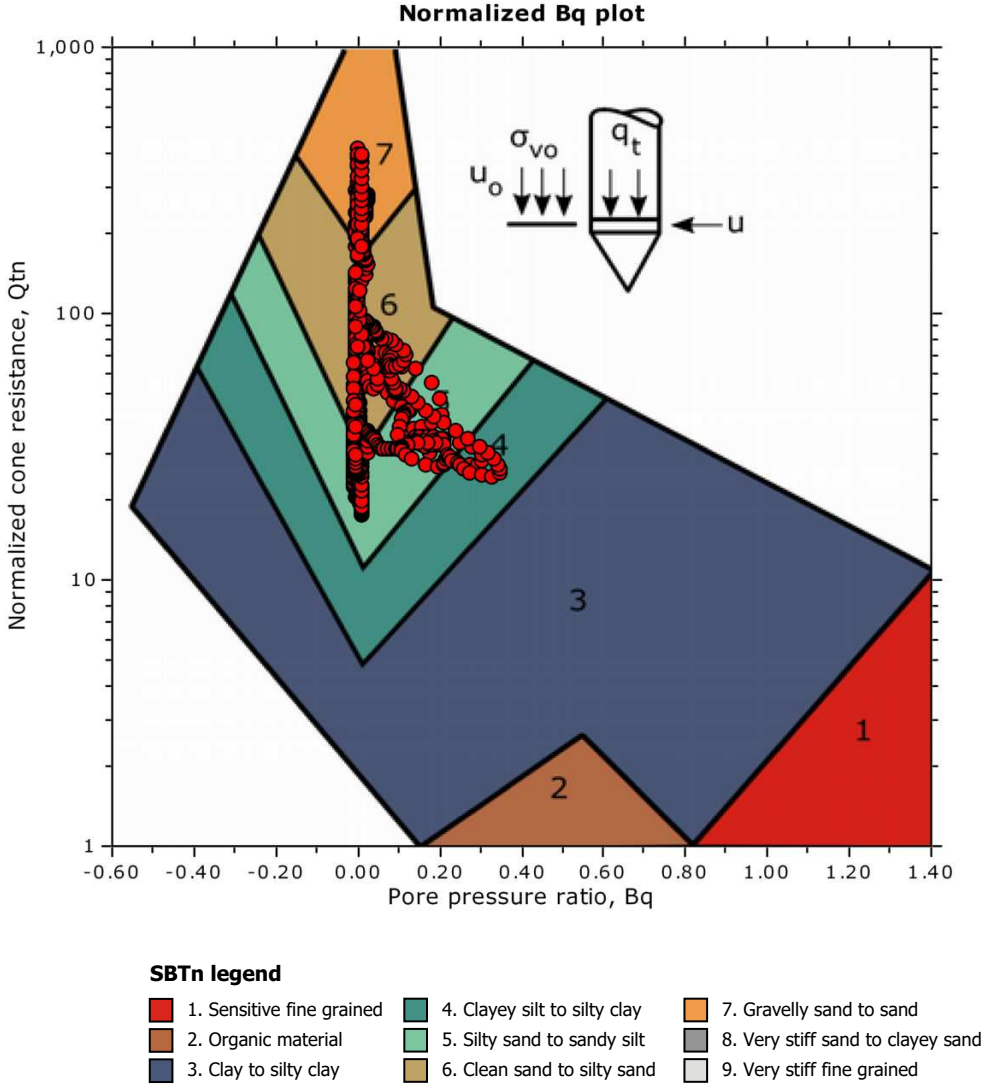




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

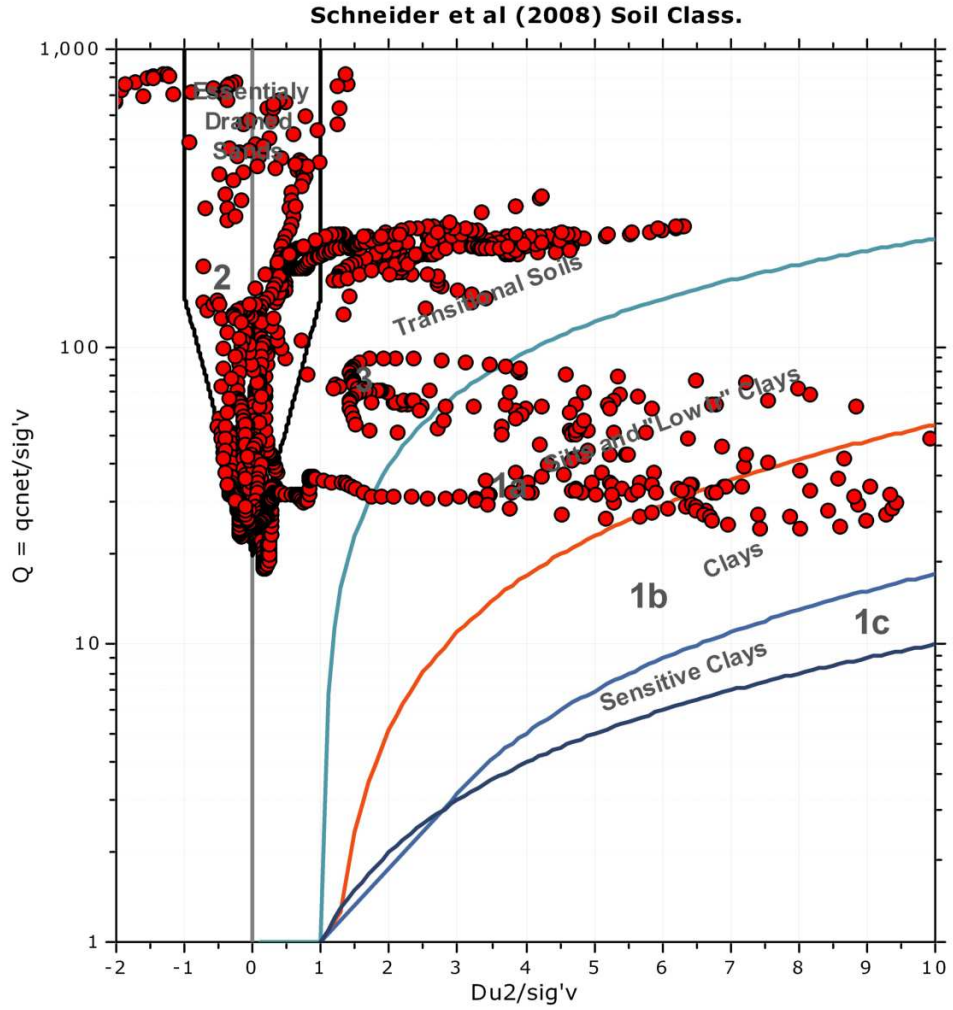


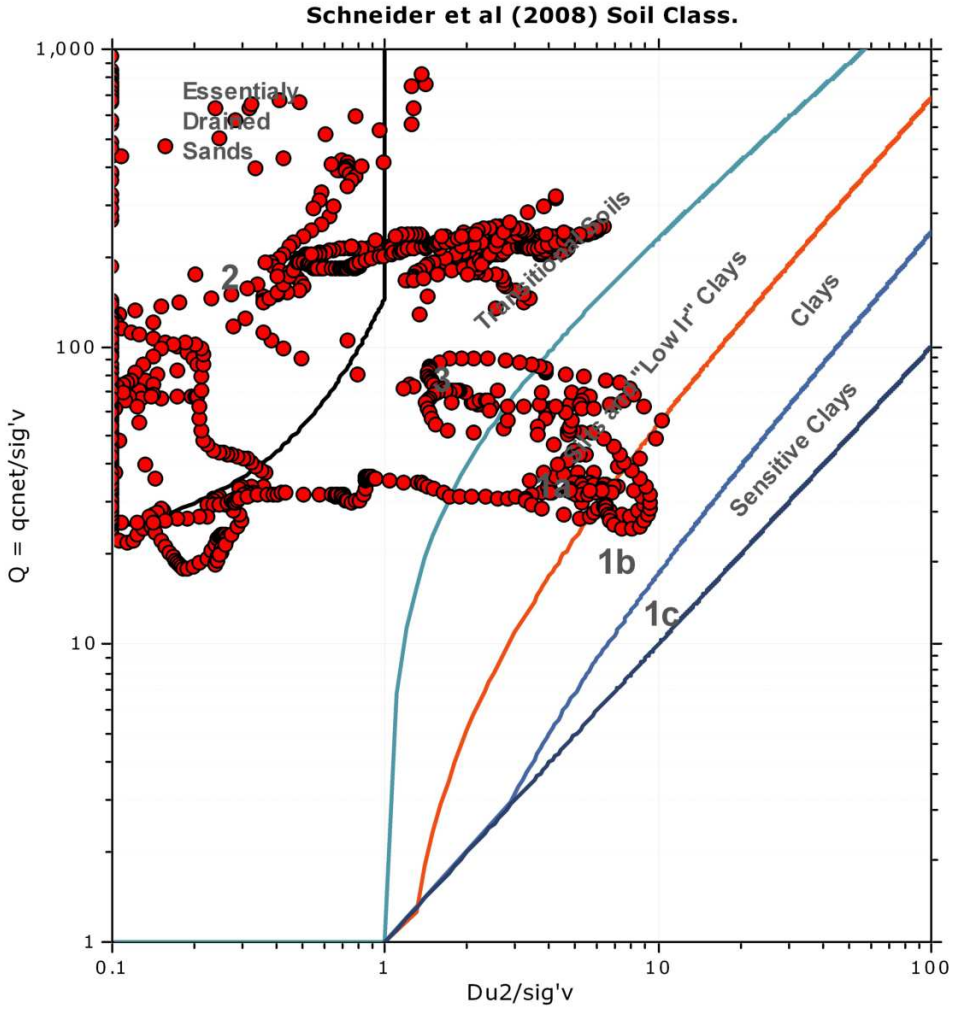



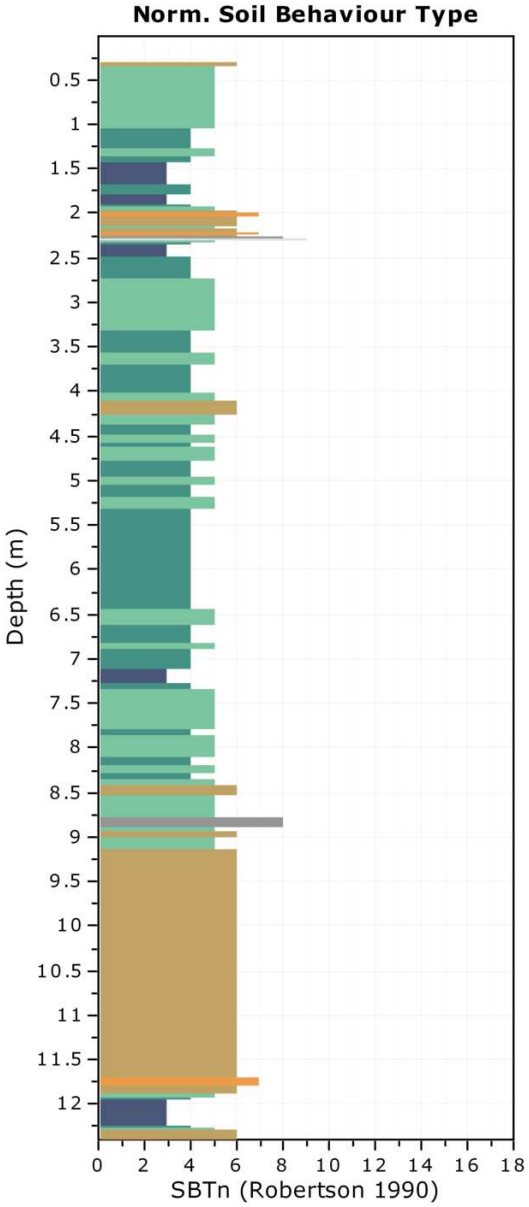

**SBTn legend**

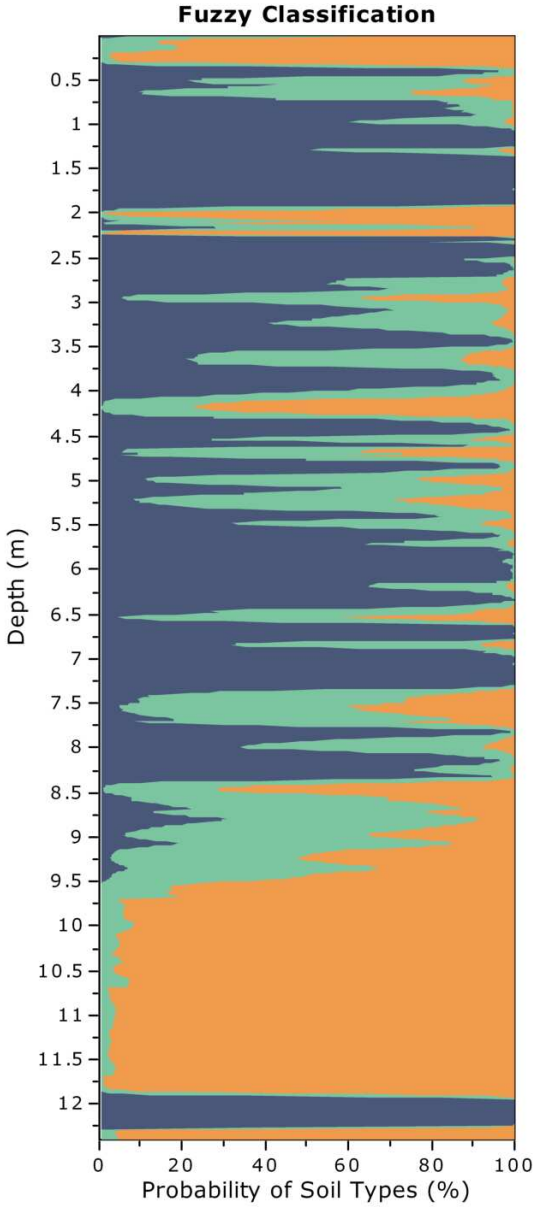
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



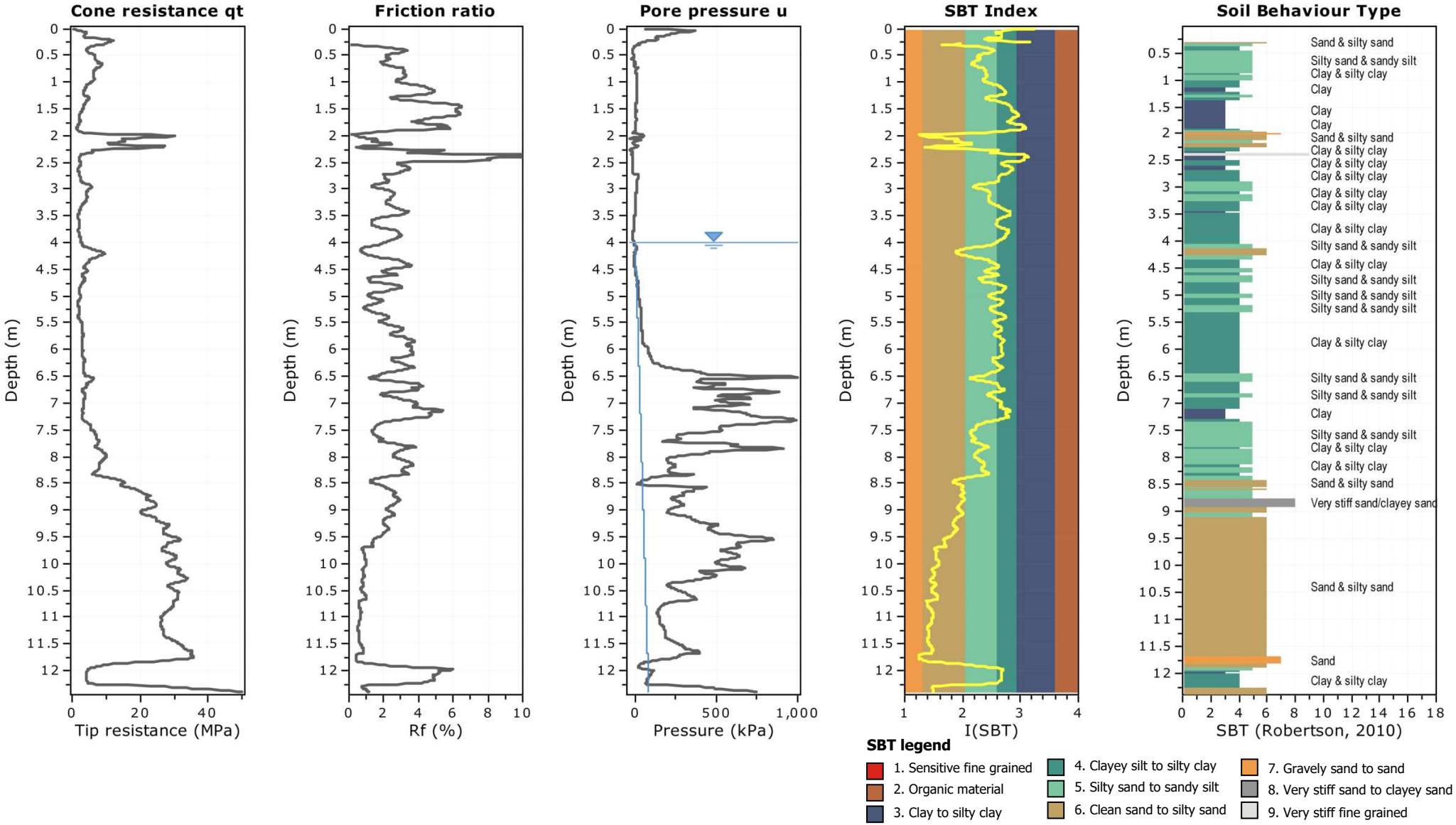



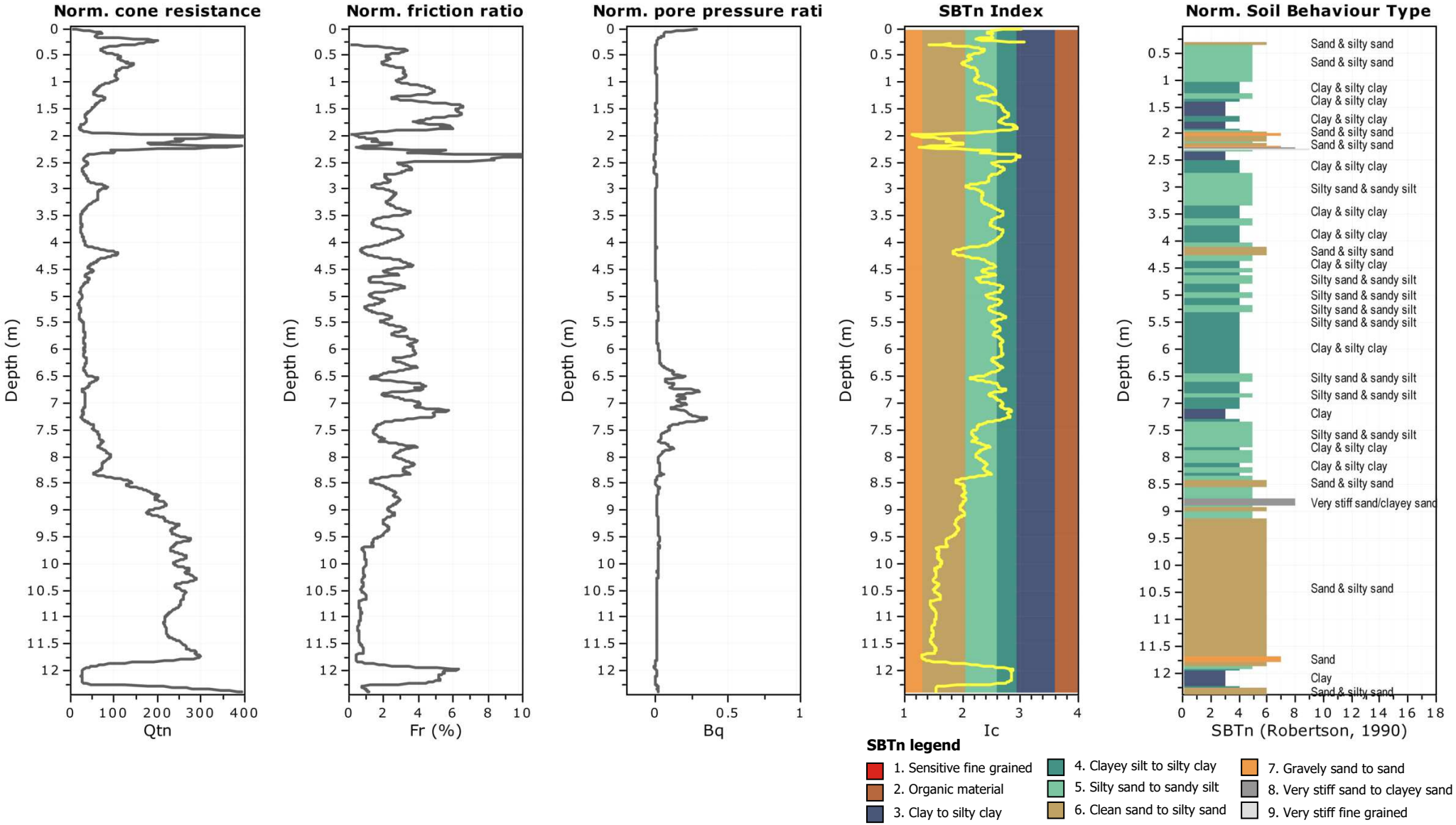


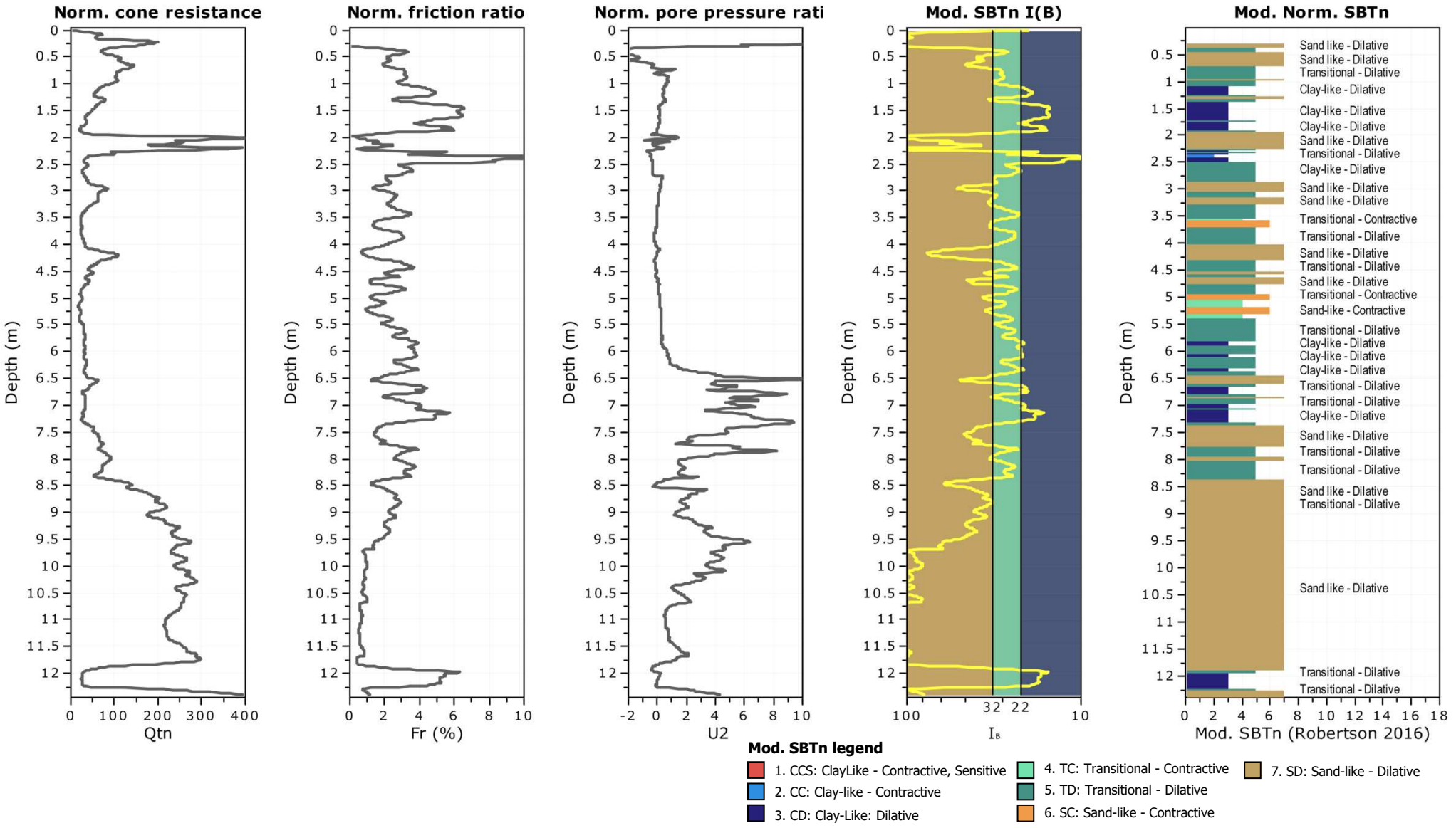




**Fuzzy classifiaction legend**

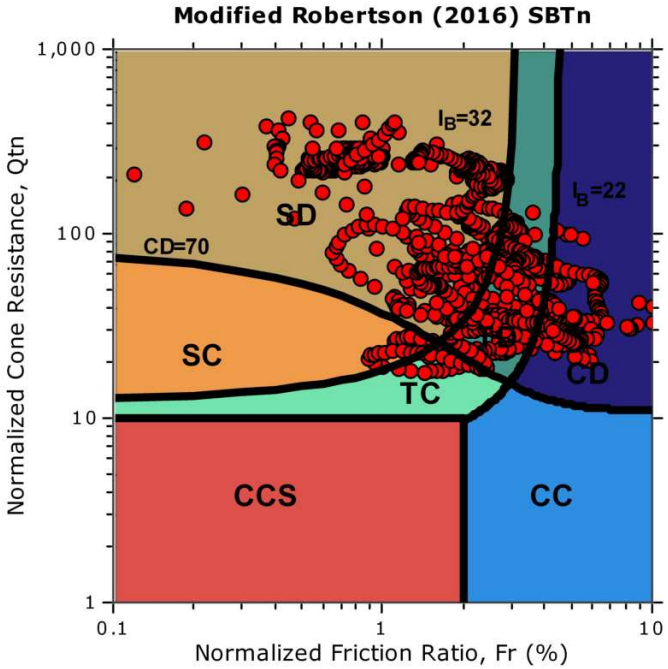
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

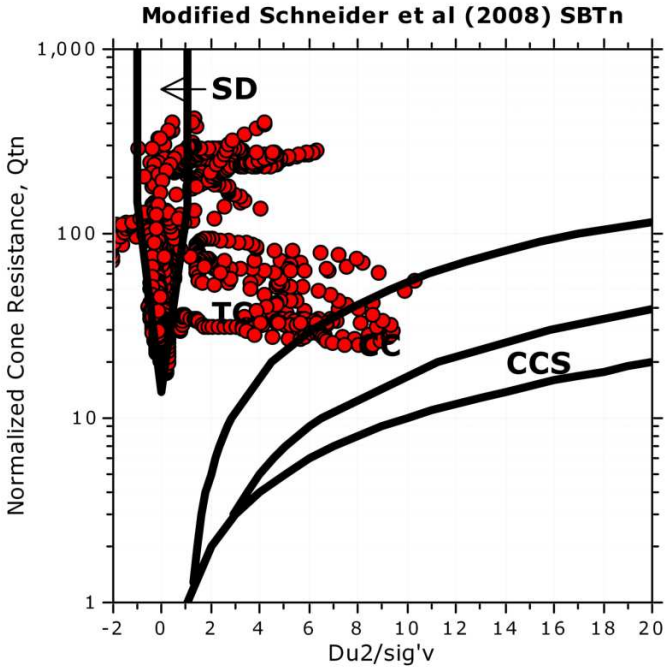

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Very stiff sand/clayey sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

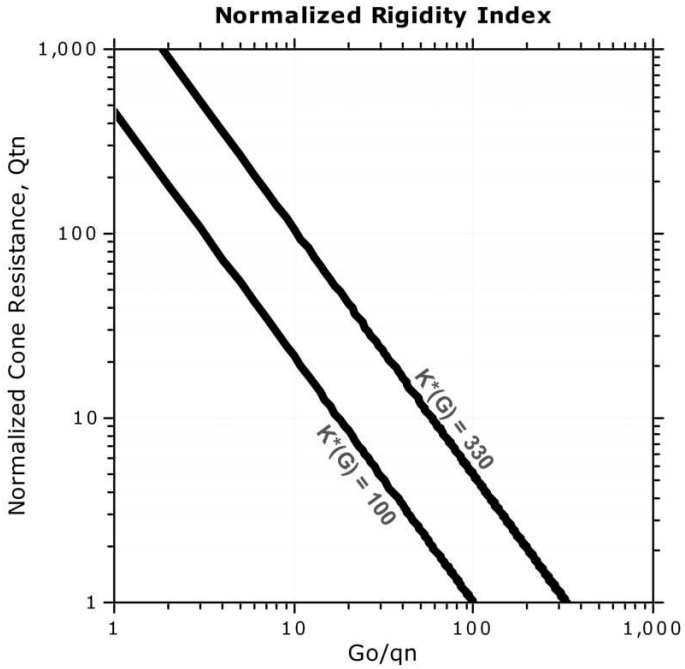

Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Depth (m)
Sand & silty sand
Clay & silty clay
Silty sand & sandy silt
Very stiff sand/clayey sand
Sand
Clay
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Transitional - Dilative
Clay-like - Dilative
Transitional - Contractive
Sand-like - Contractive
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

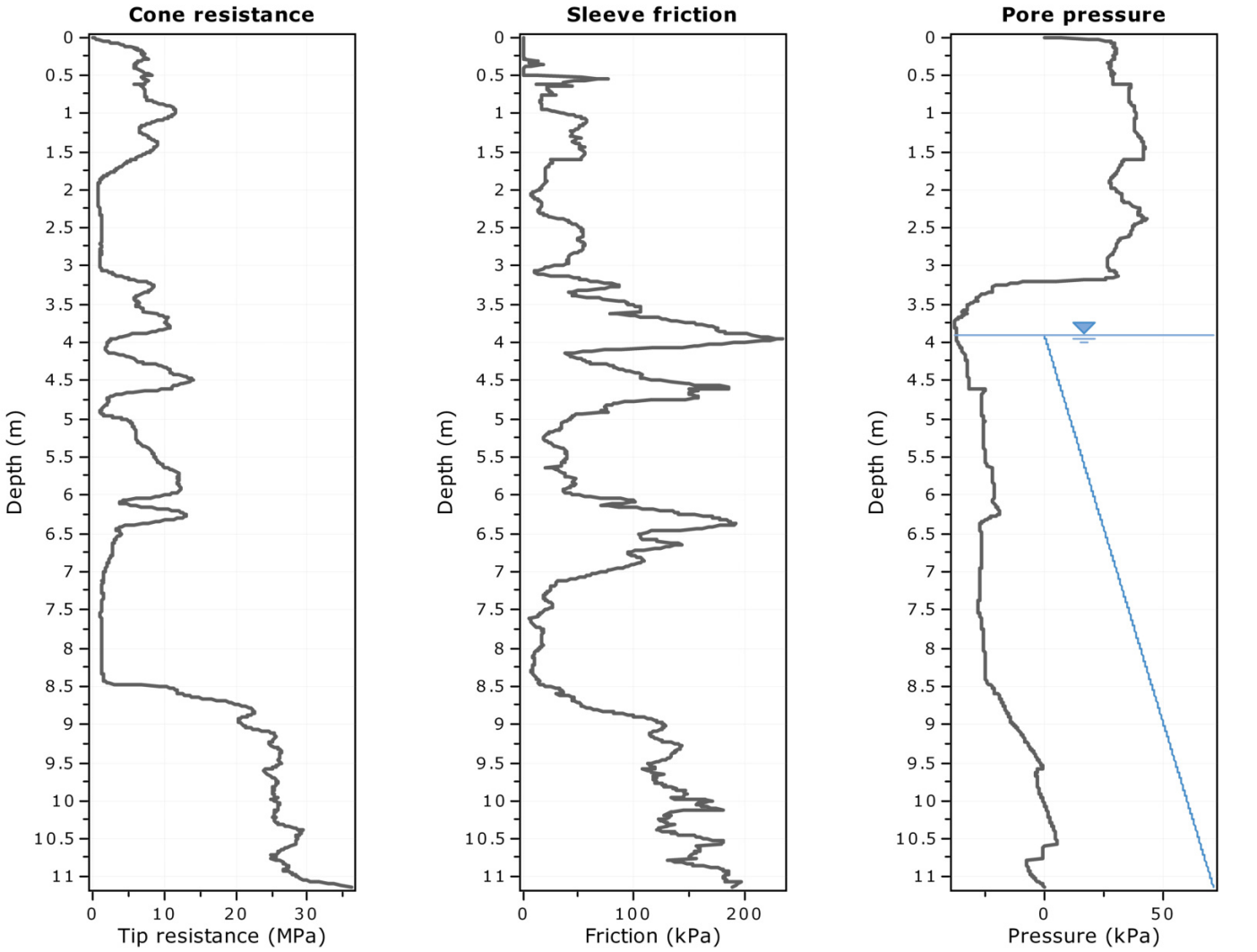


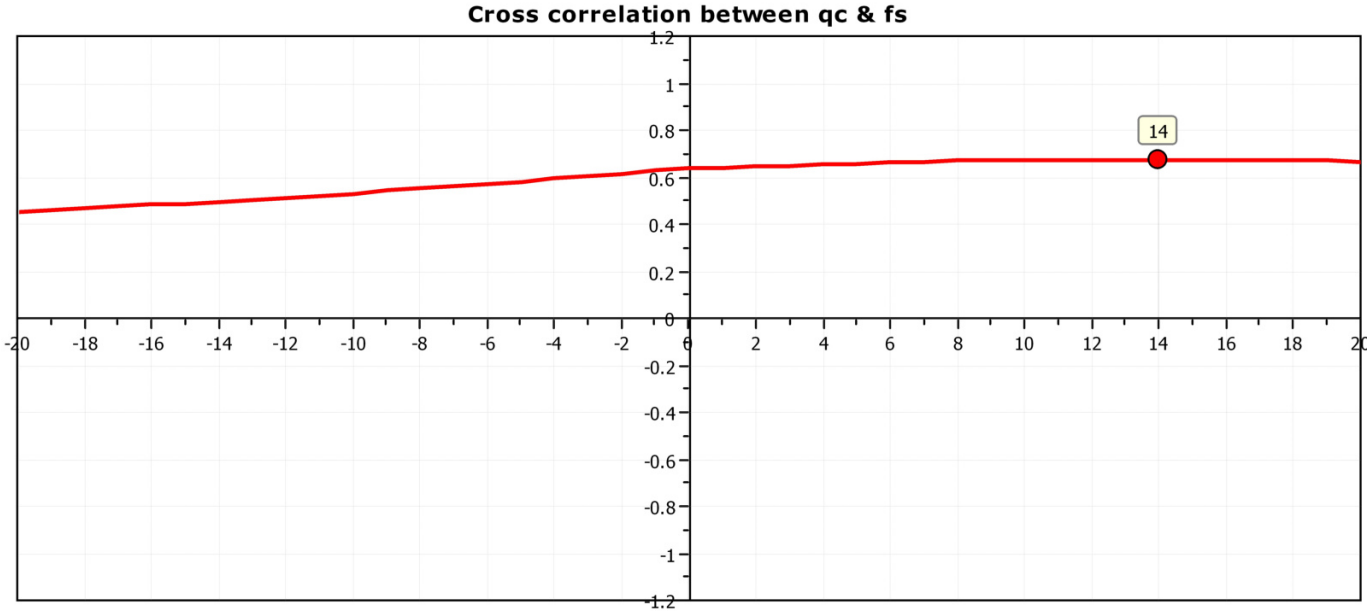




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

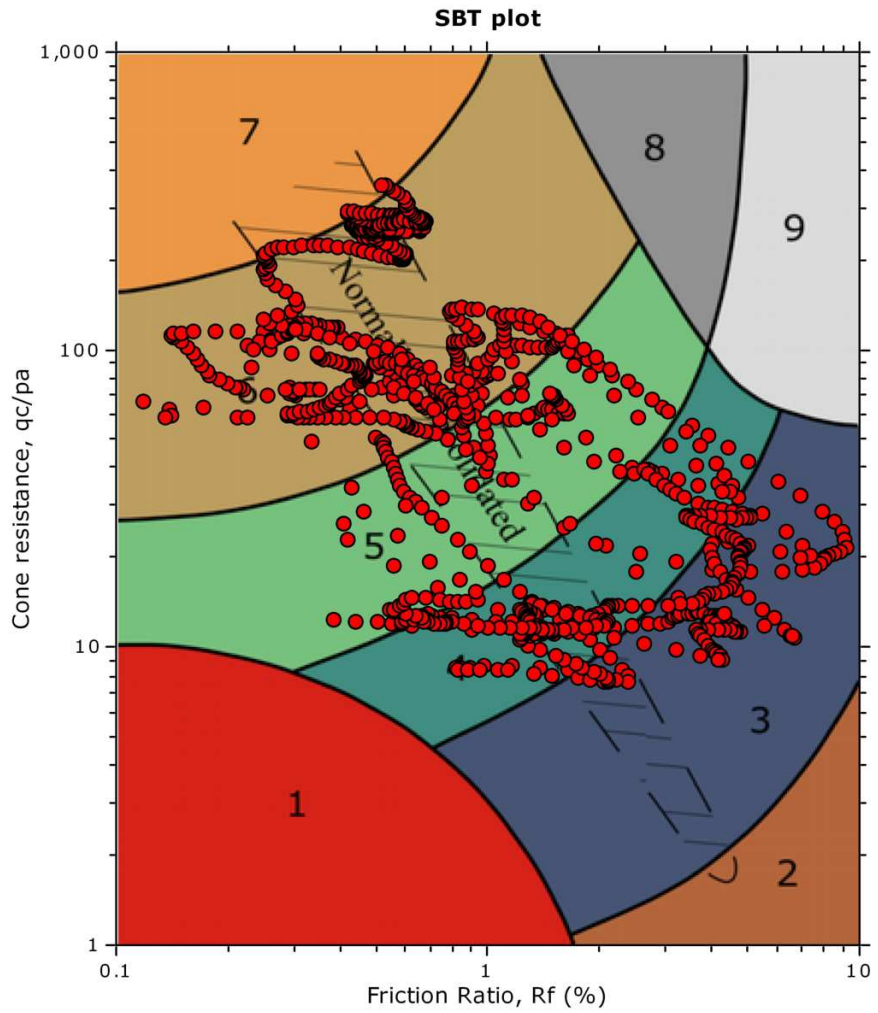
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

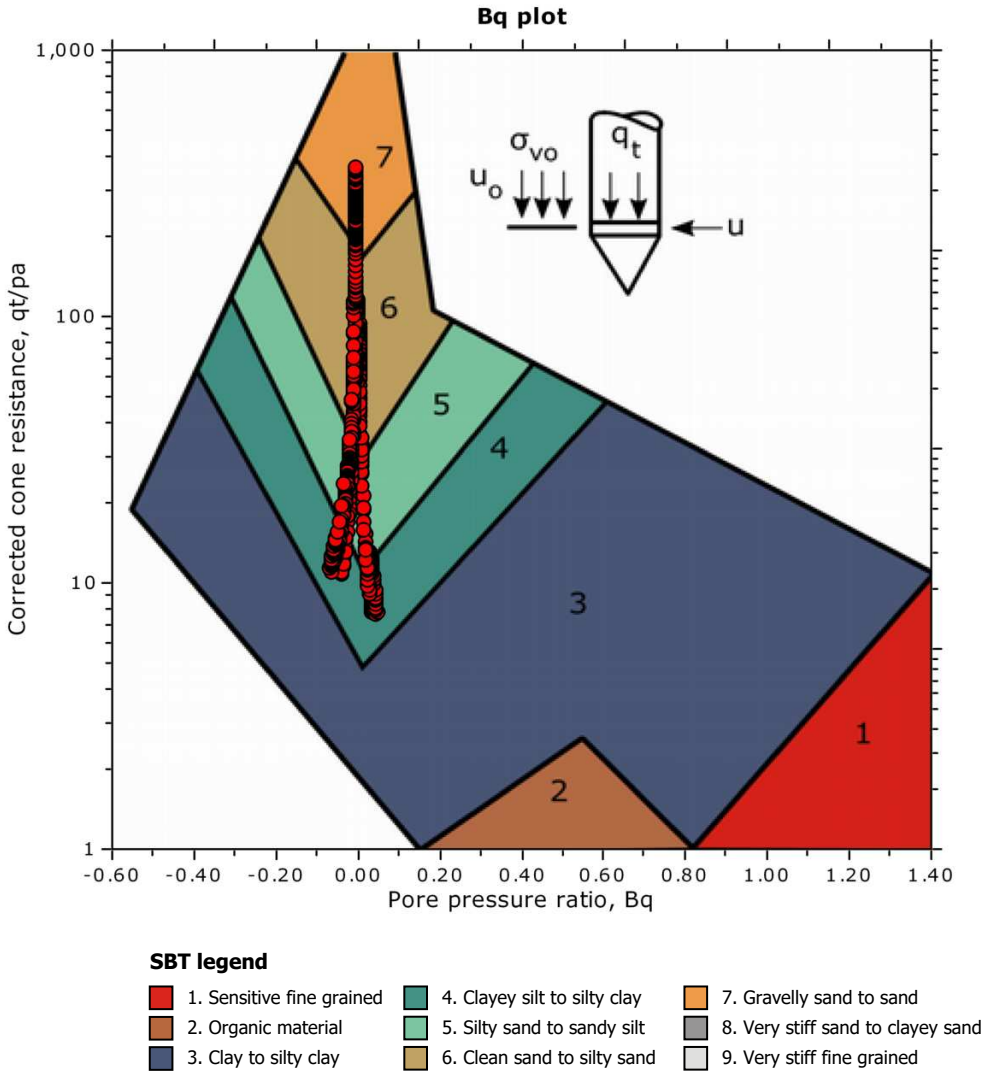



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

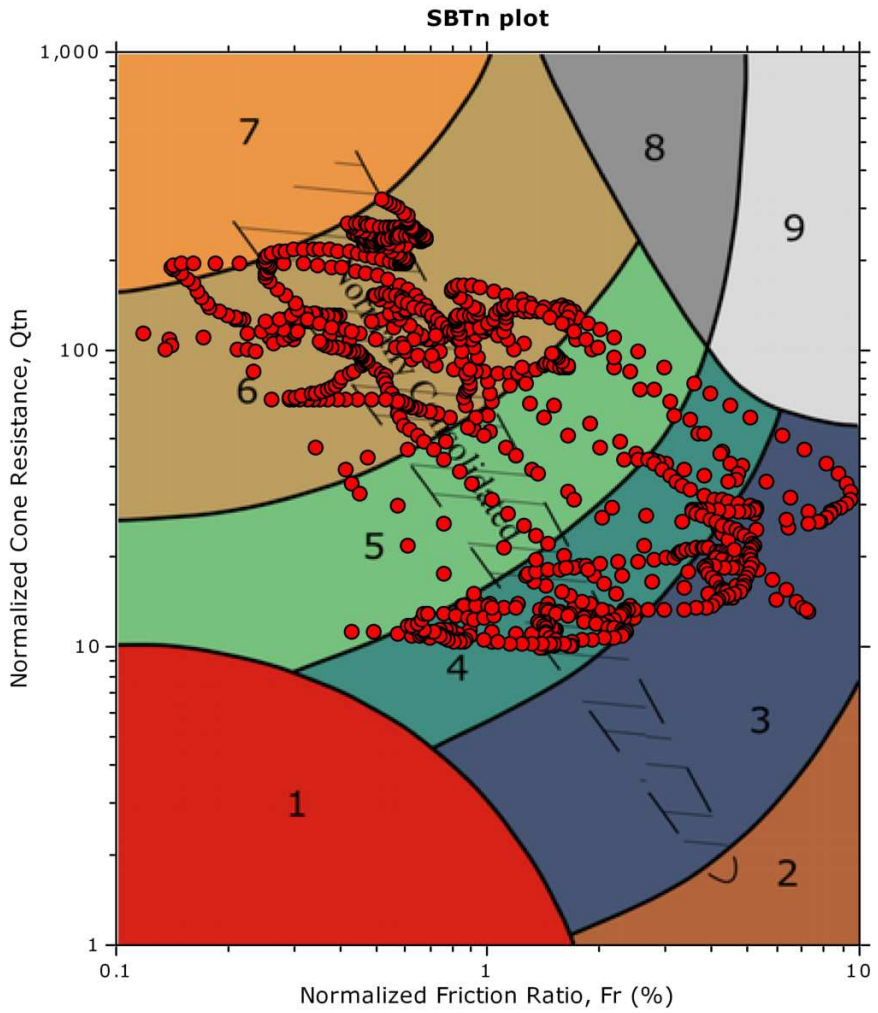


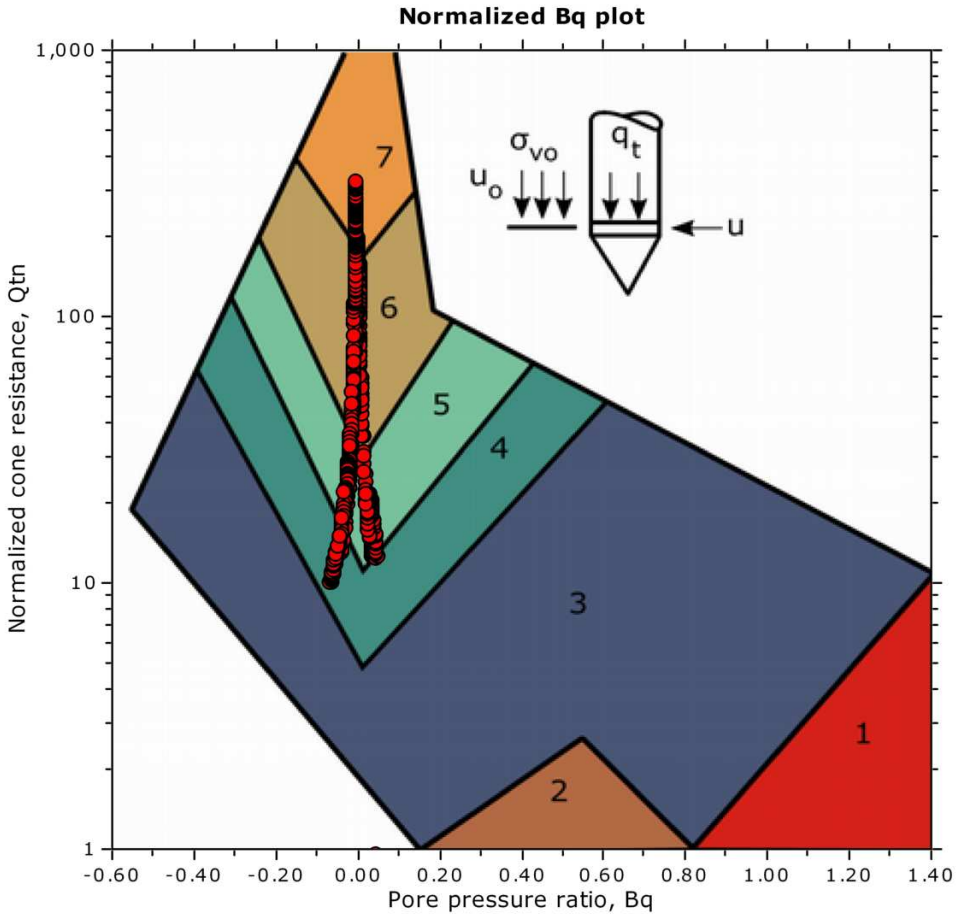




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

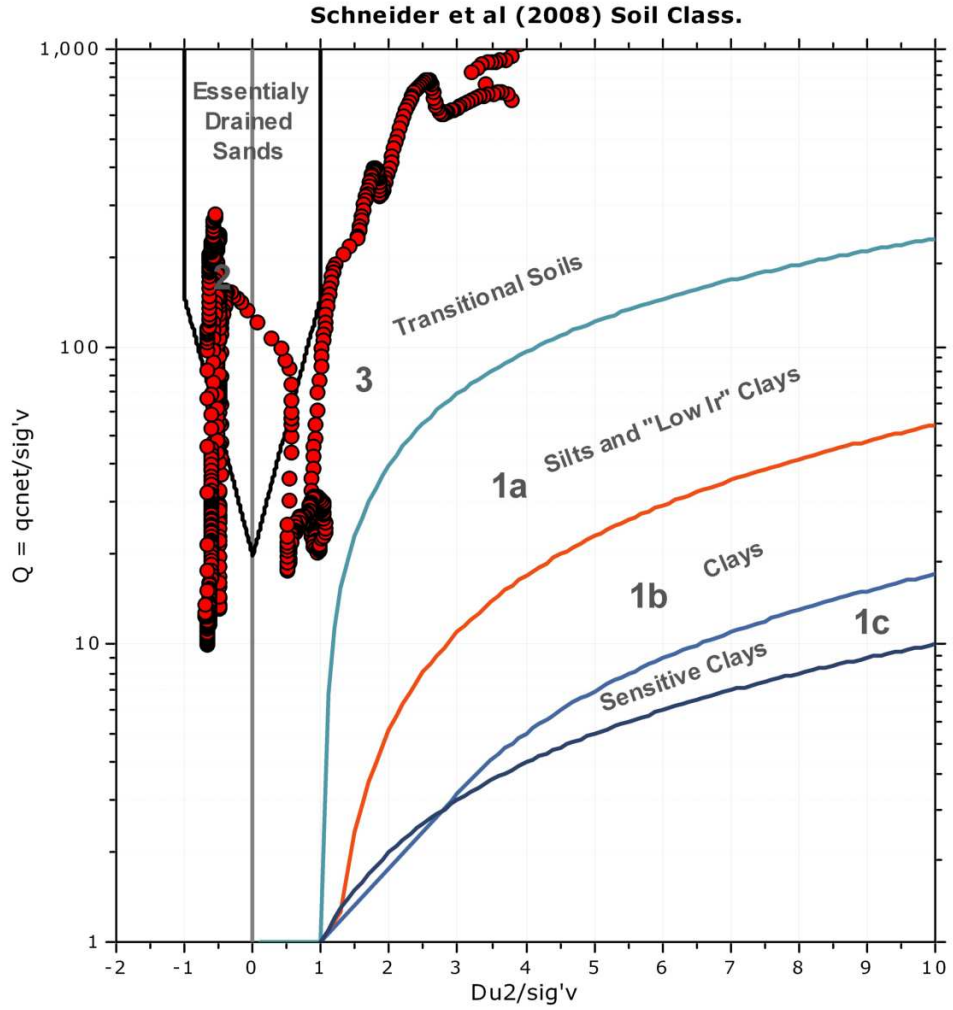


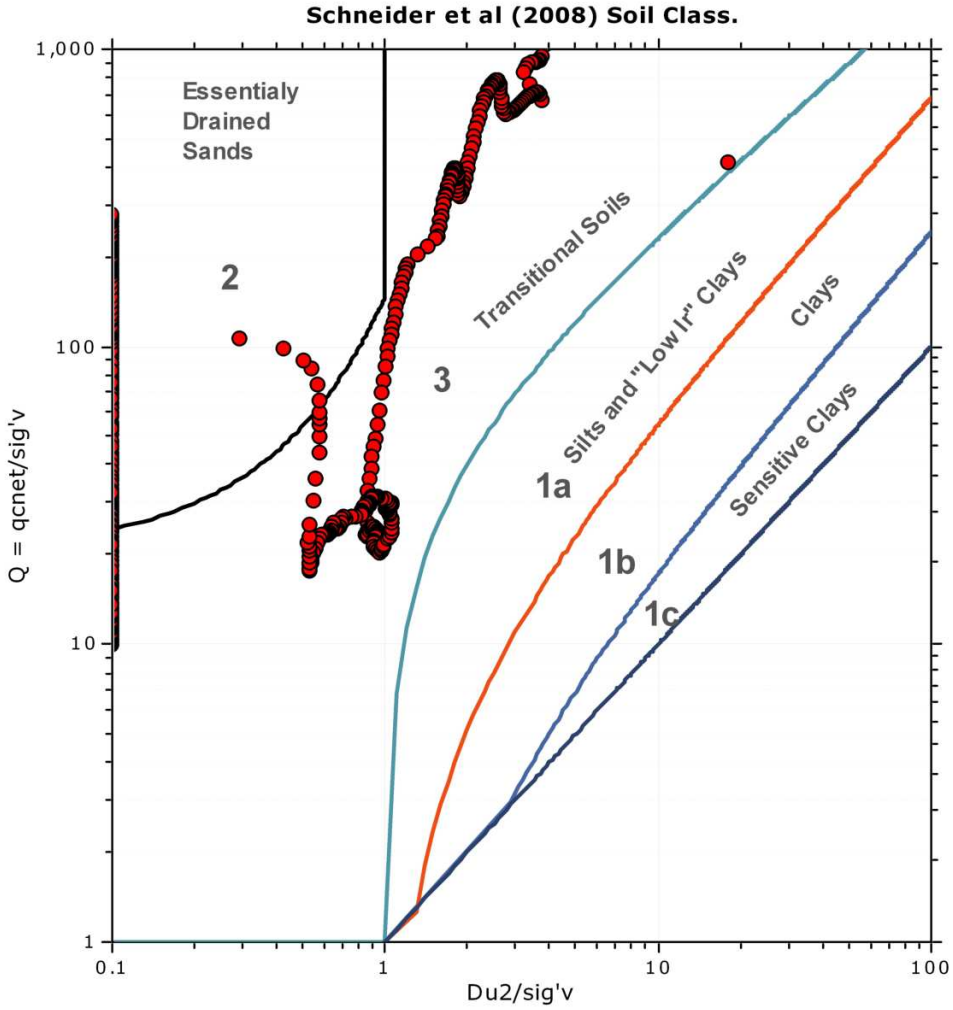



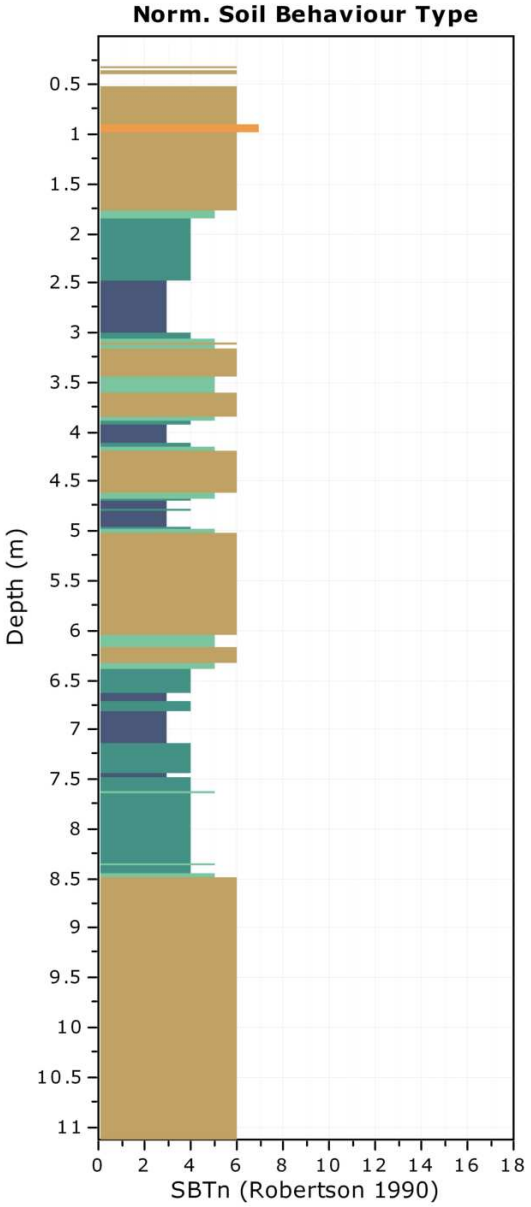

**SBTn legend**

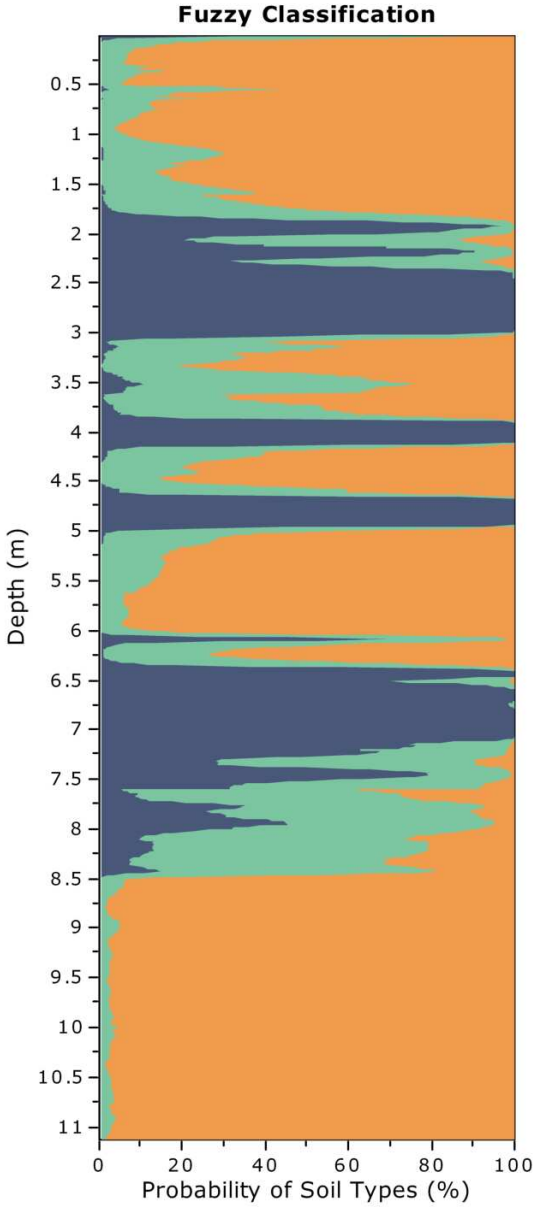
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



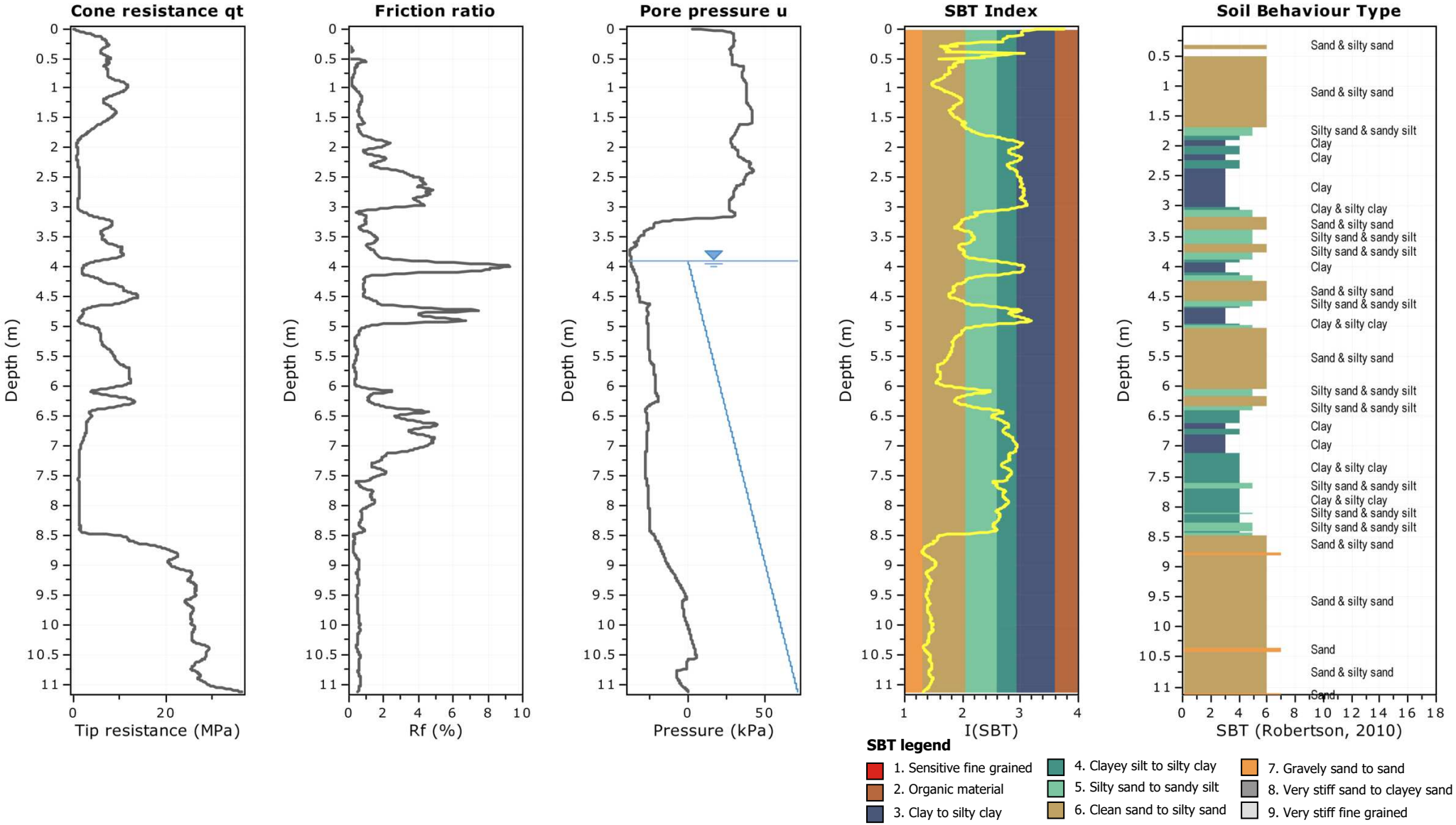



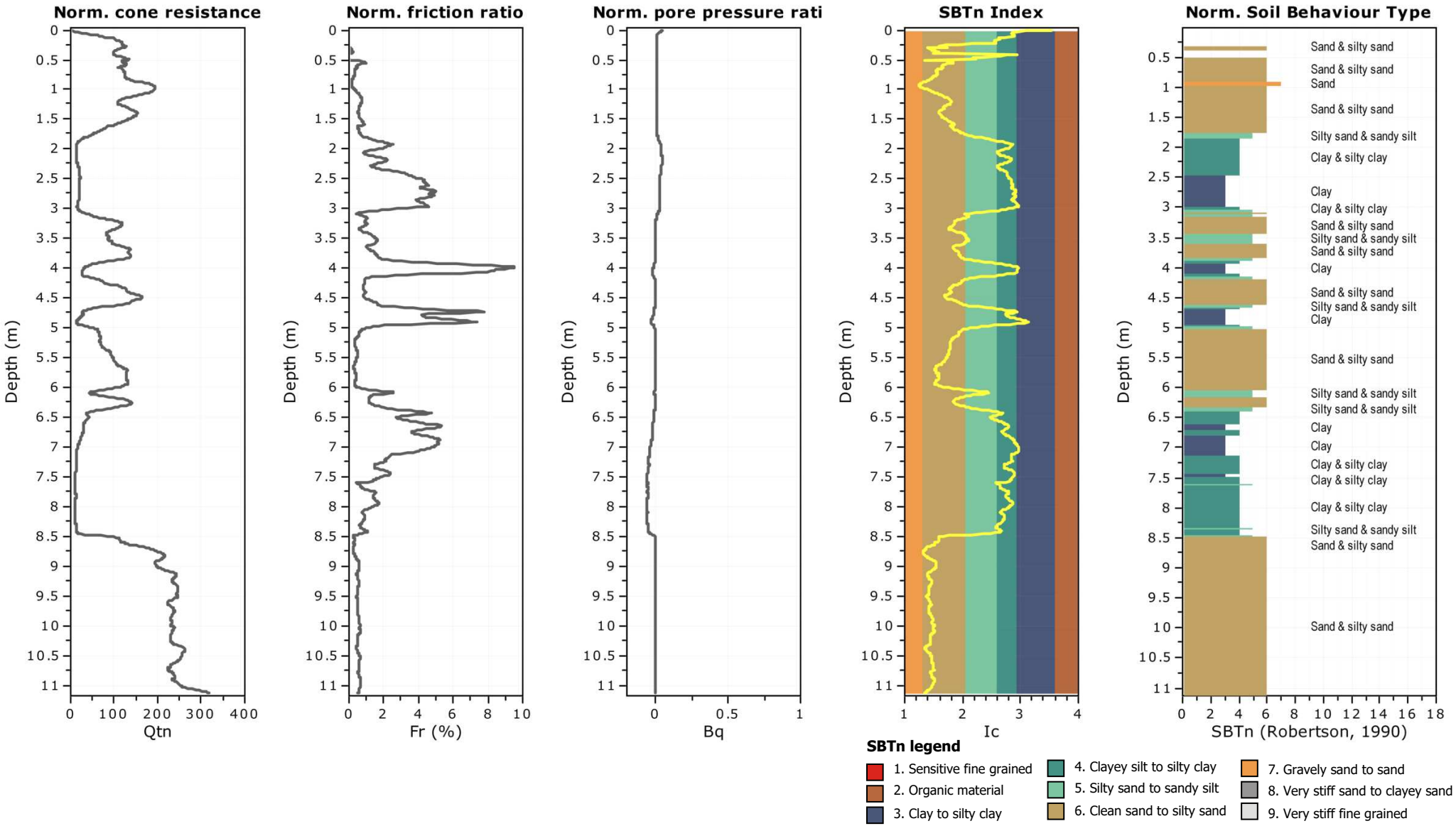


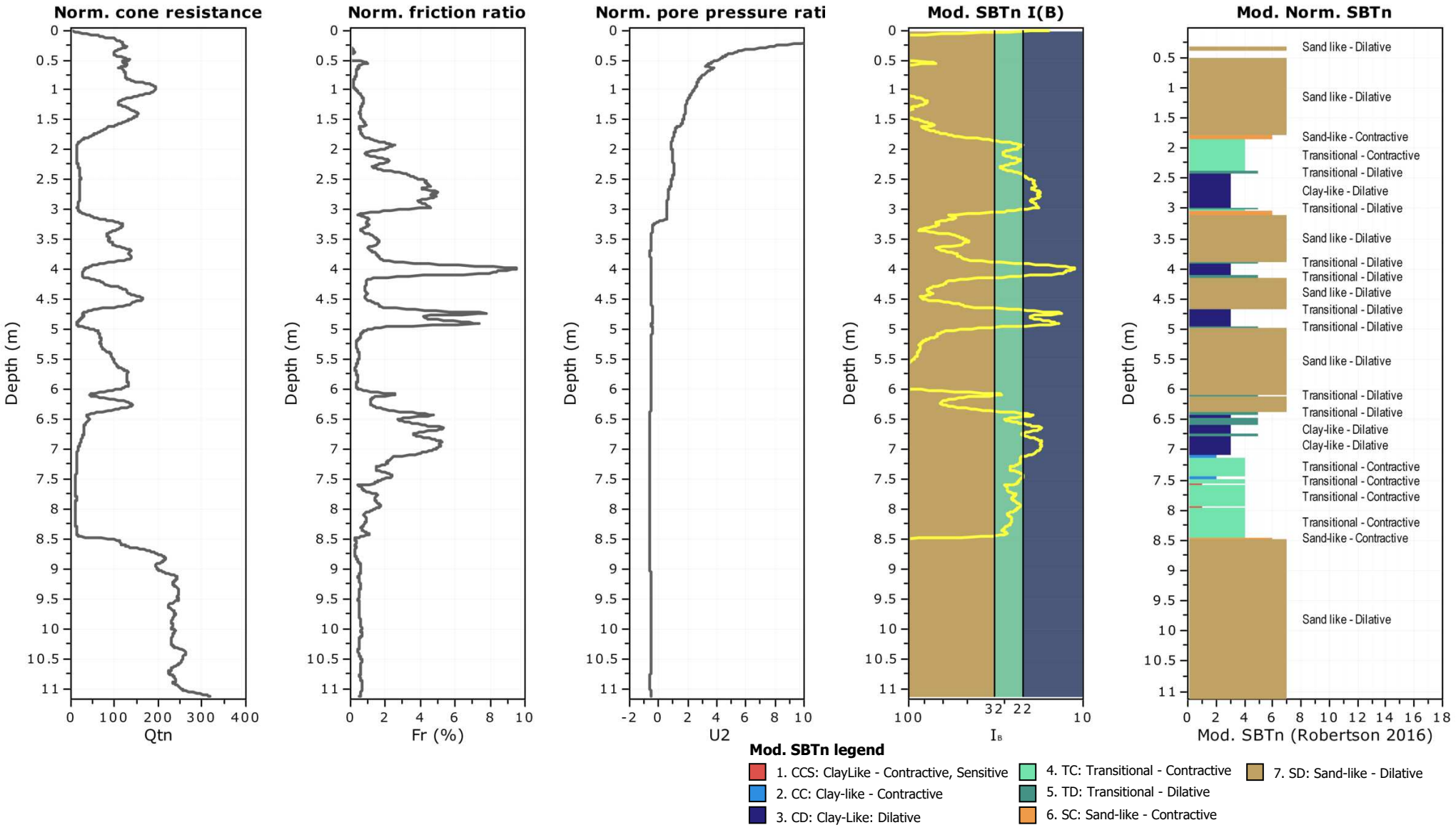




**Fuzzy classifiaction legend**

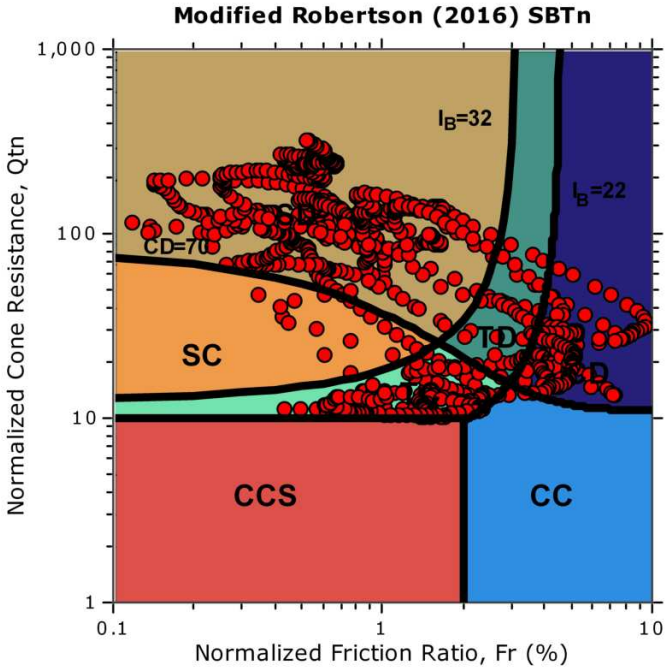
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

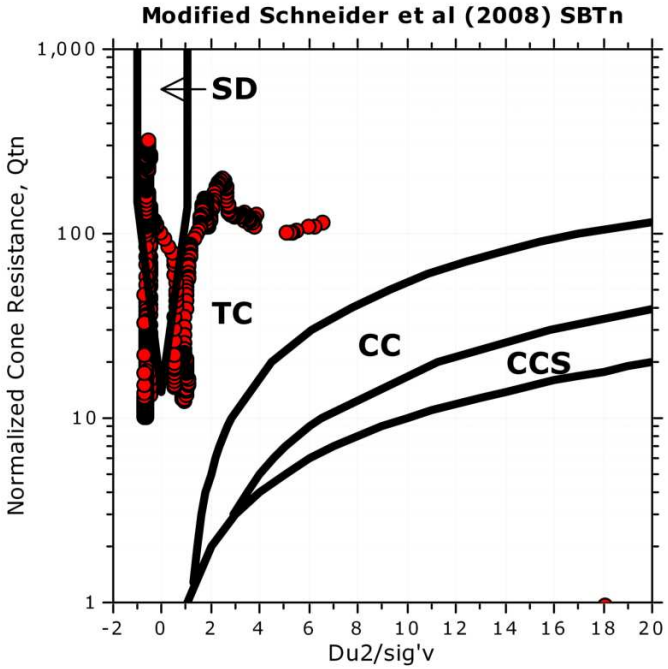

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

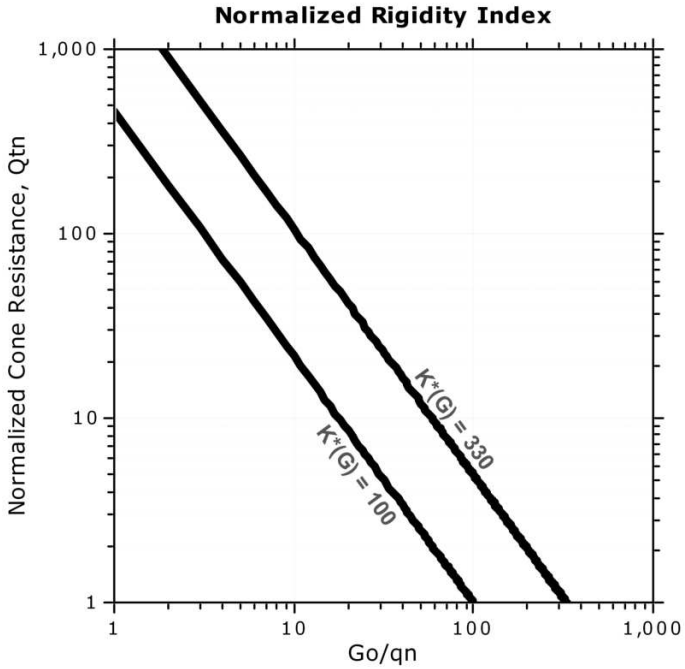

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Sand & silty sand
Sand
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Clay & silty clay
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
Clay
Sand & silty sand
Silty sand & sandy silt
Clay
Sand & silty sand
Silty sand & sandy silt
Silty sand & sandy silt
Clay
Clay
Clay & silty clay
Clay & silty clay
Clay & silty clay
Silty sand & sandy silt
Sand & silty sand
Sand & silty sand
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Sand like - Dilative
Sand-like - Contractive
Transitional - Contractive
Transitional - Dilative
Clay-like - Dilative
Transitional - Dilative
Sand like - Dilative
Transitional - Dilative
Transitional - Dilative
Sand like - Dilative
Transitional - Dilative
Transitional - Dilative
Sand like - Dilative
Transitional - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Dilative
Transitional - Contractive
Transitional - Contractive
Transitional - Contractive
Transitional - Contractive
Sand-like - Contractive
Sand like - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

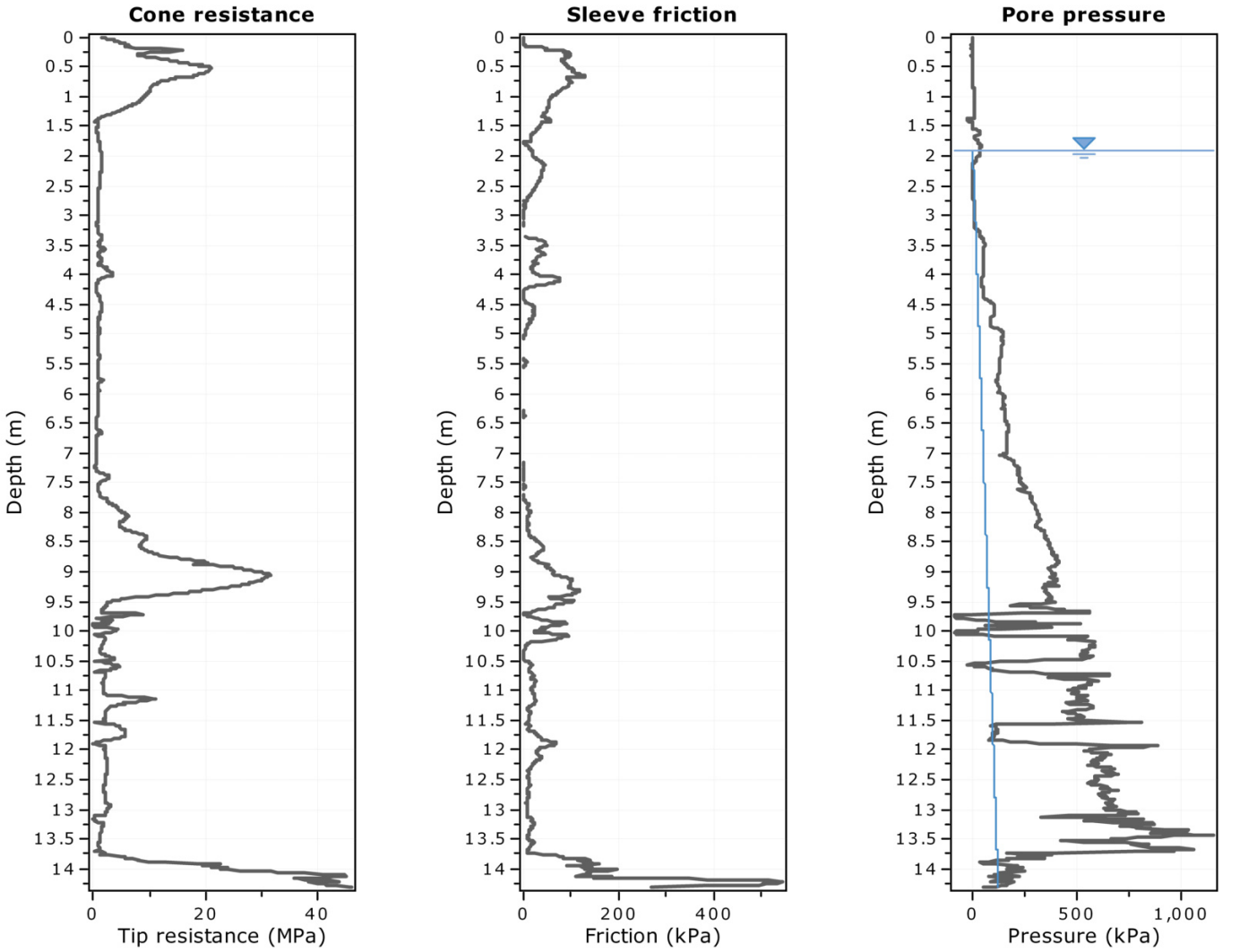


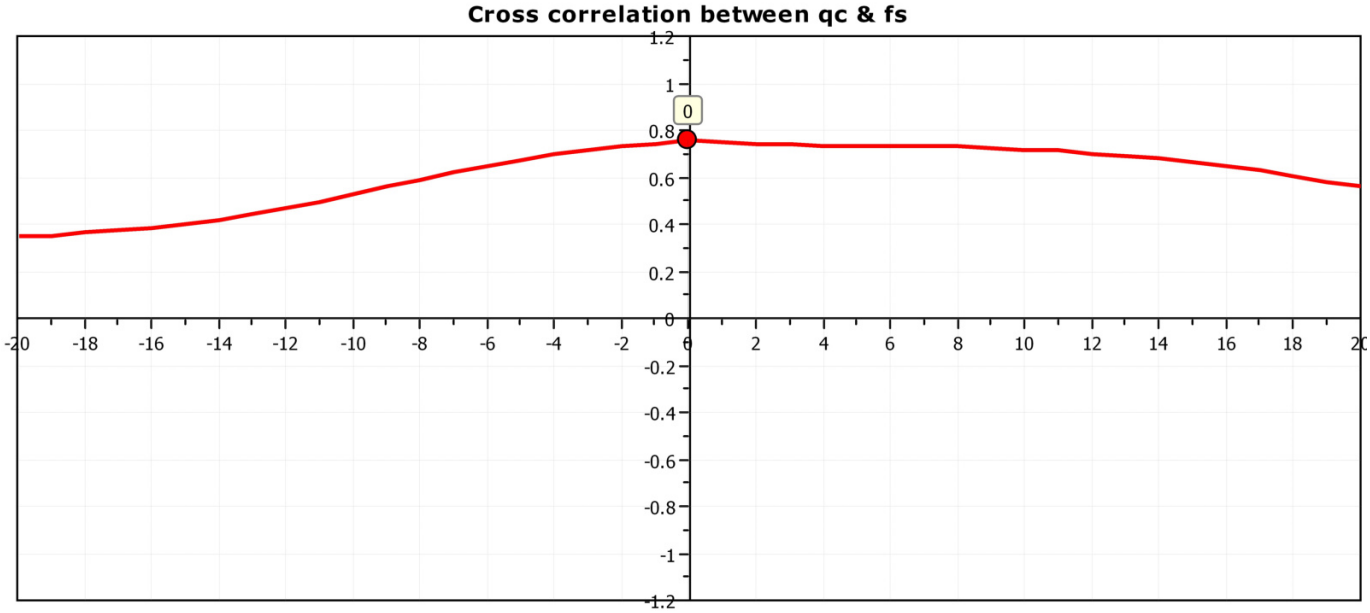




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

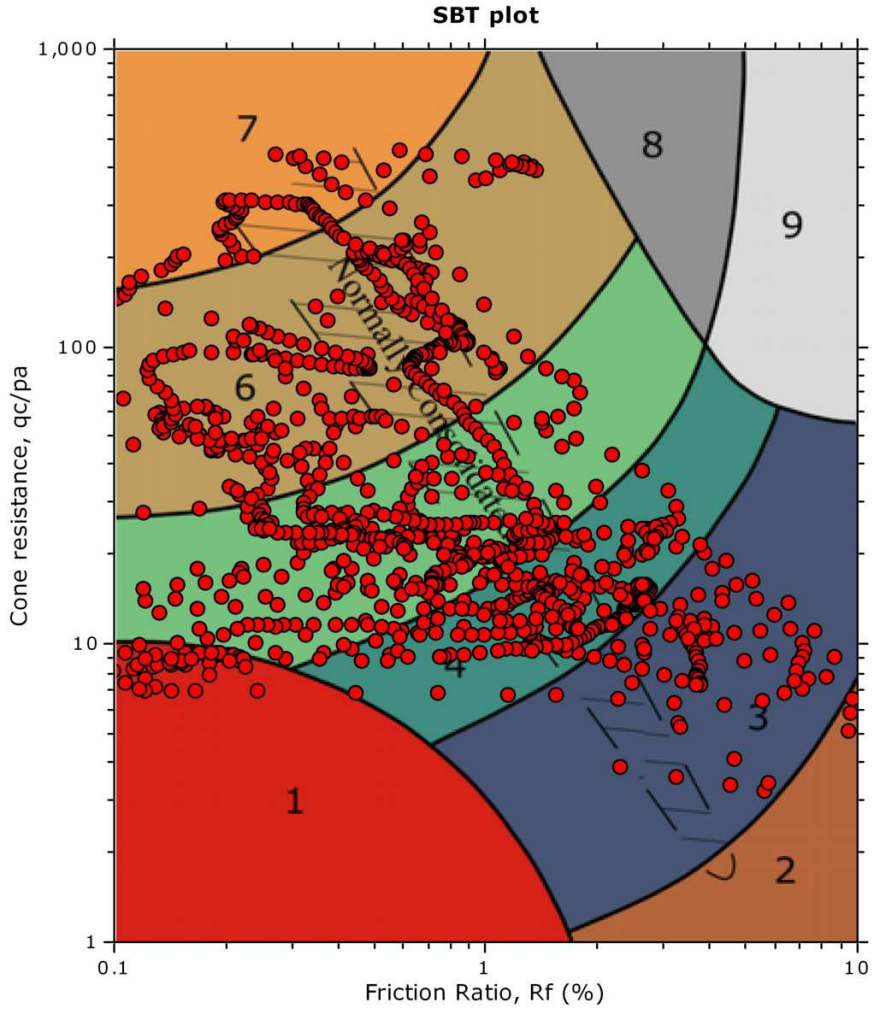
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

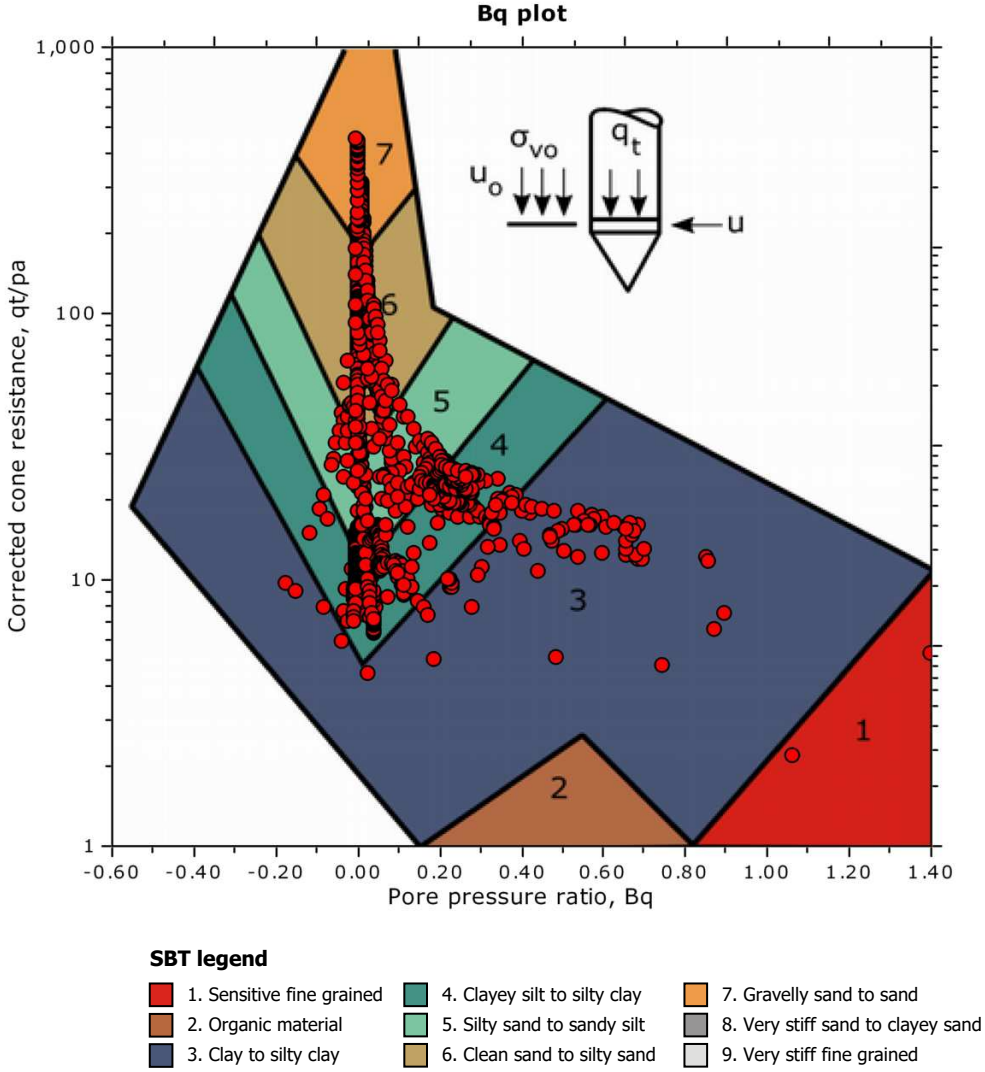



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

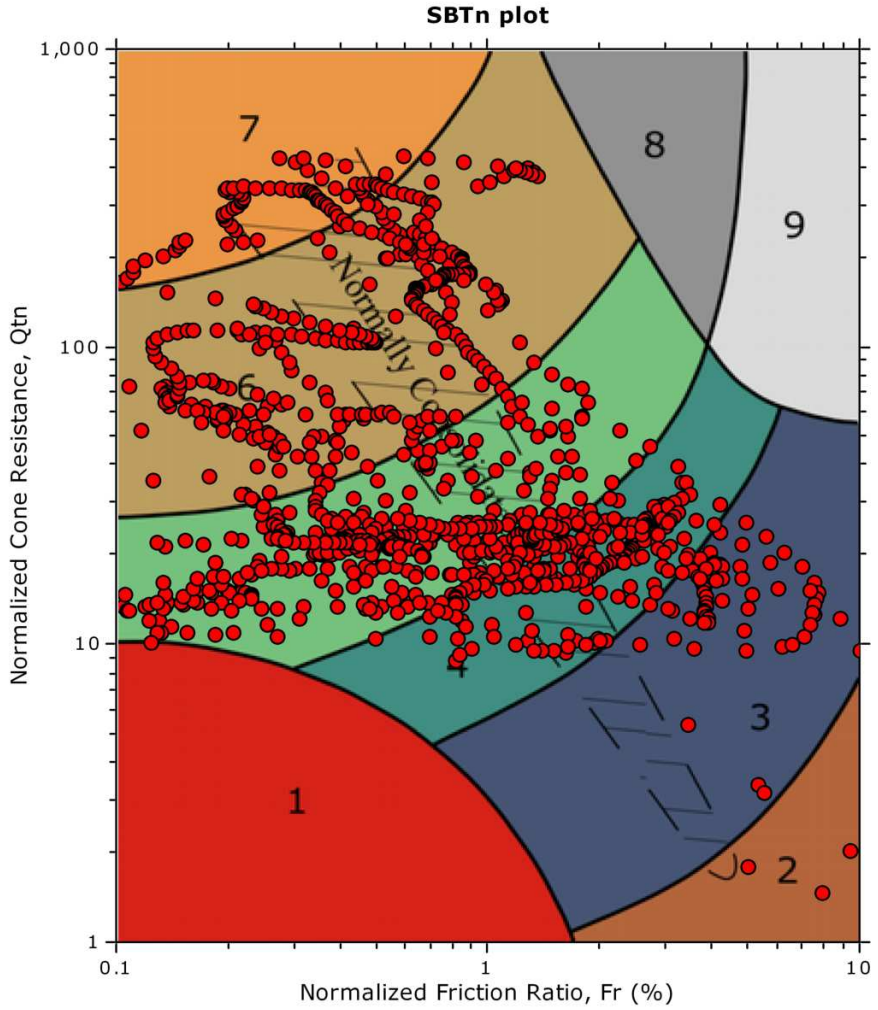


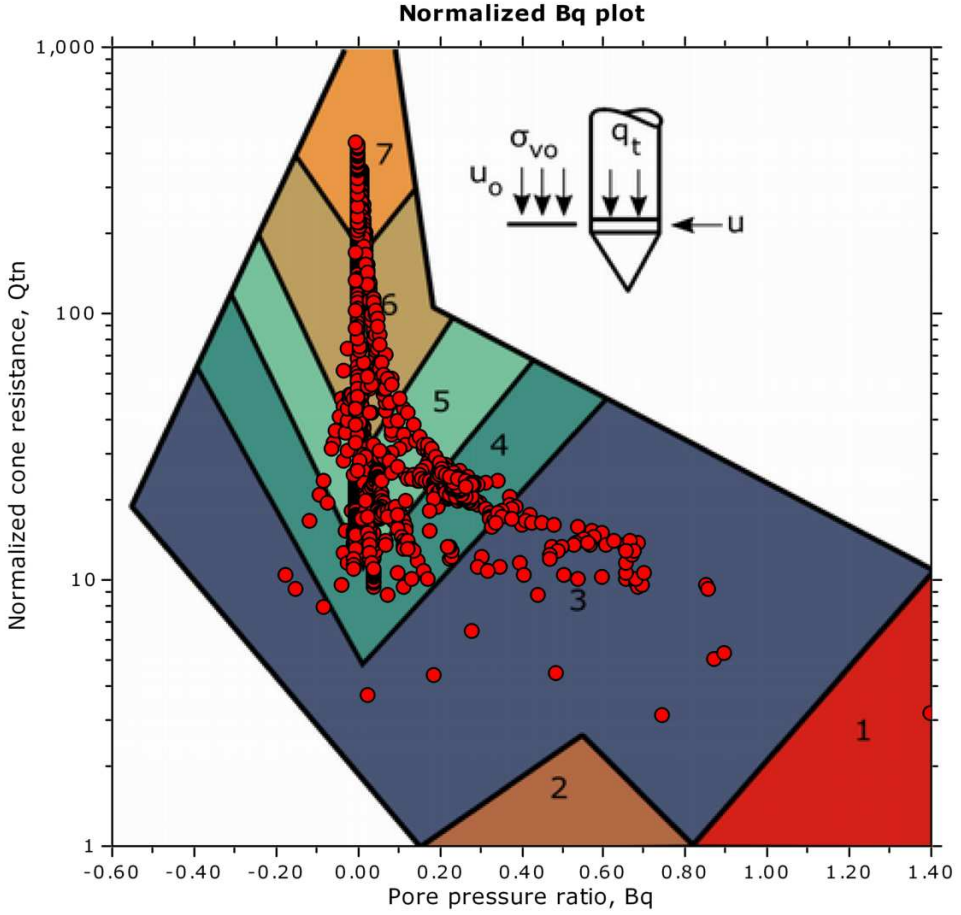




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

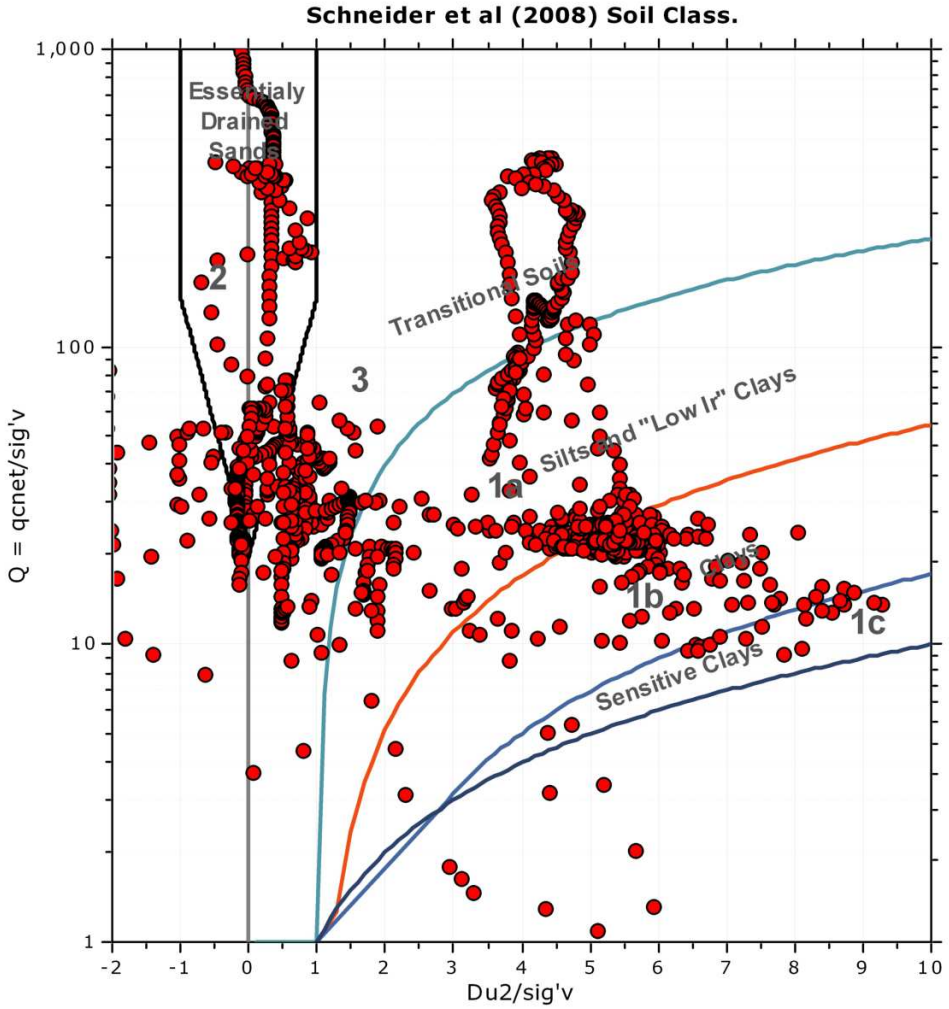


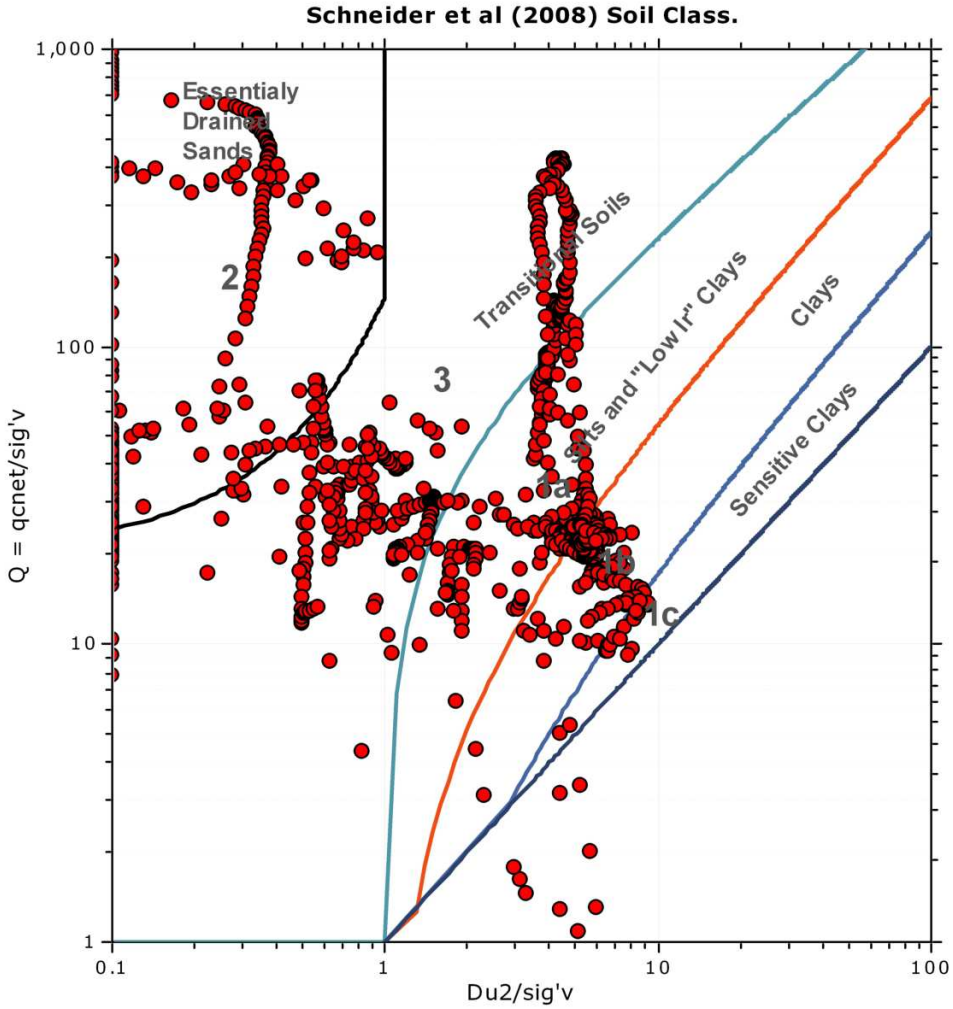



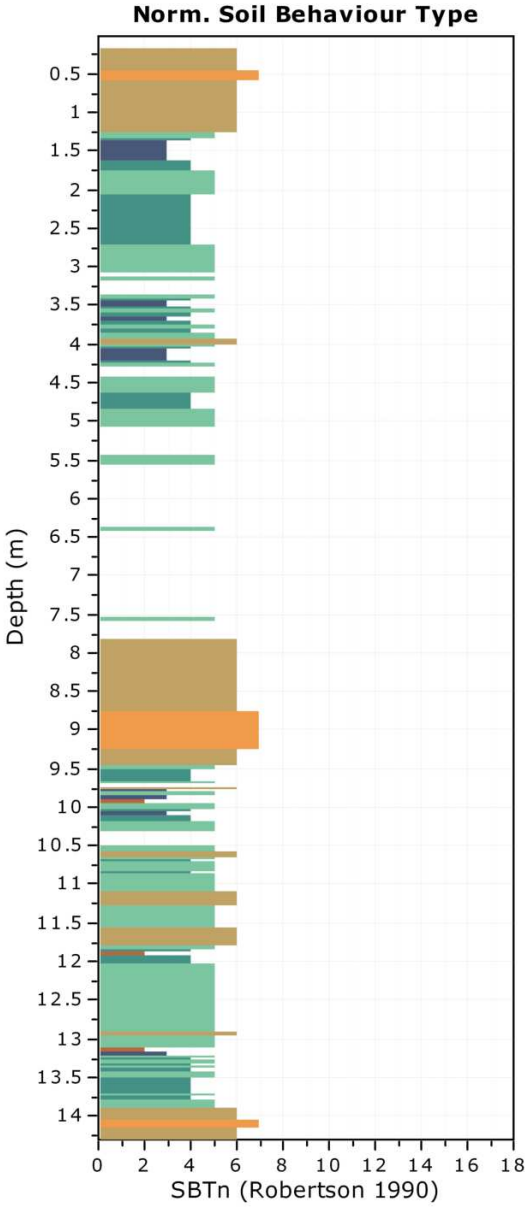

**SBTn legend**

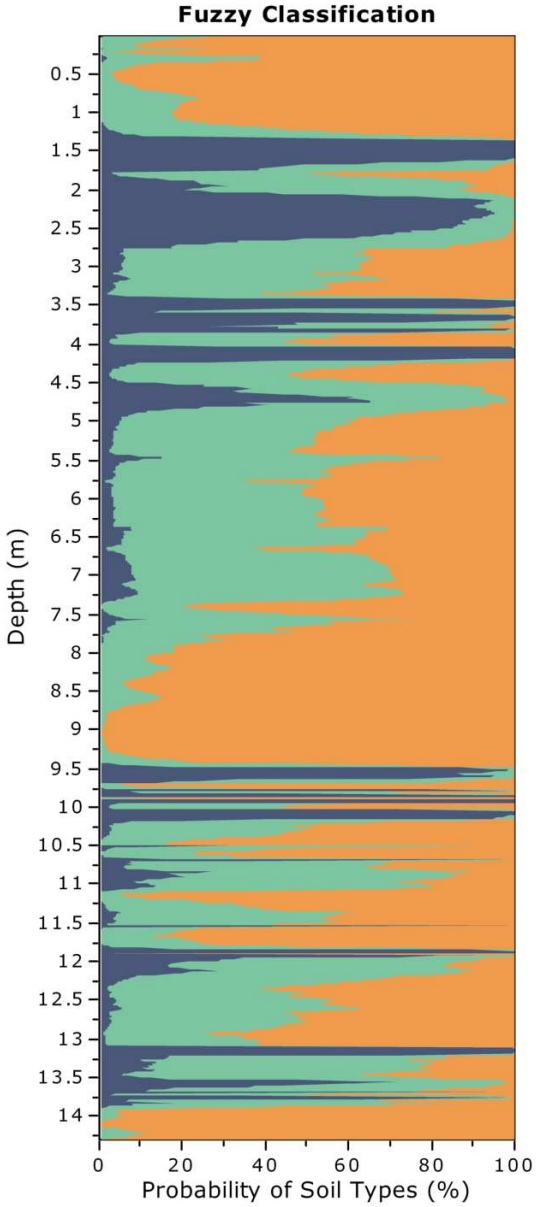
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



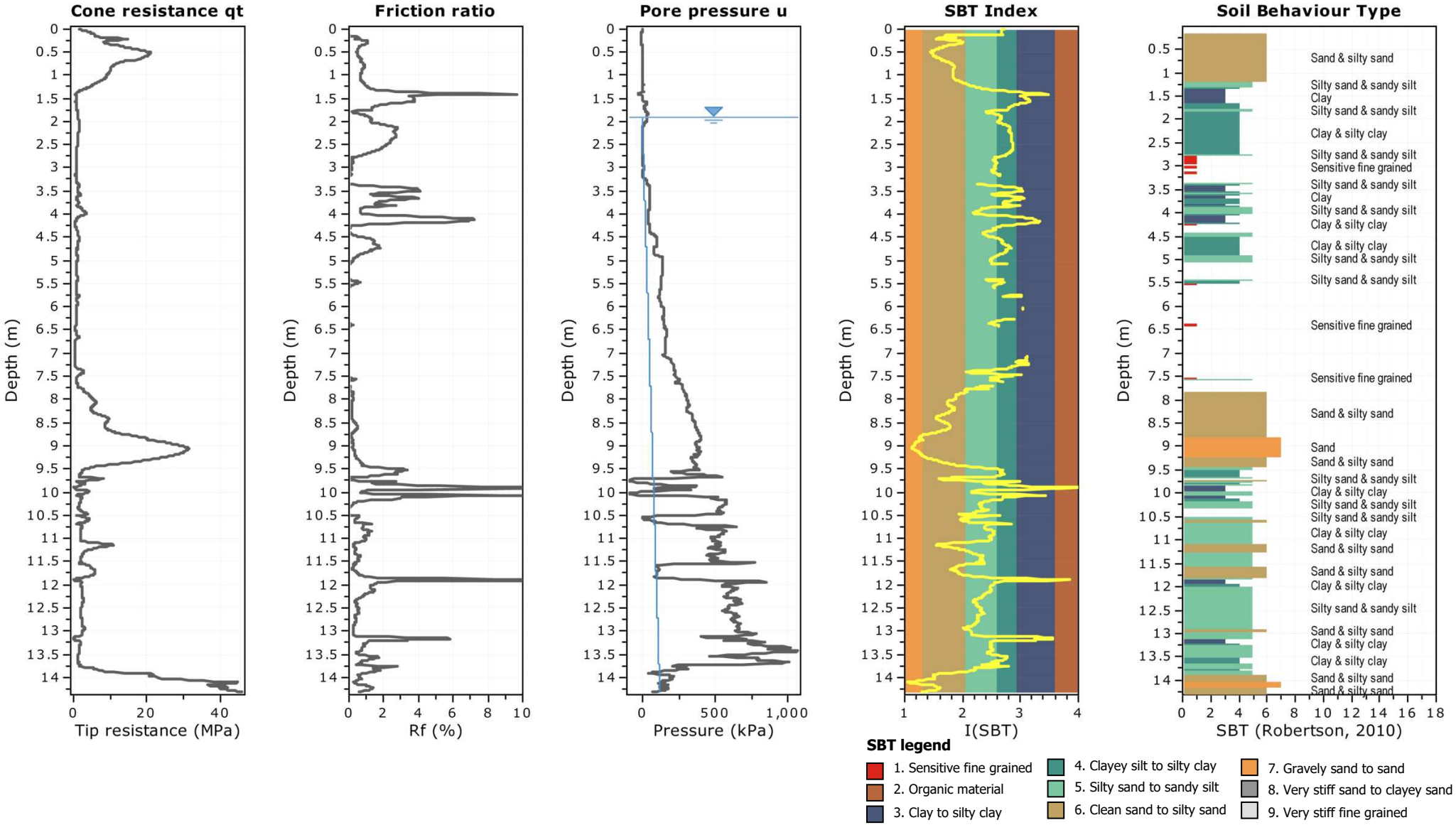



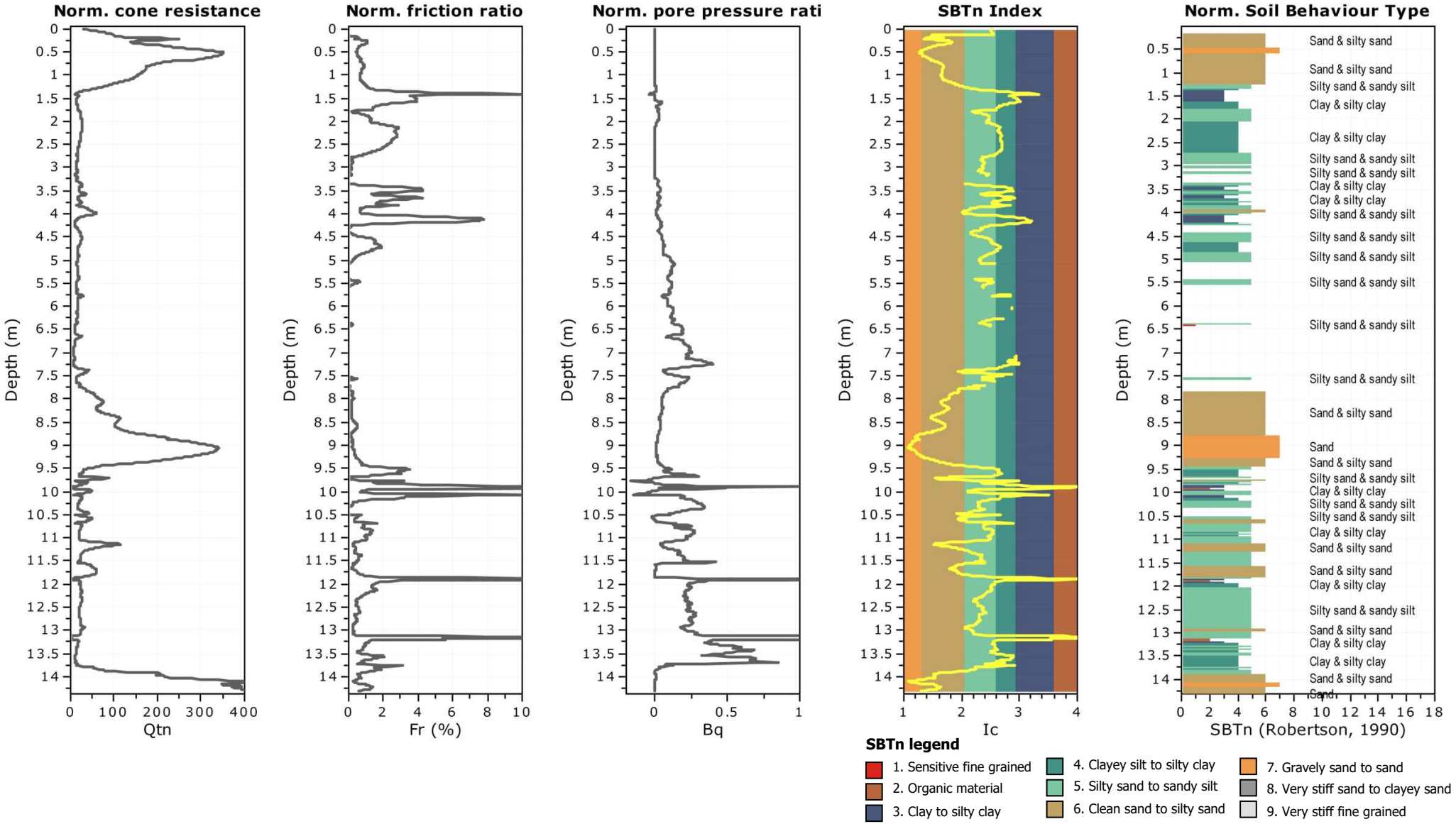


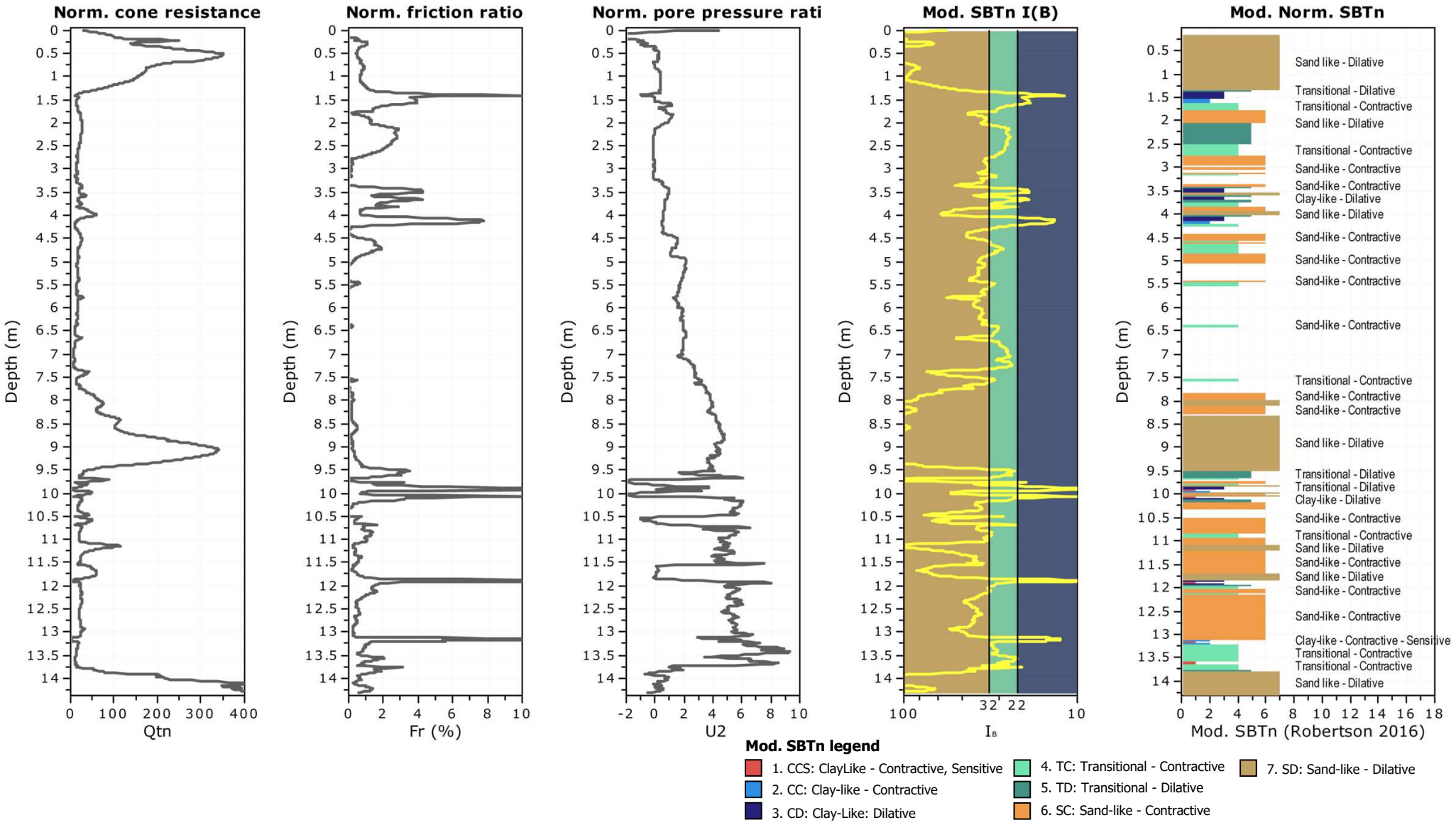




**Fuzzy classifiaction legend**

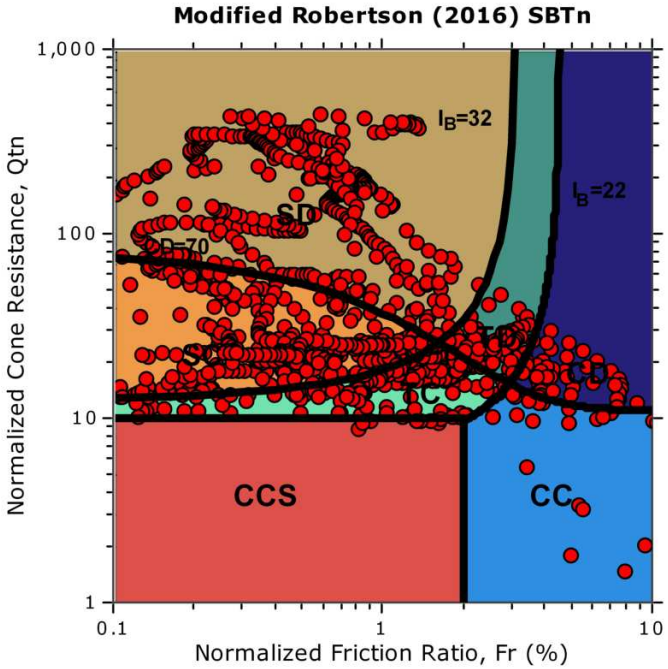
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

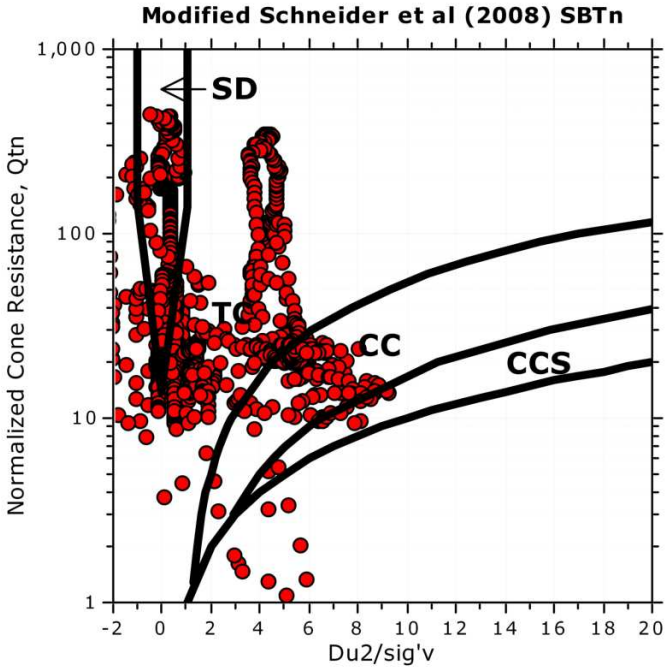

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
Sensitive fine grained
Sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

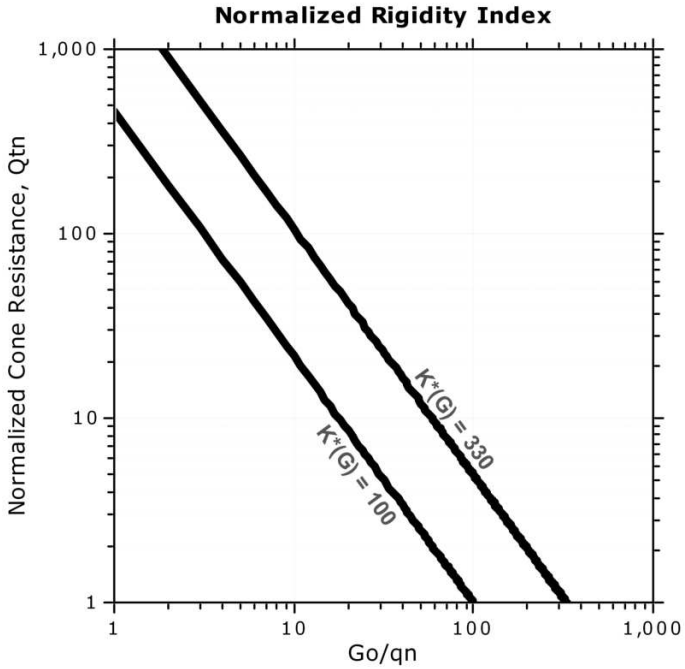

Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Depth (m)
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

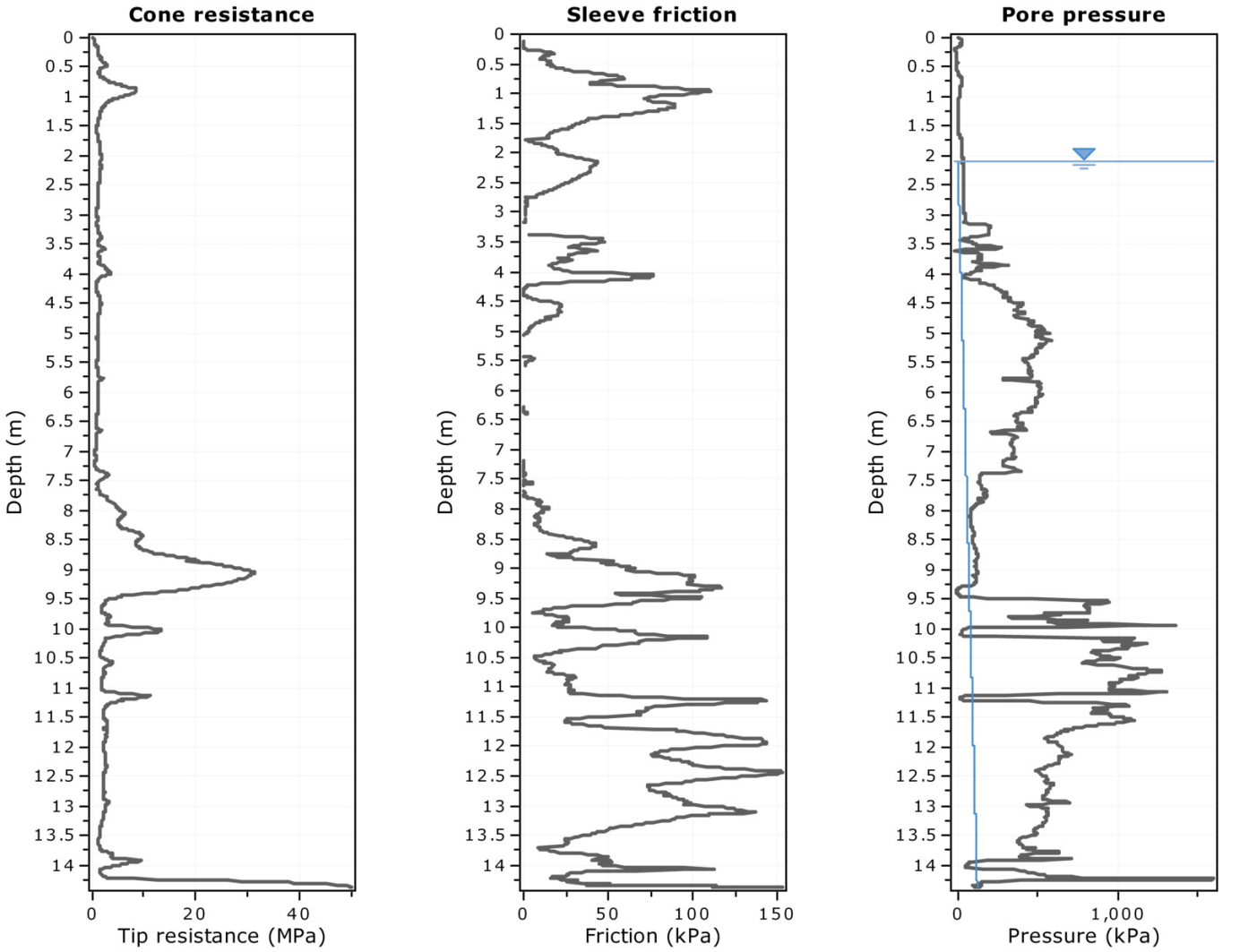


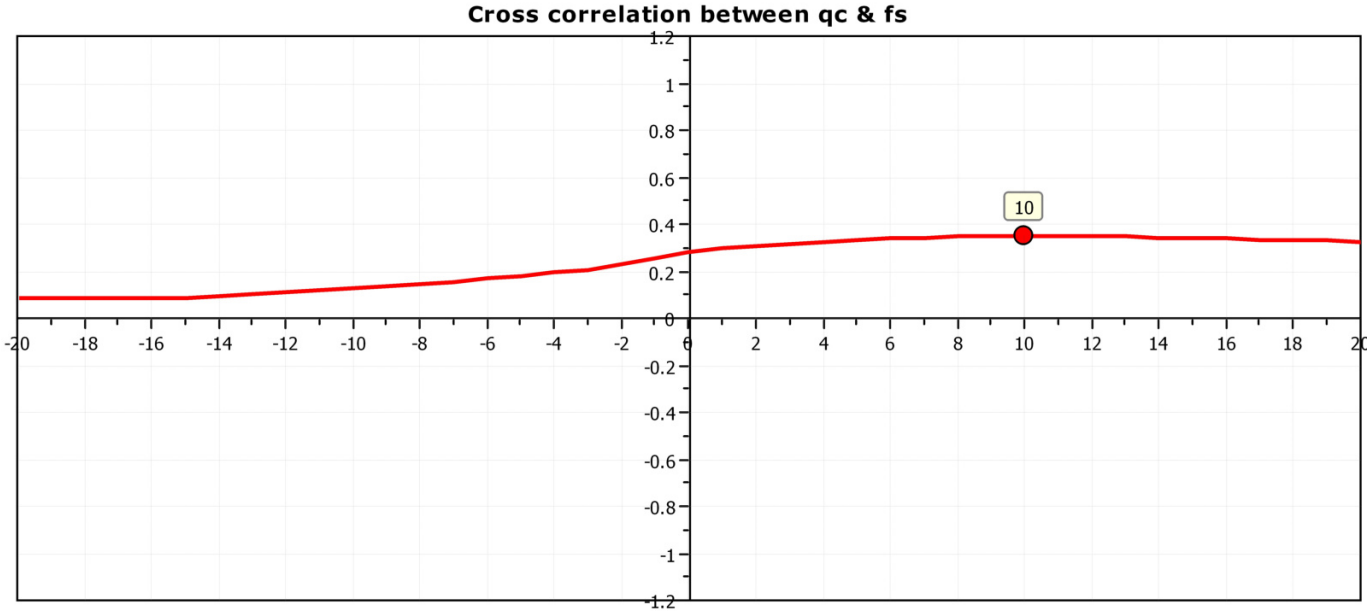




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

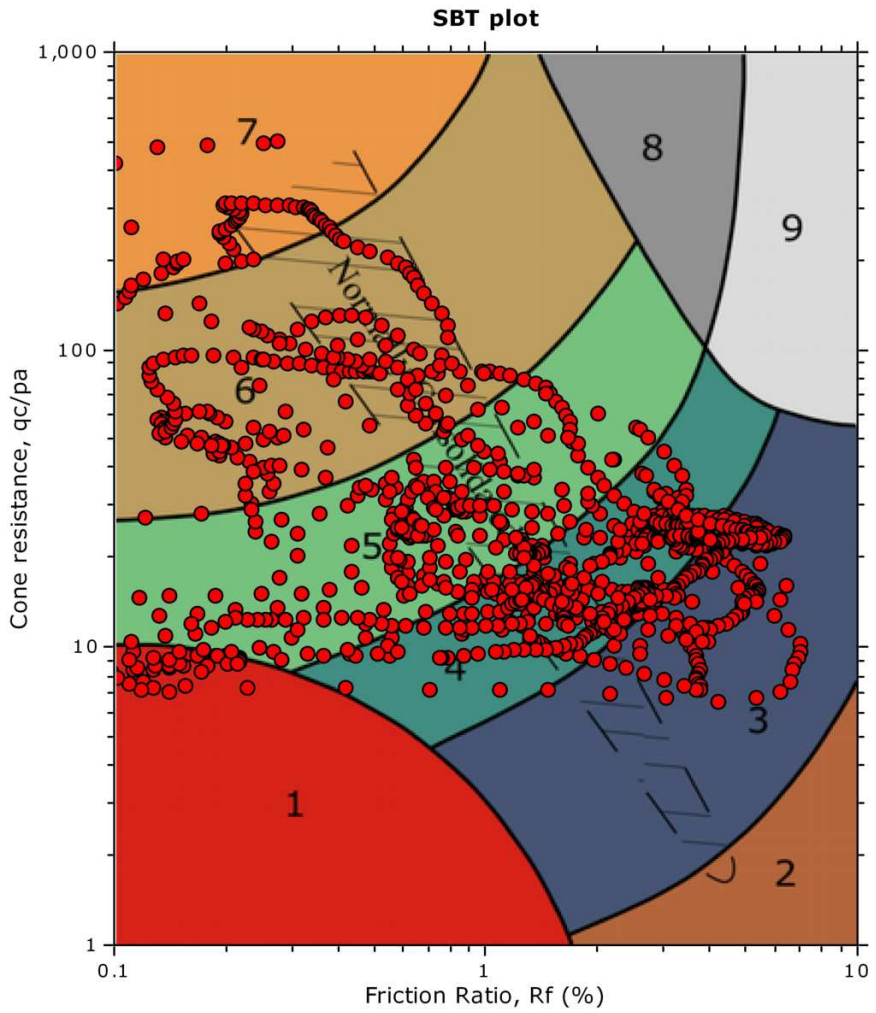
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

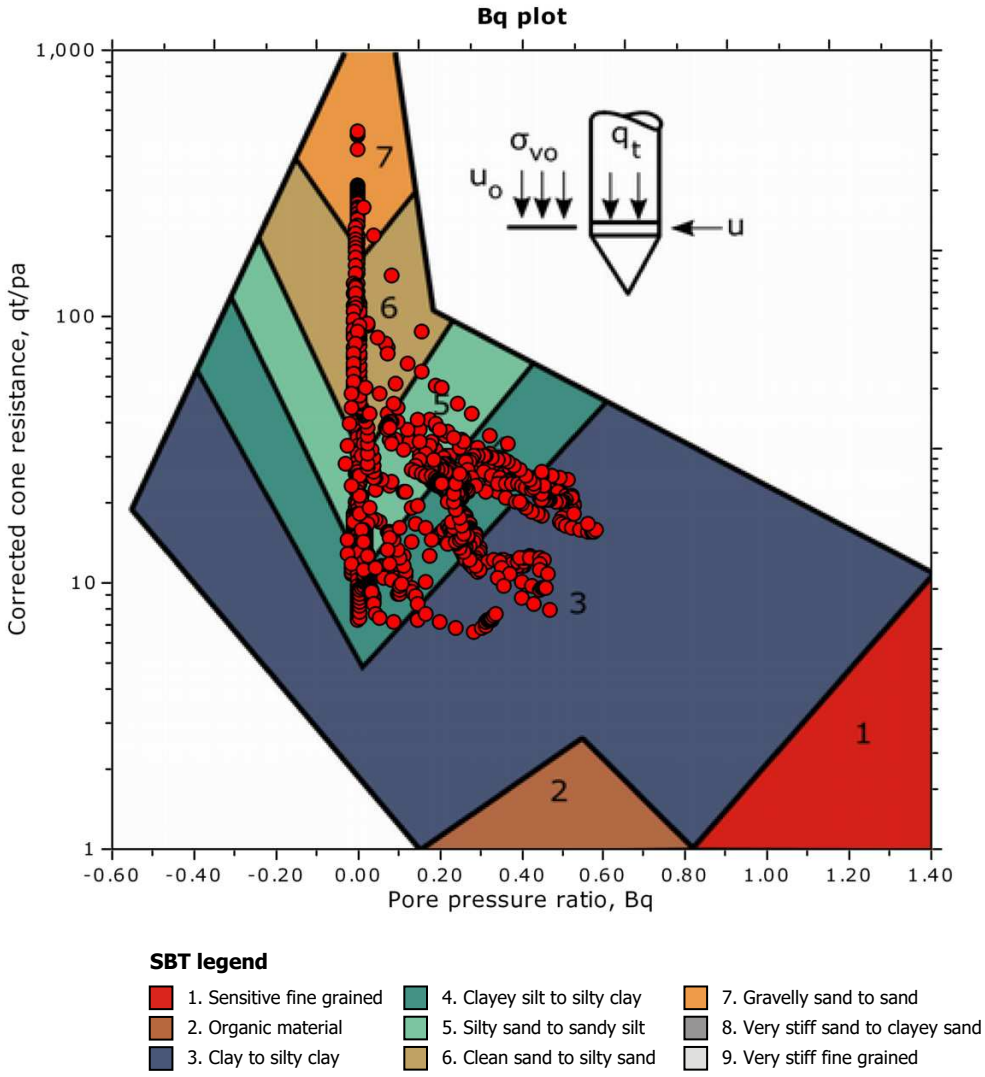



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

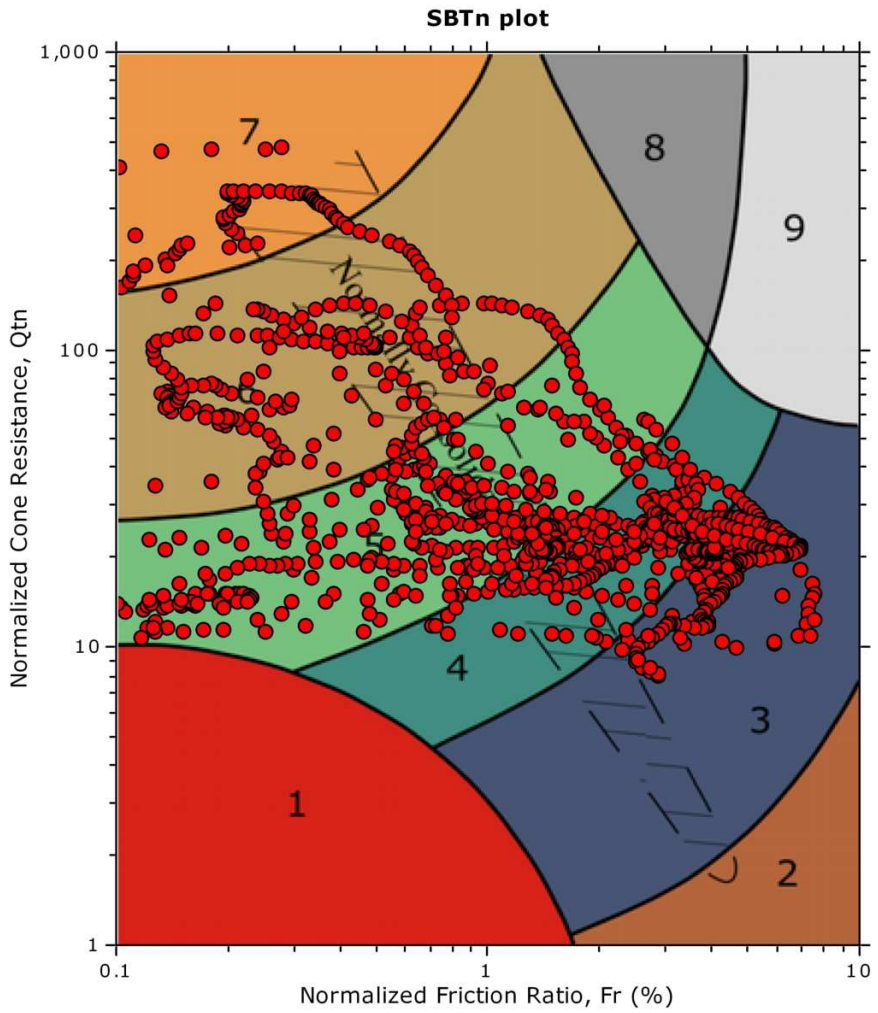


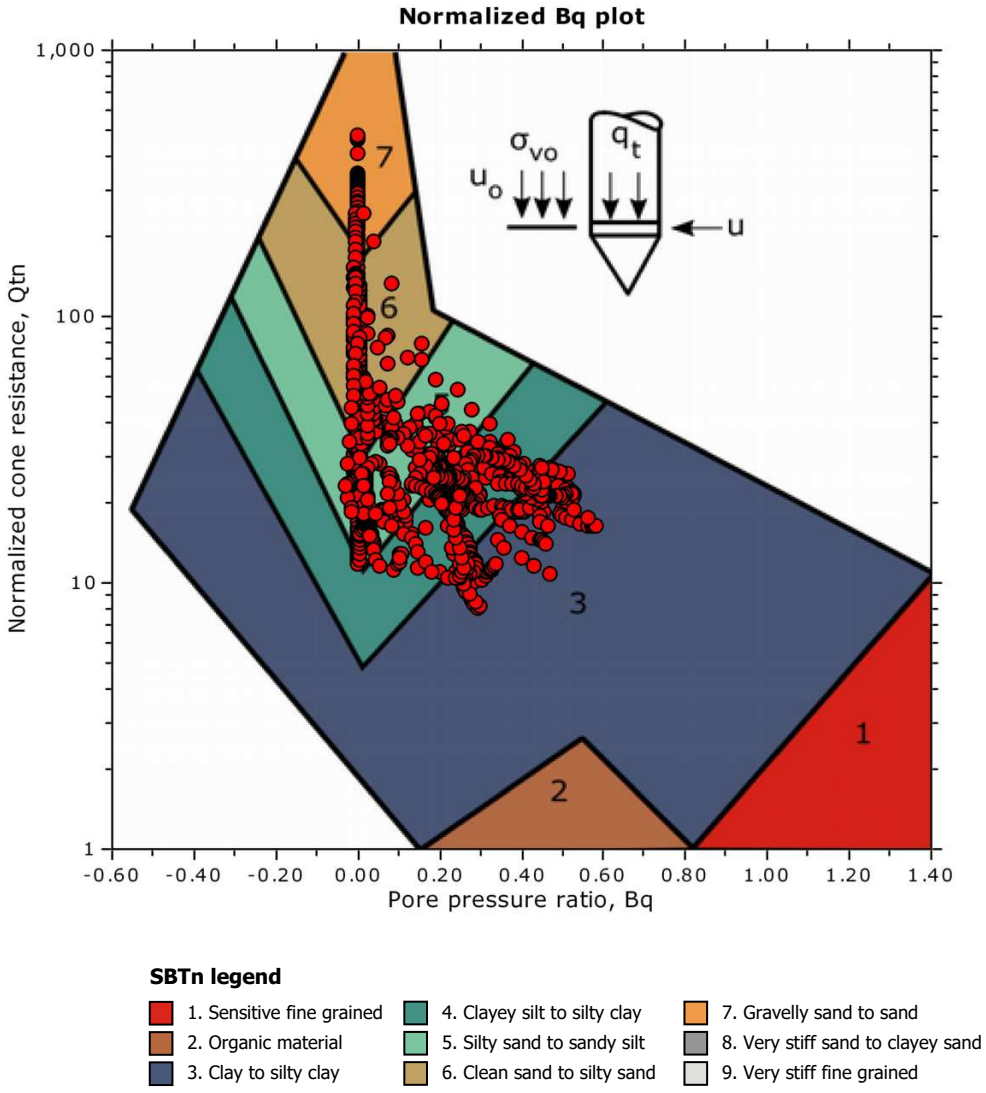
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
Normally consolidated
1
2
3
4
5
6
7
8
9


Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
3
5
6
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

## SBT - Bq plots (normalized)

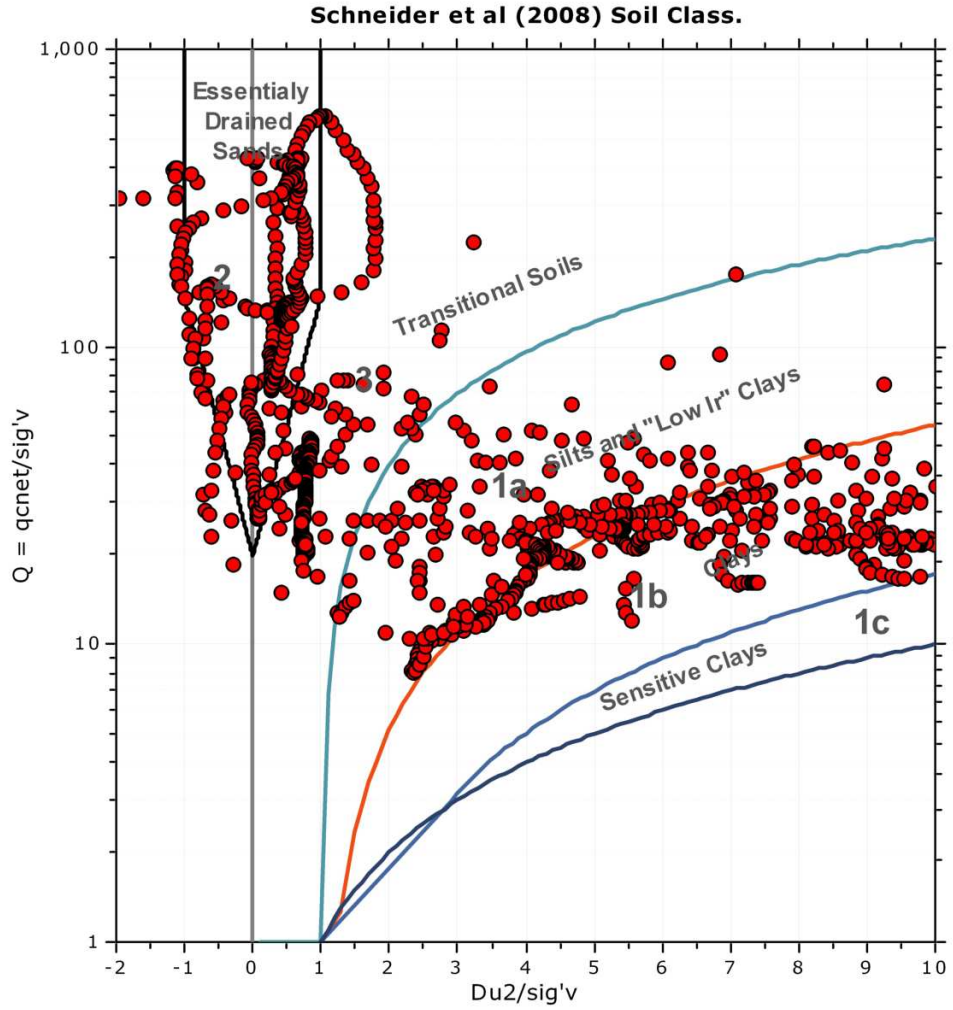


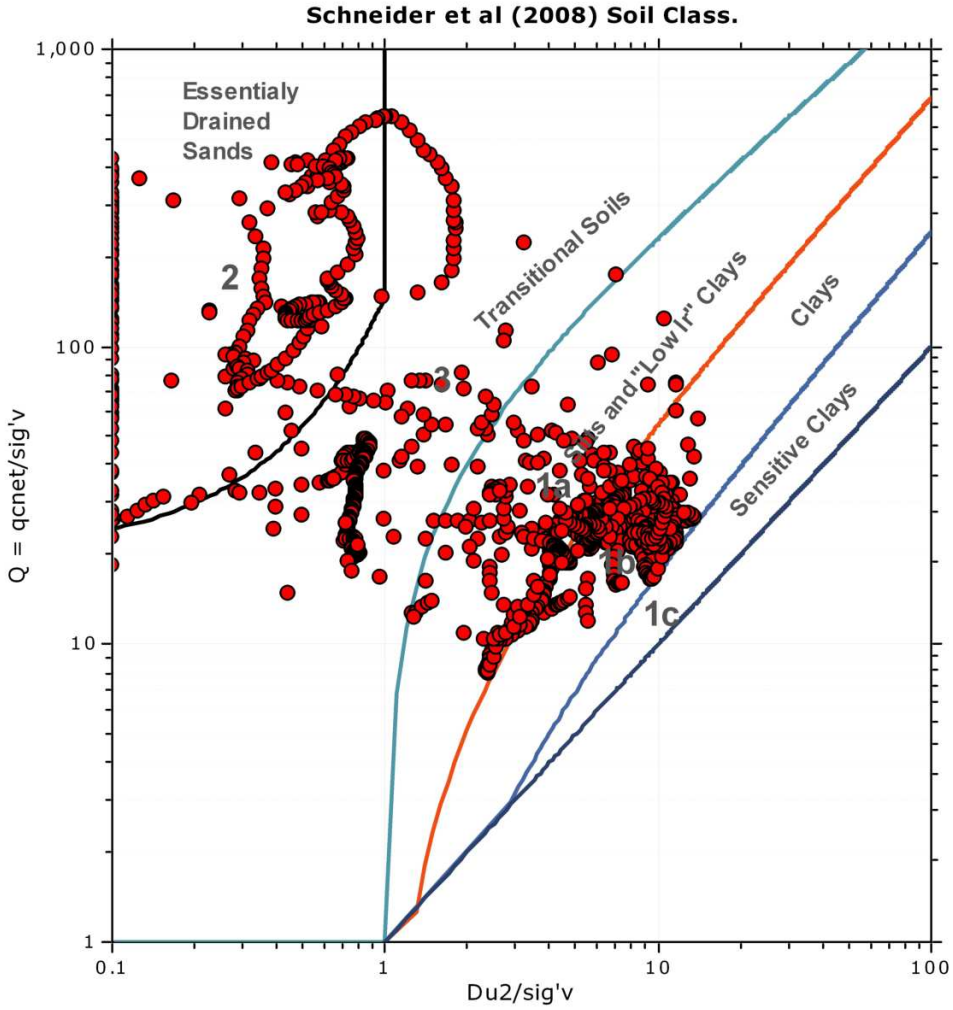



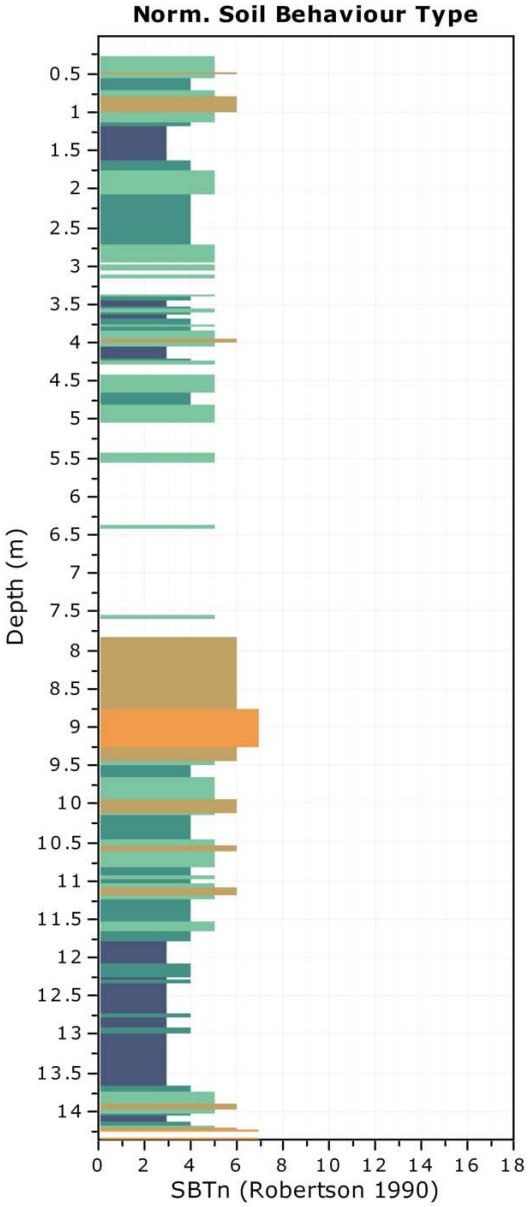

**SBTn legend**

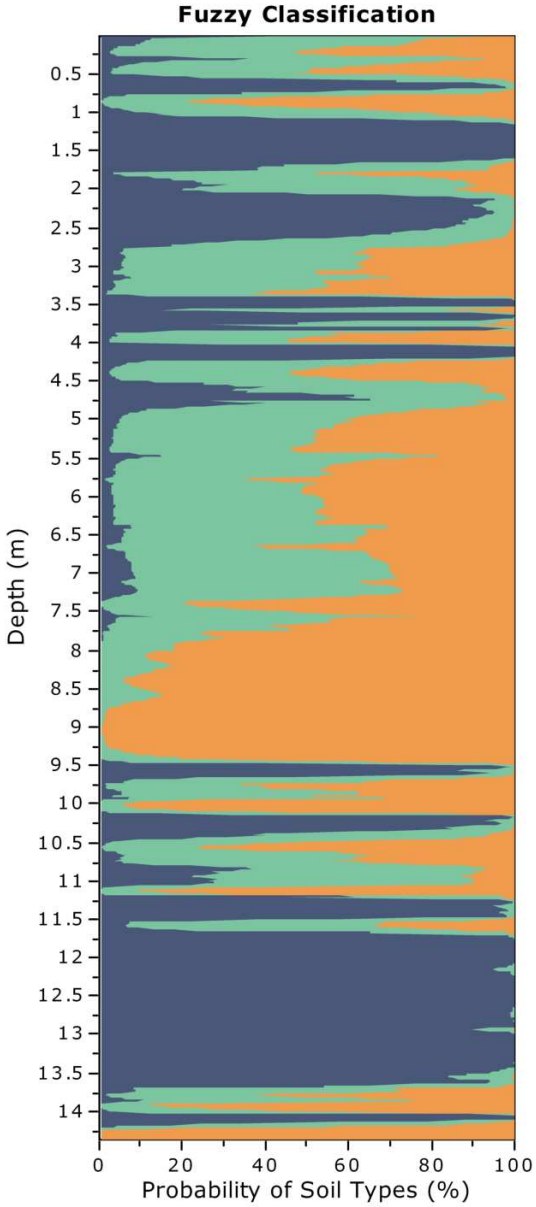
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



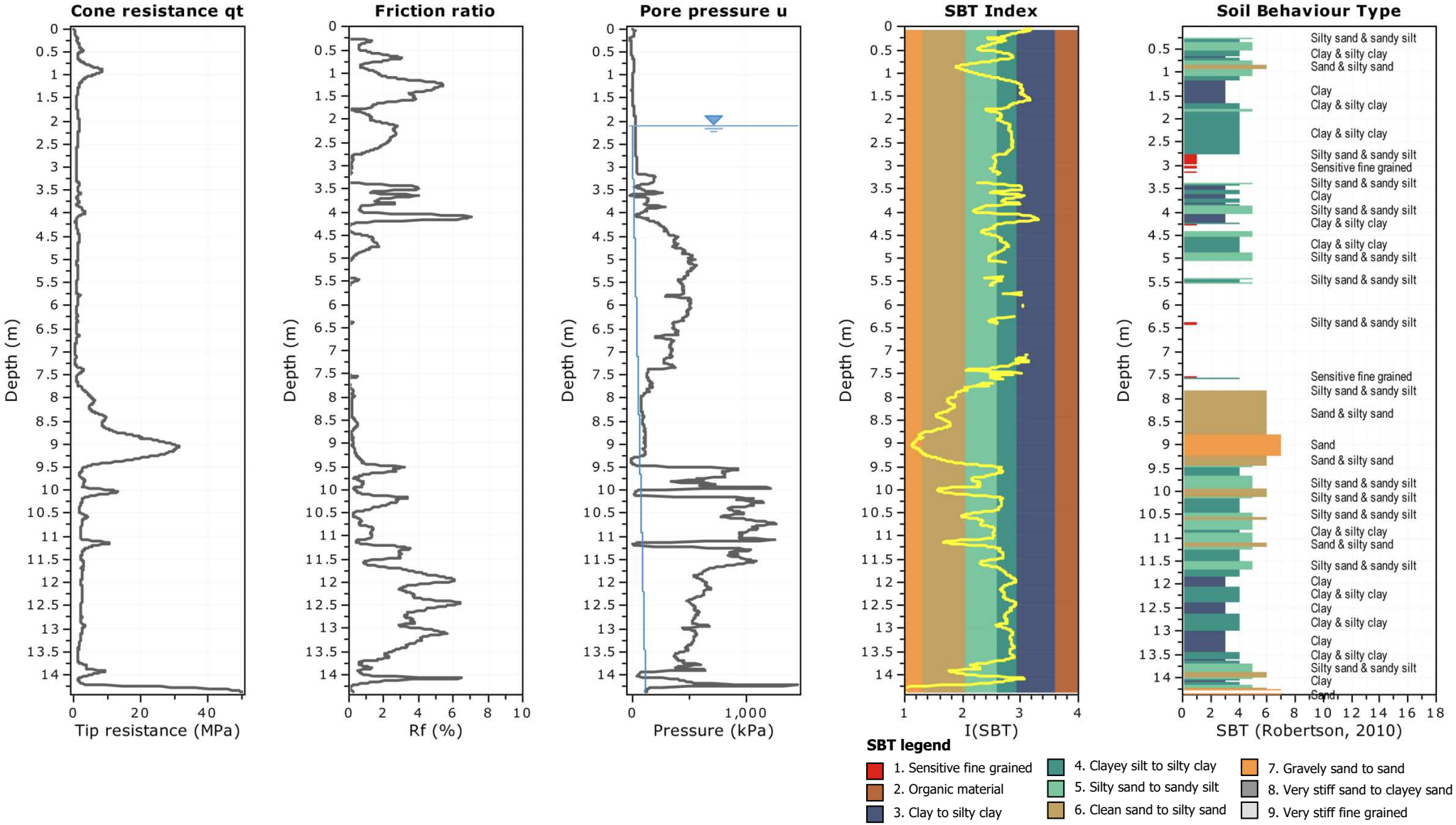



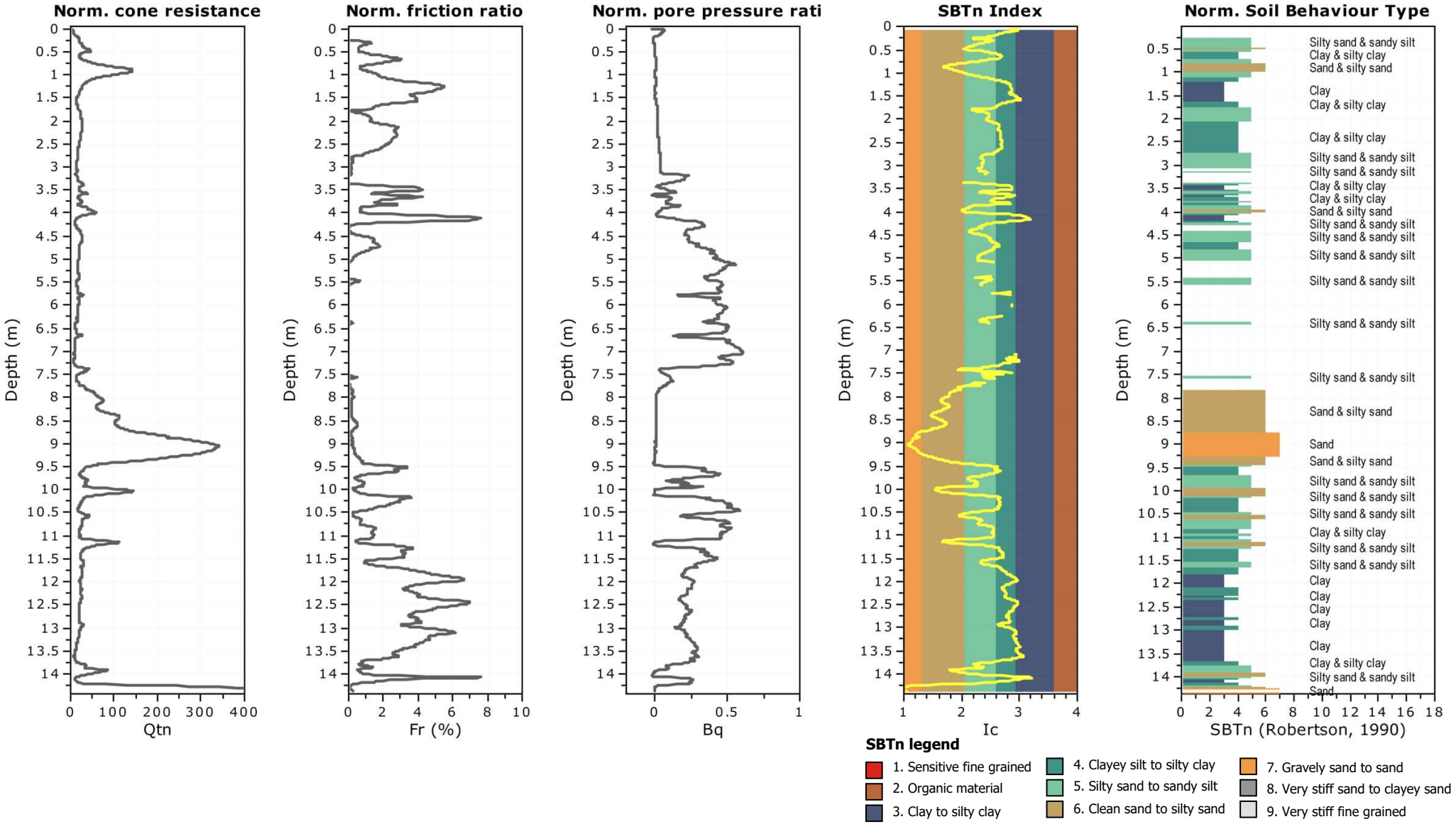


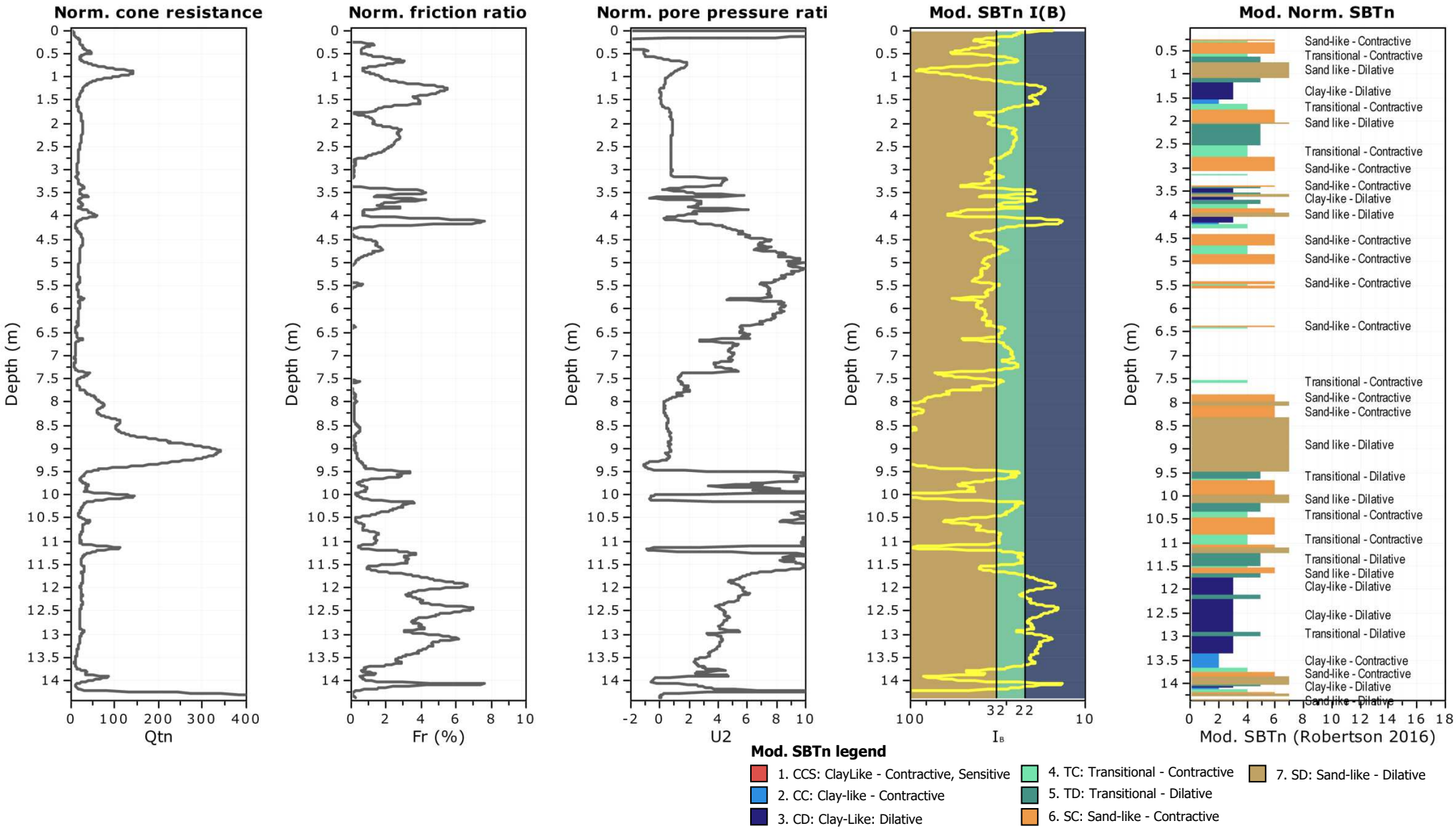




**Fuzzy classifiaction legend**

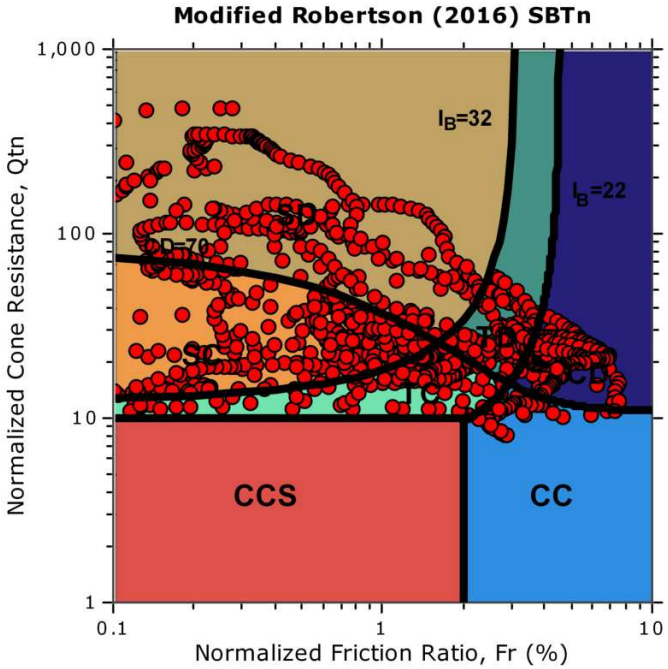
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

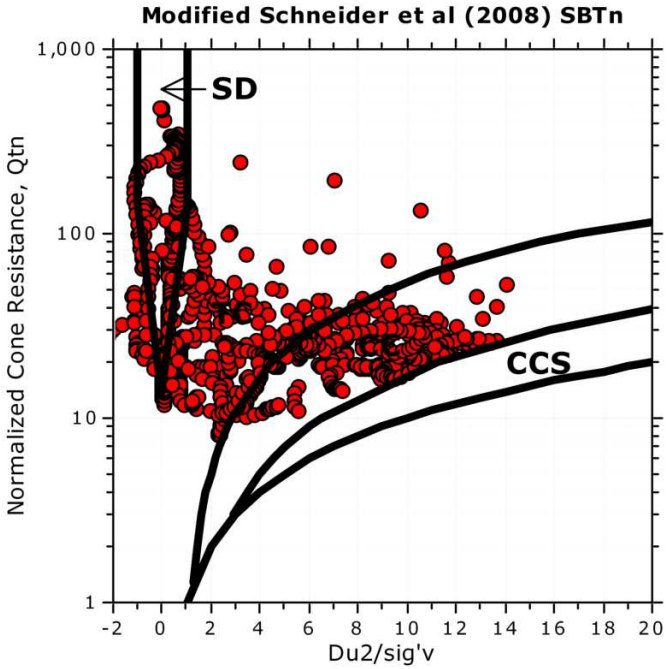

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Silty sand & sandy silt
Clay & silty clay
Sand & silty sand
Clay
Sensitive fine grained
Sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

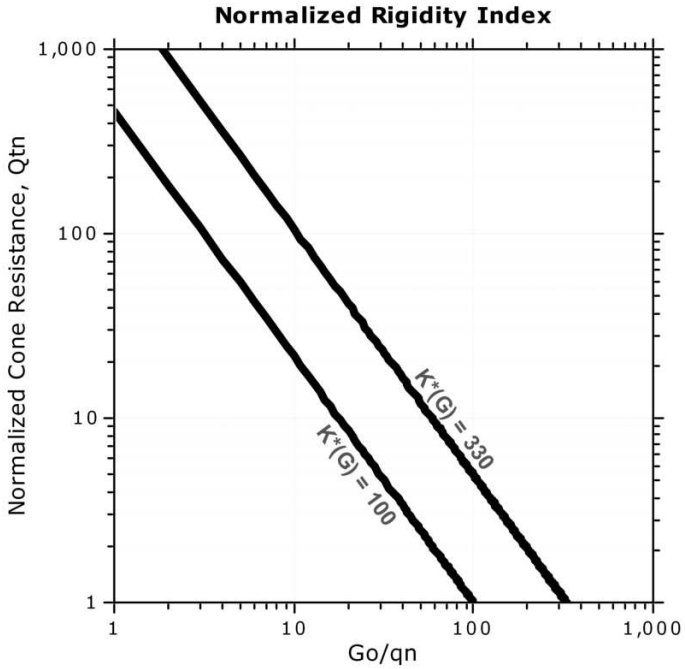

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Silty sand & sandy silt
Clay & silty clay
Sand & silty sand
Clay
Sand
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

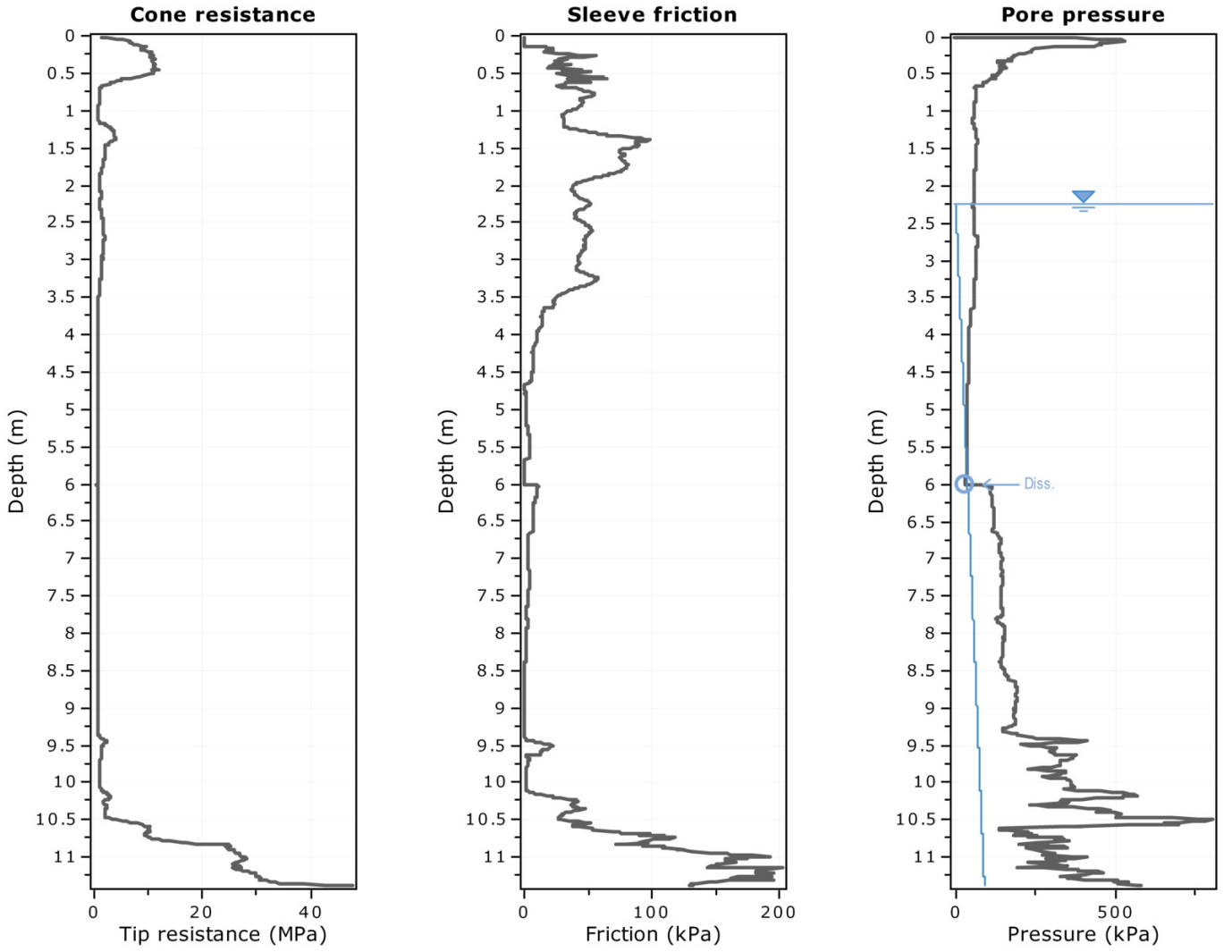


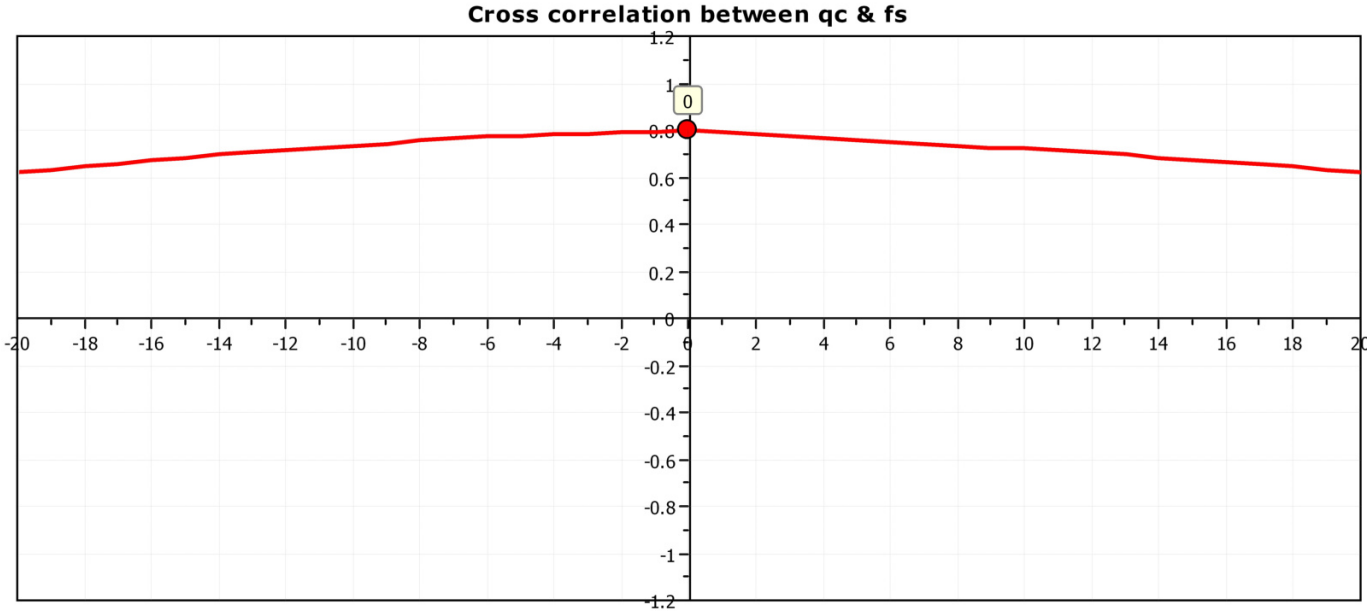




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

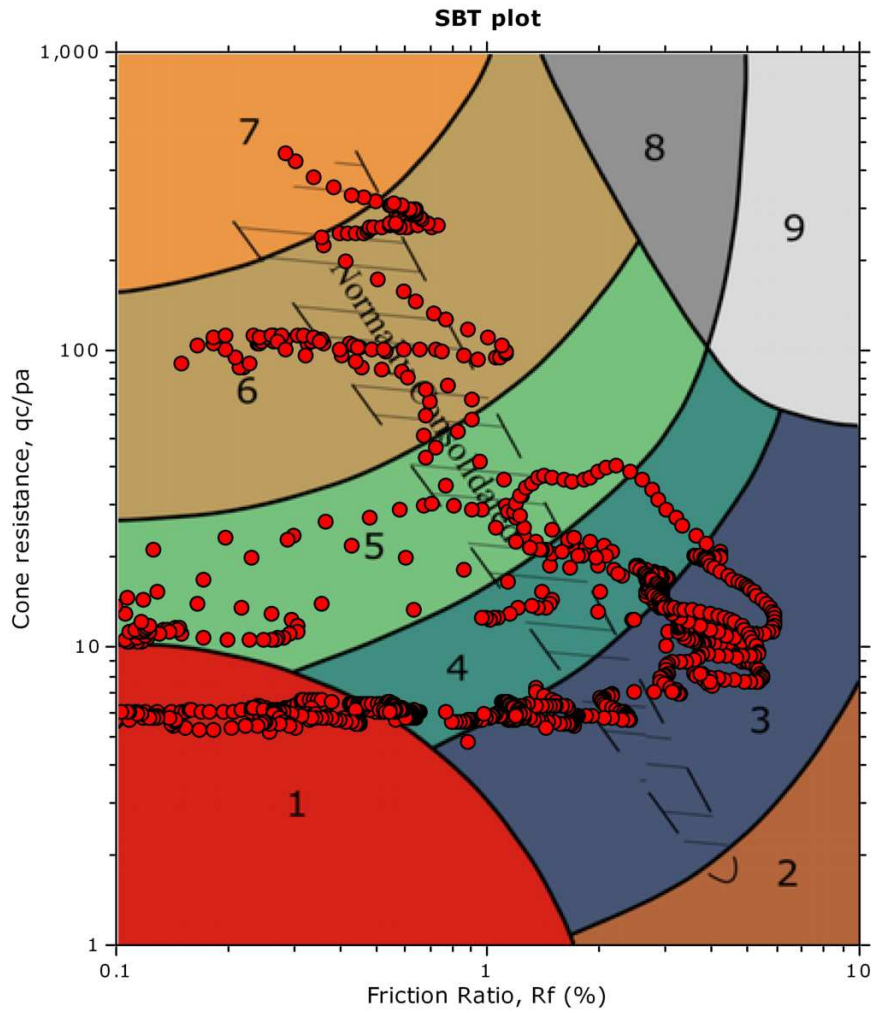
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

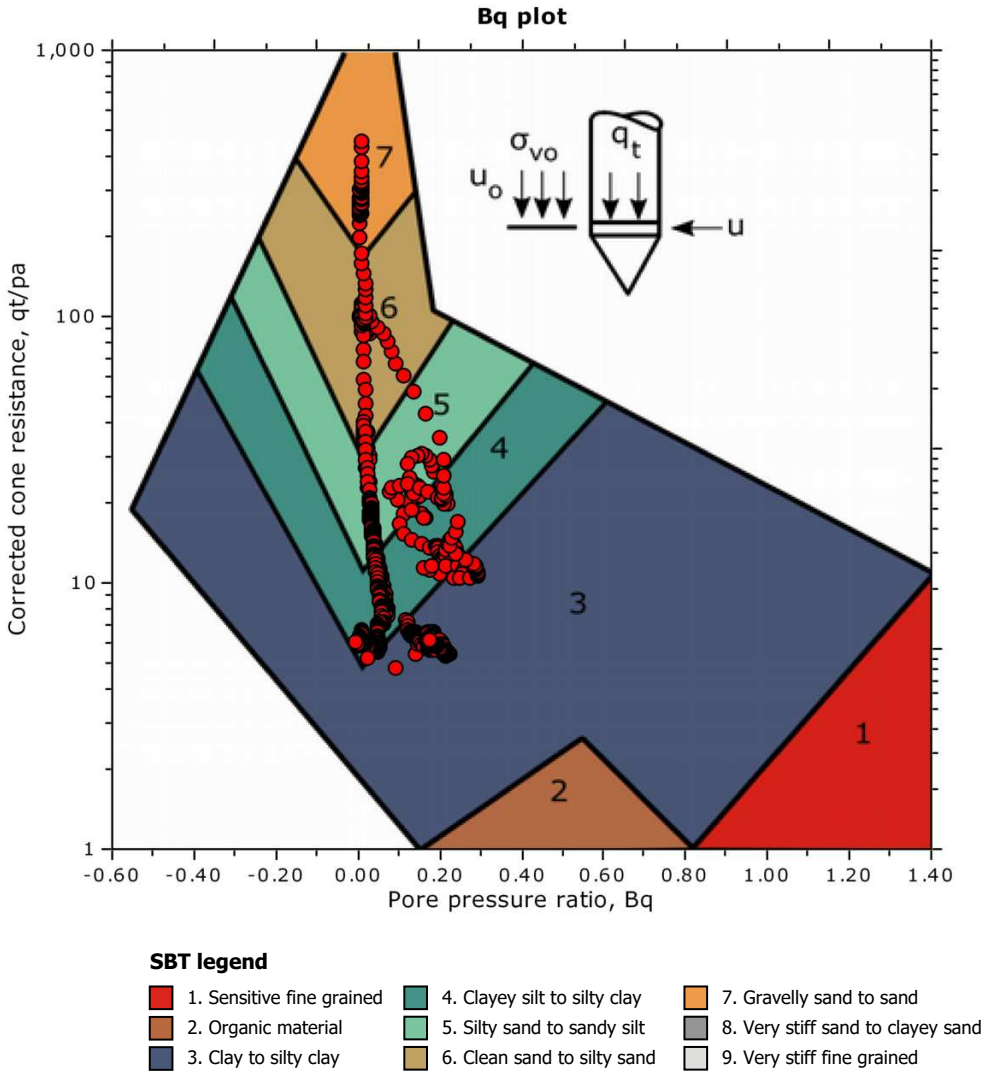



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

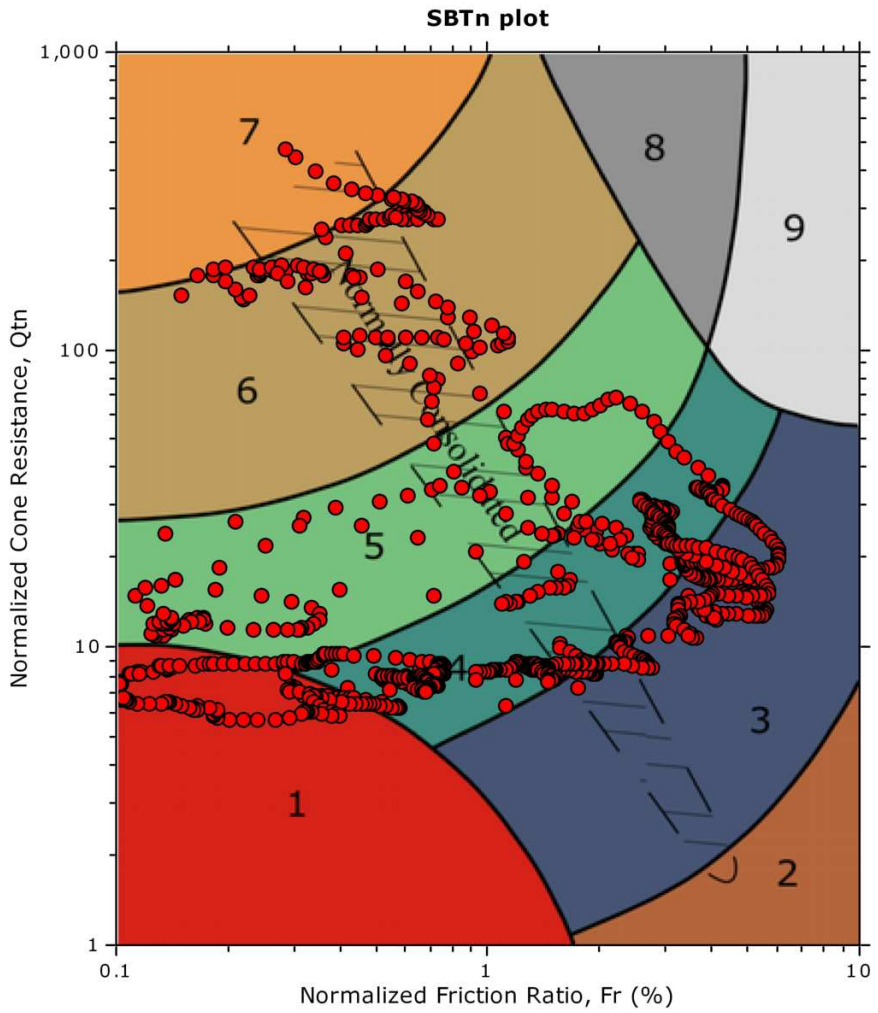


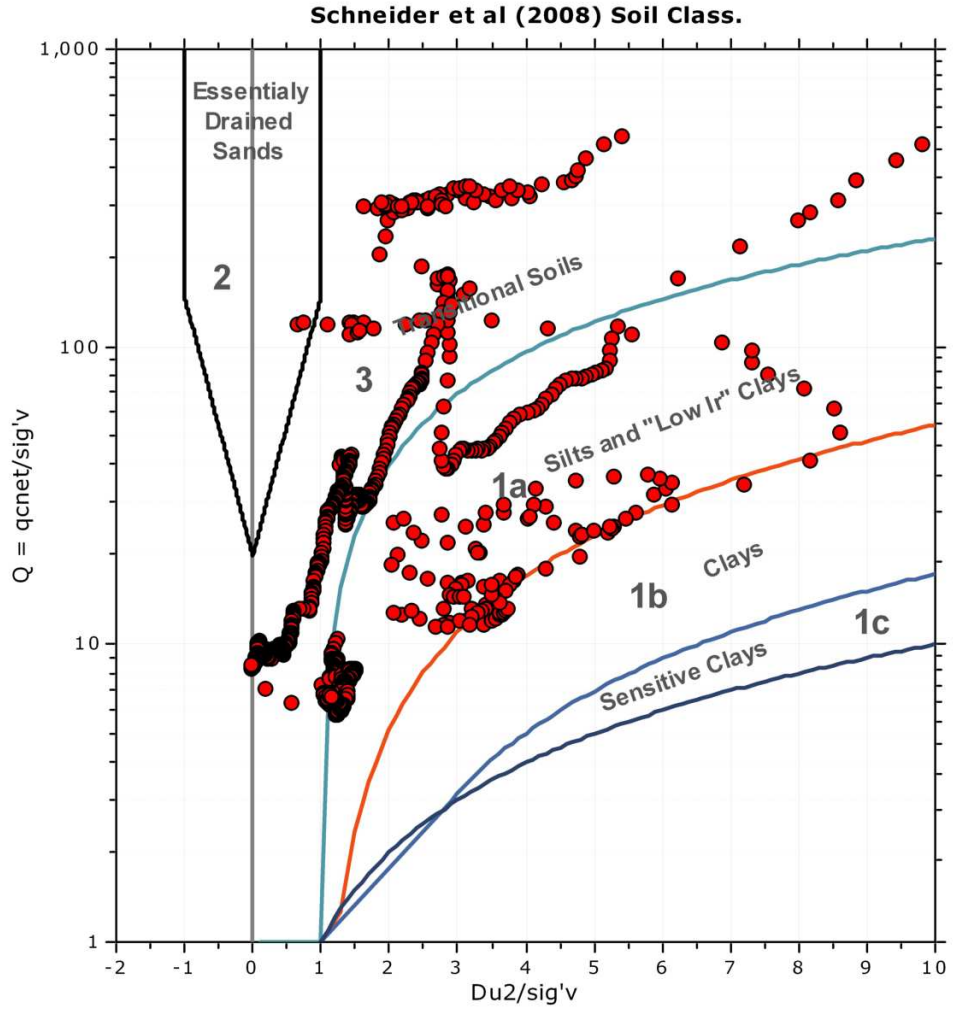

**SBT legend**

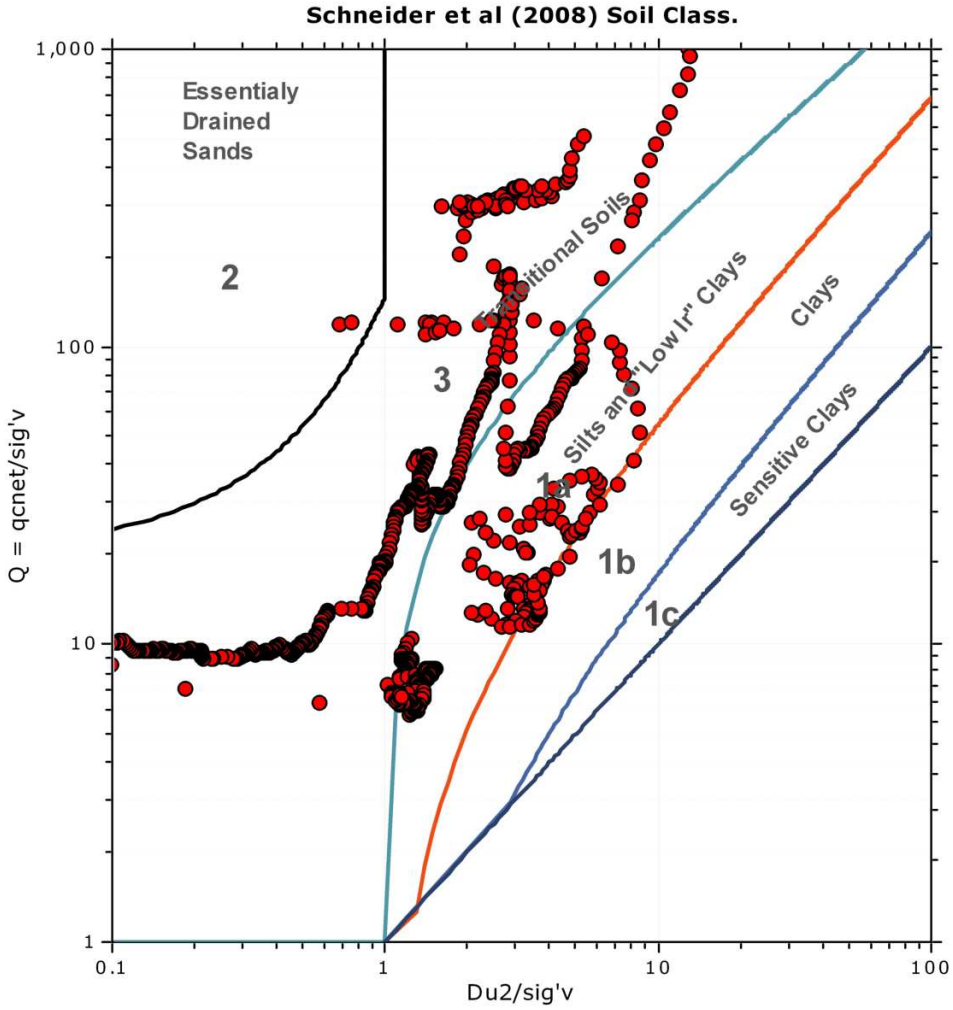
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

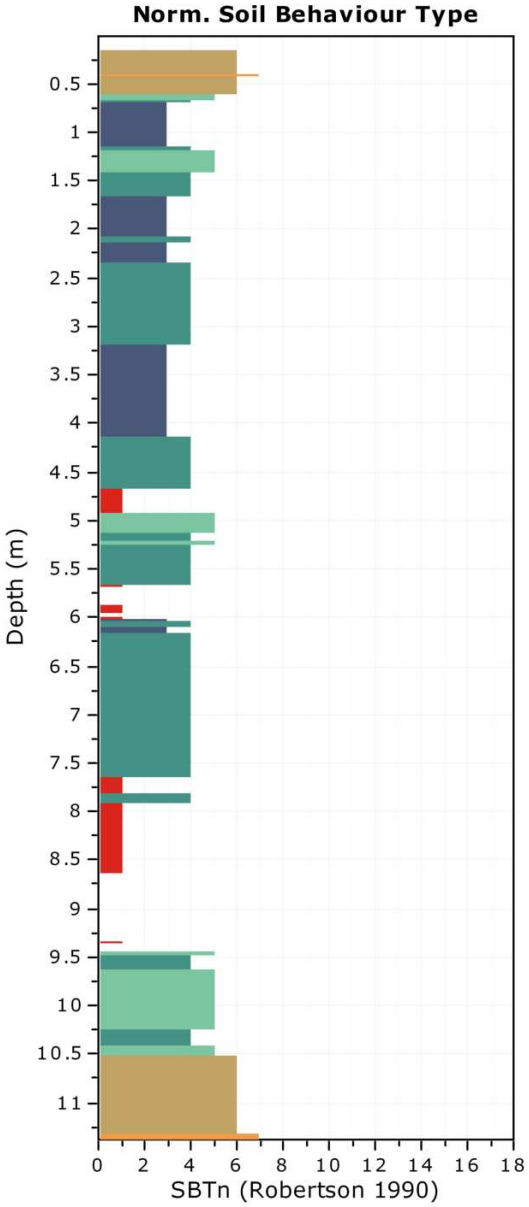
## SBT - Bq plots (normalized)

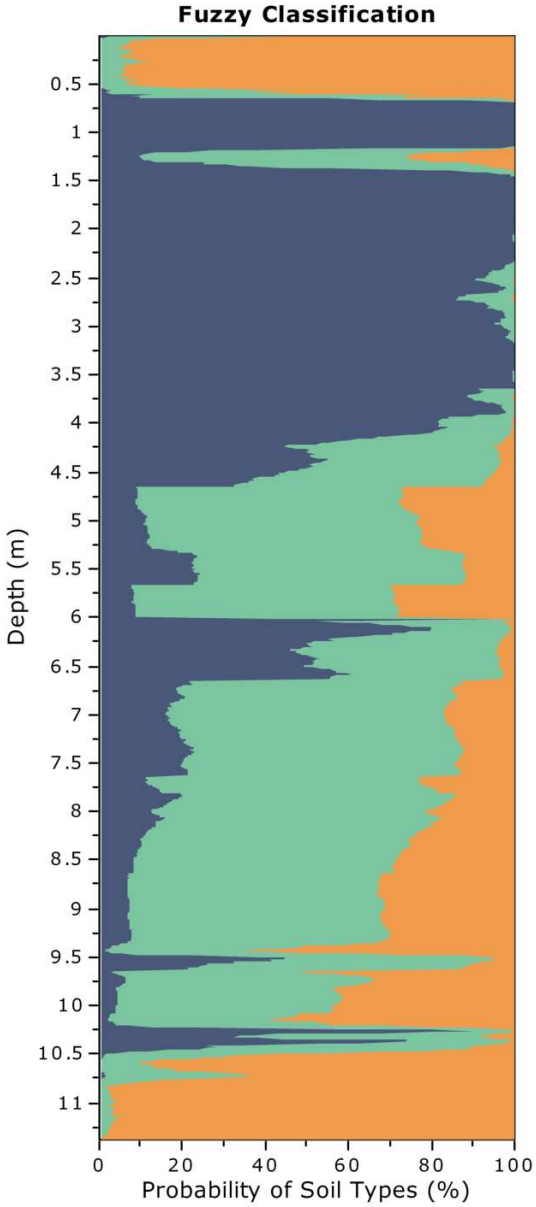


## Bq plots (Schneider)



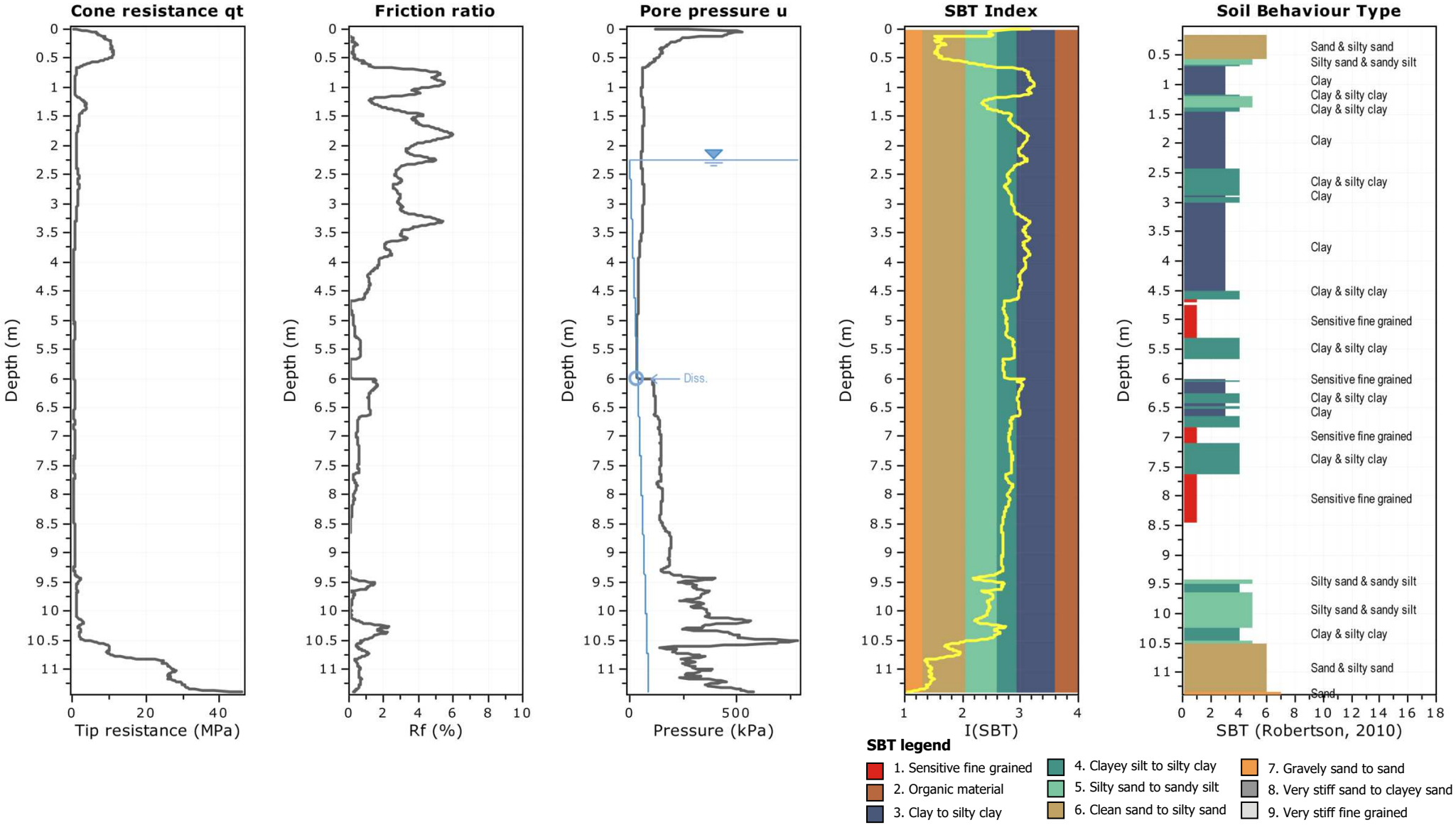



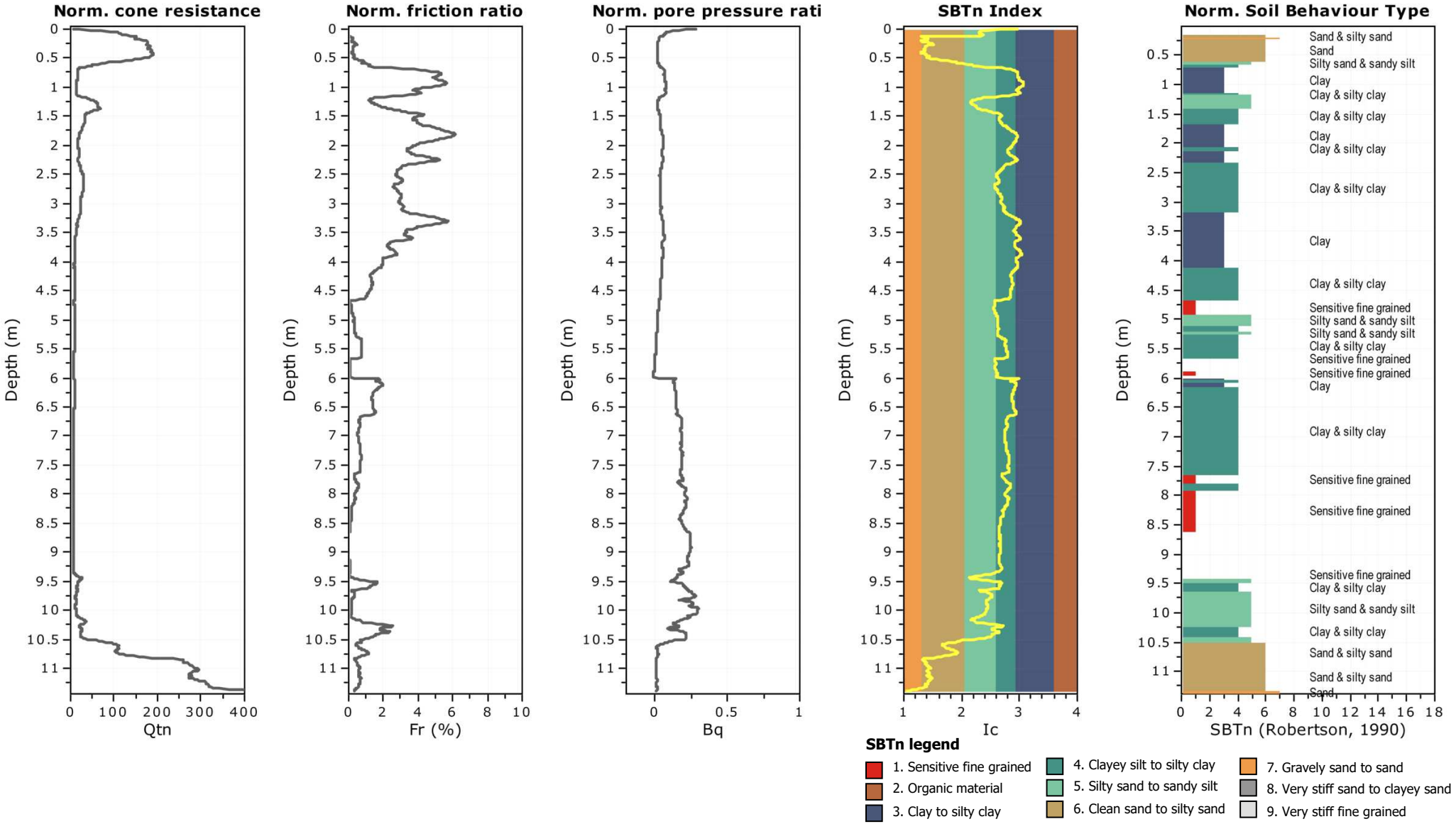


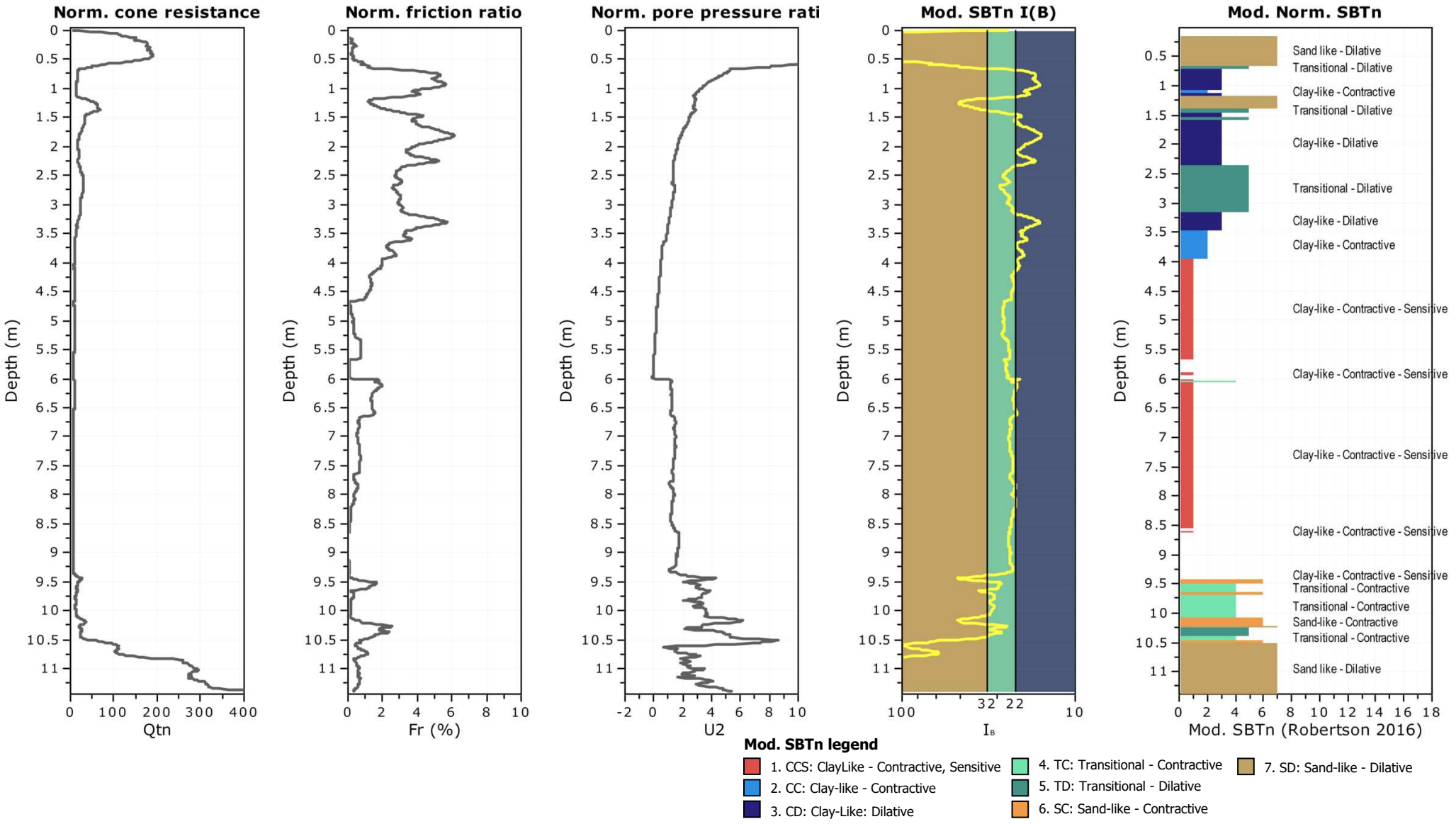




**Fuzzy classifiaction legend**

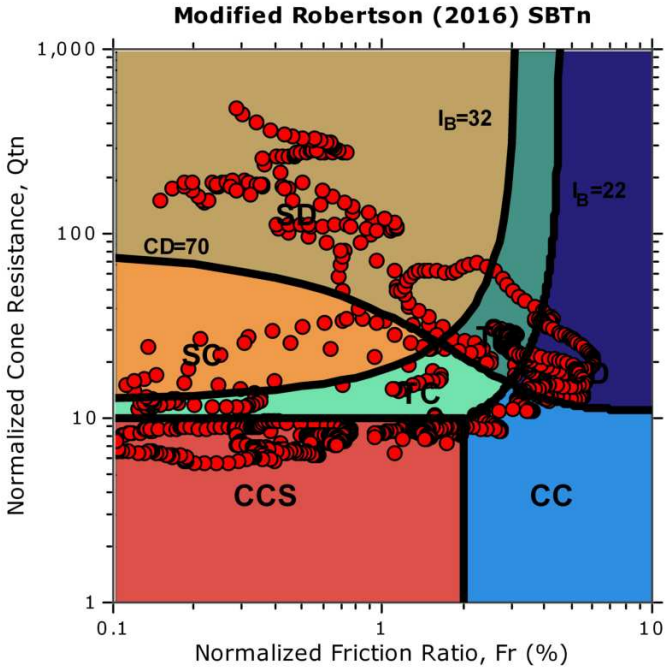
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

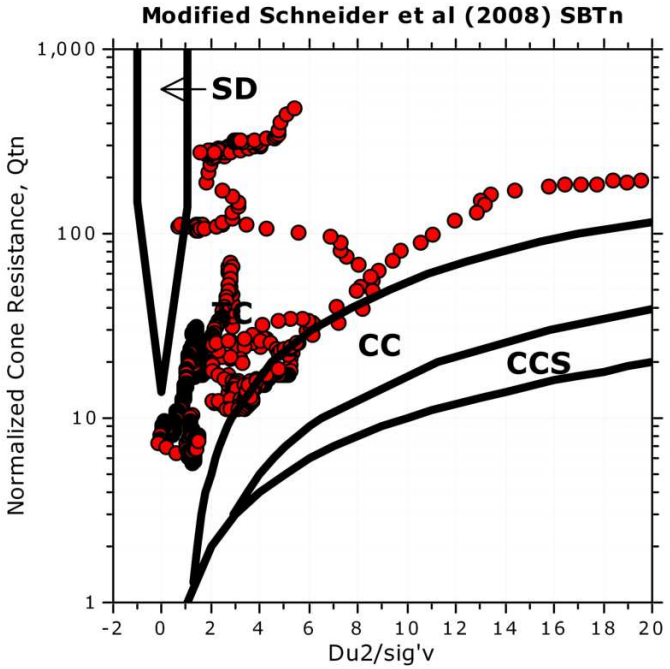

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Diss.
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
Sensitive fine grained
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

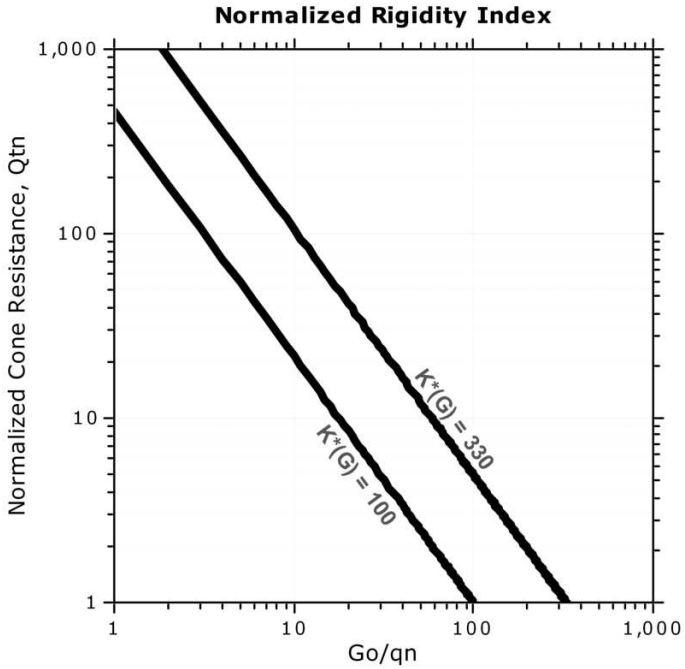

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Sand
Silty sand & sandy silt
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Sensitive fine grained
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Sensitive fine grained
Sensitive fine grained
Clay
Clay & silty clay
Sensitive fine grained
Sensitive fine grained
Sensitive fine grained
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Sand & silty sand
Sand & silty sand
Sand
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Transitional - Dilative
Clay-like - Contractive
Transitional - Dilative
Clay-like - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Transitional - Contractive
Transitional - Contractive
Sand-like - Contractive
Transitional - Contractive
Sand like - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

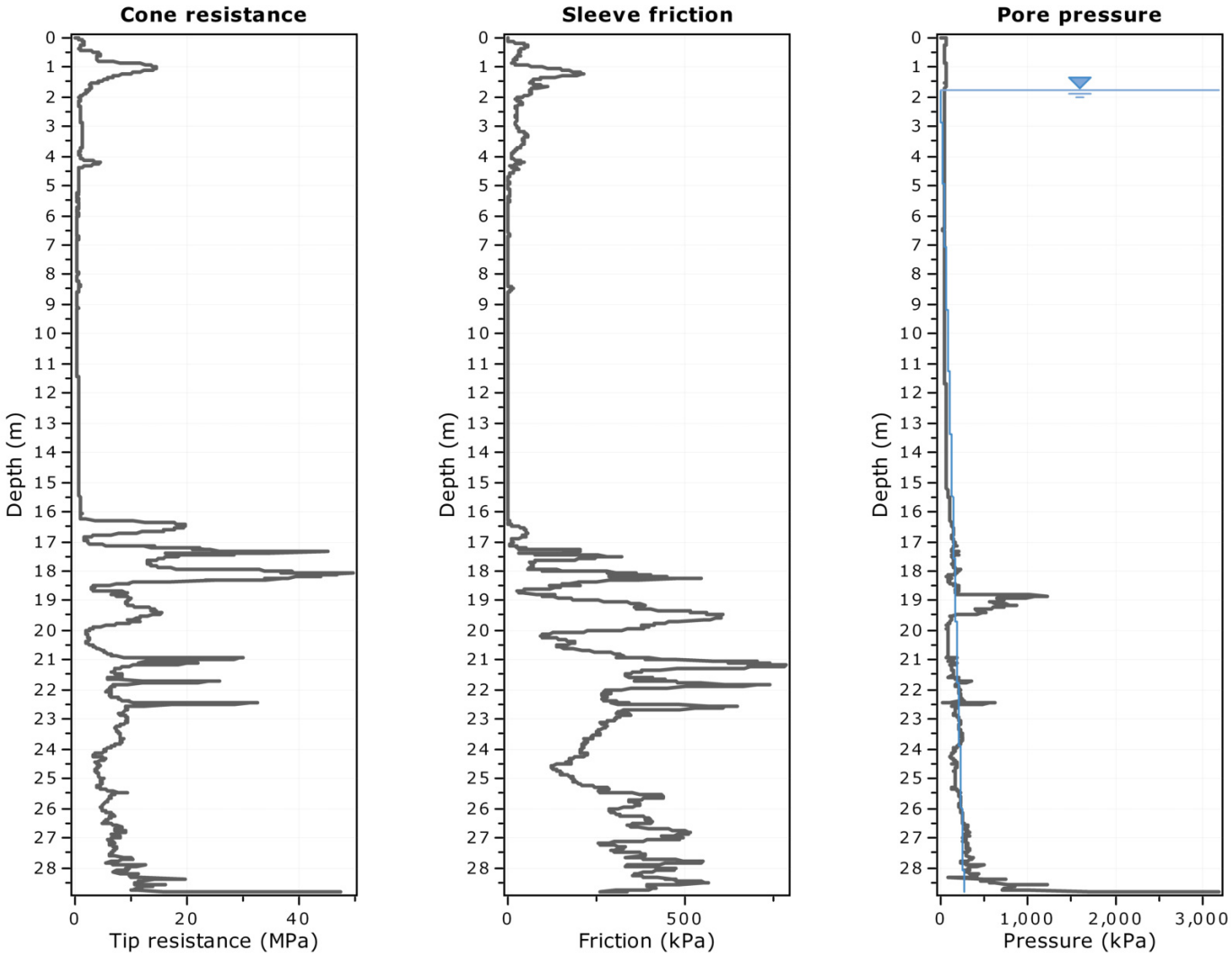


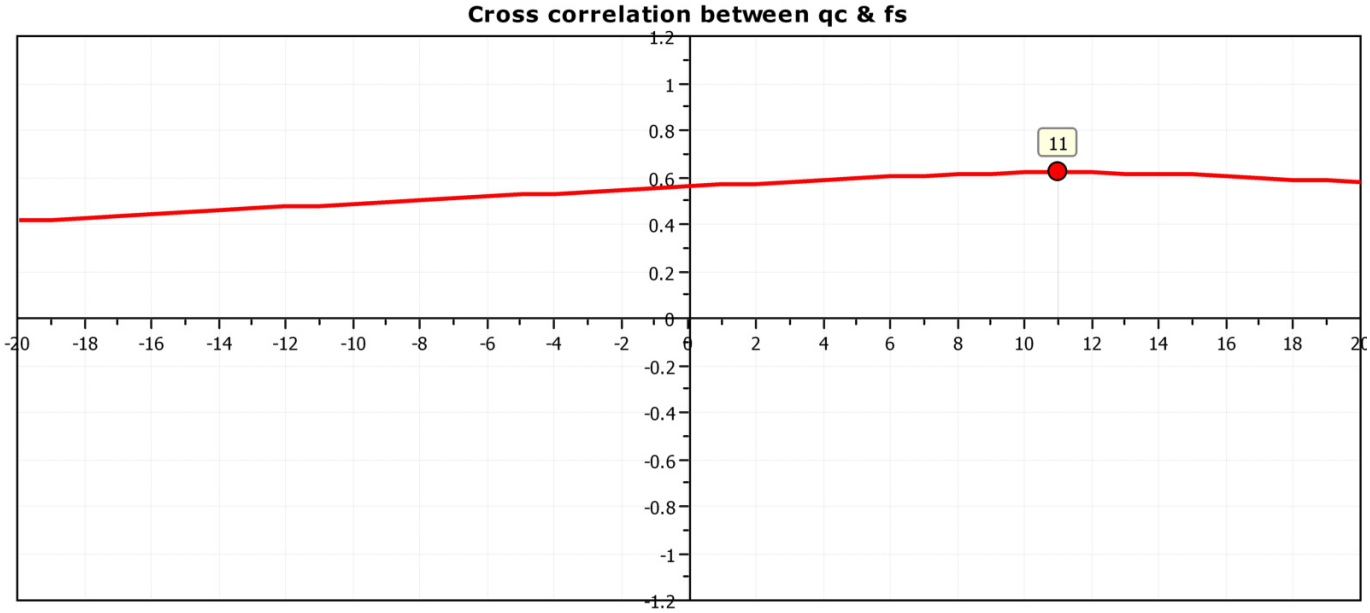




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

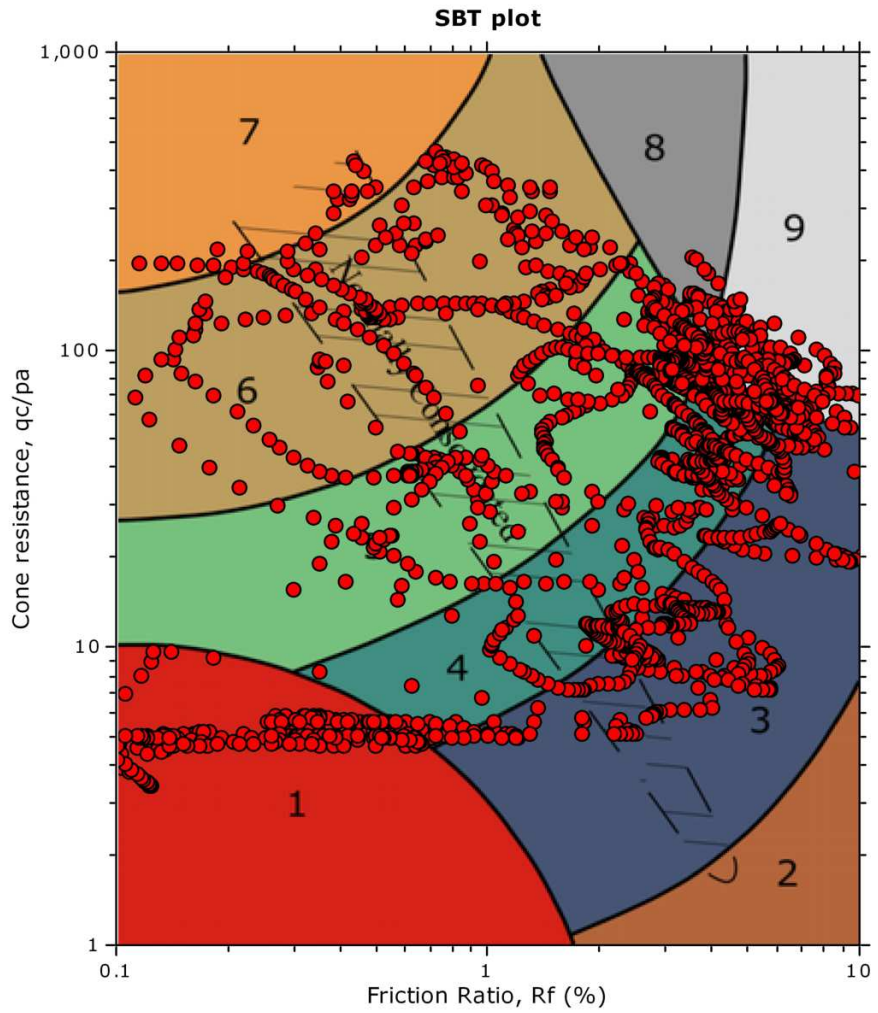
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

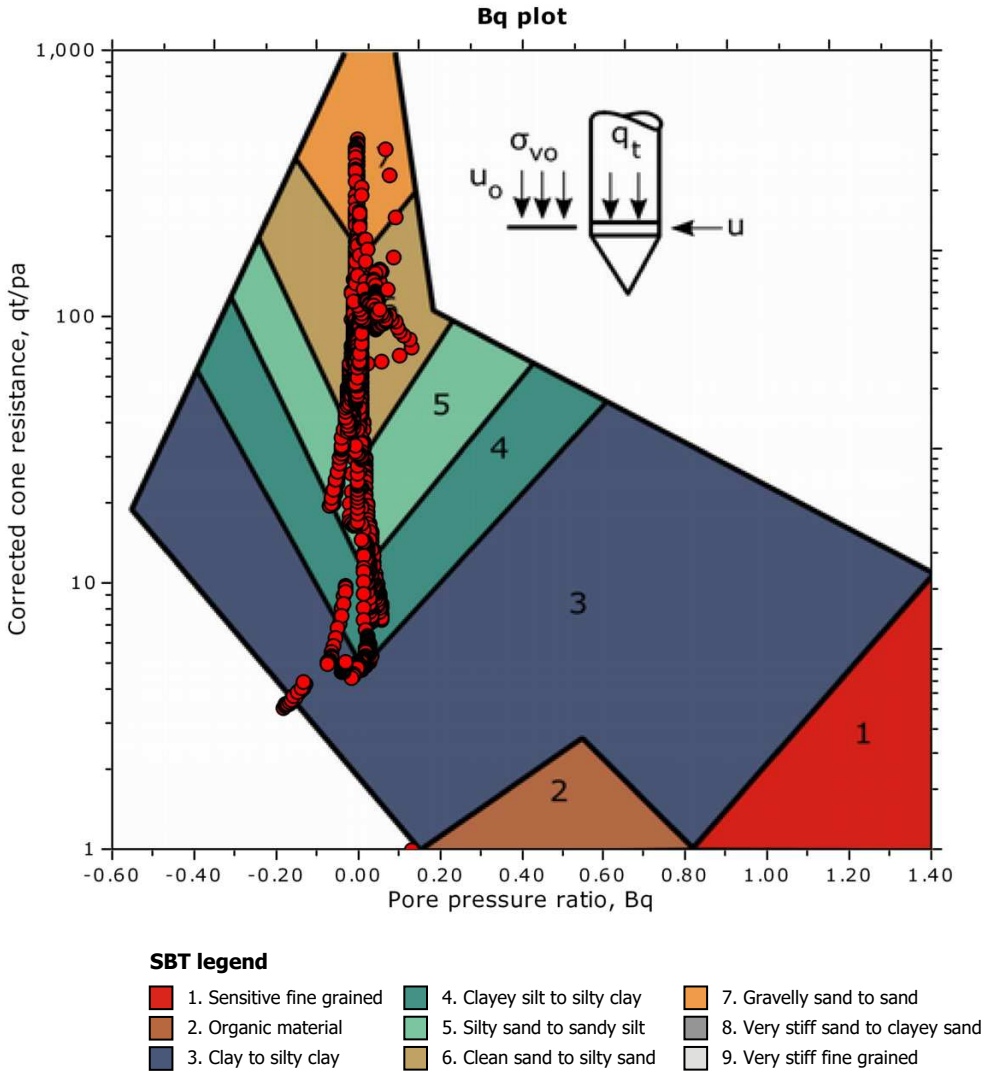



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

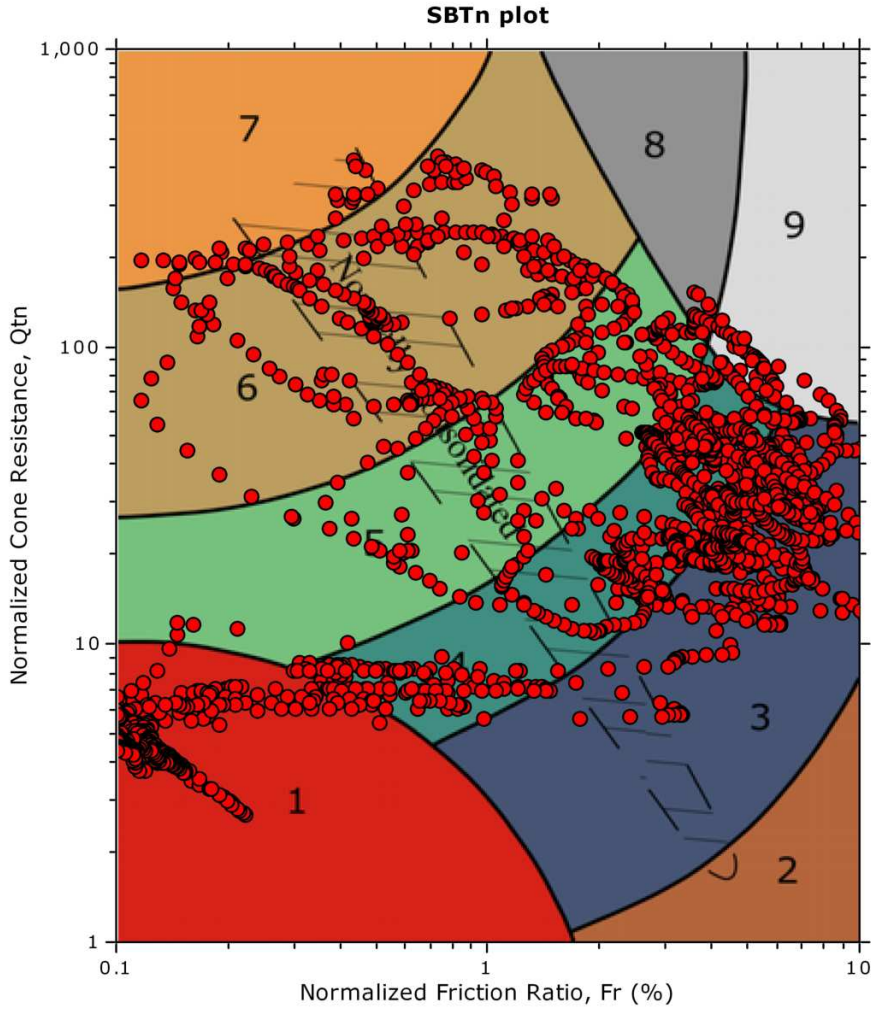


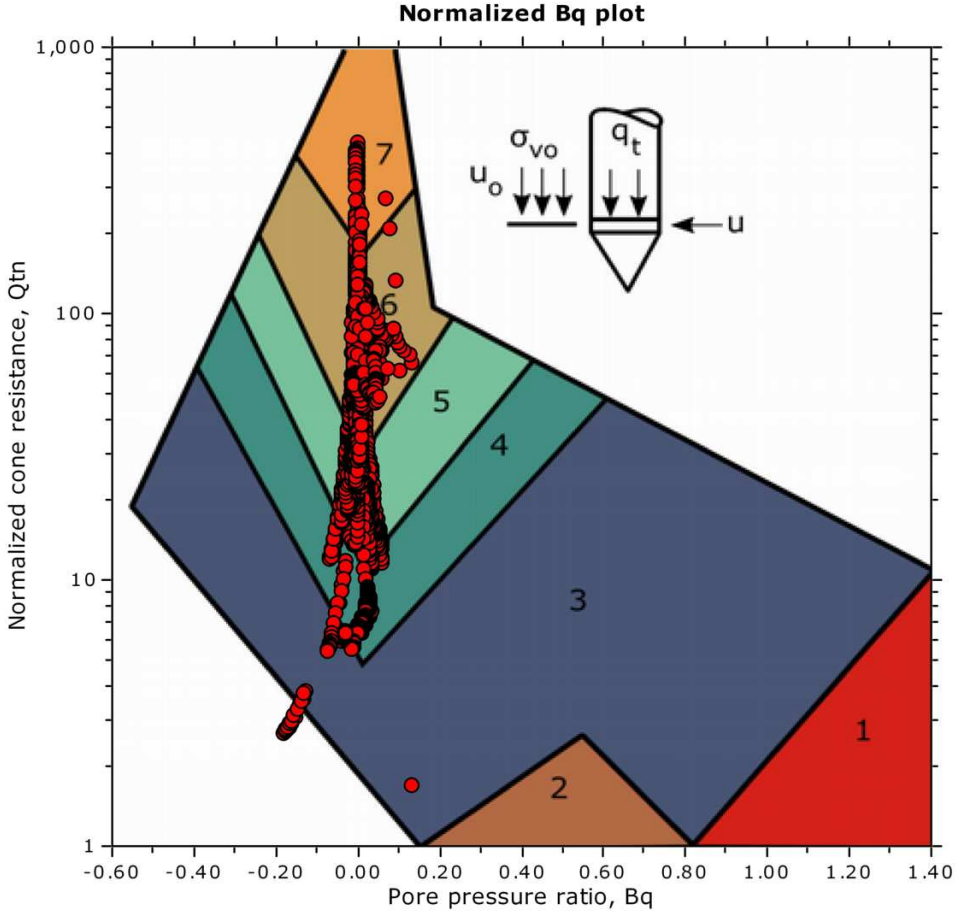




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

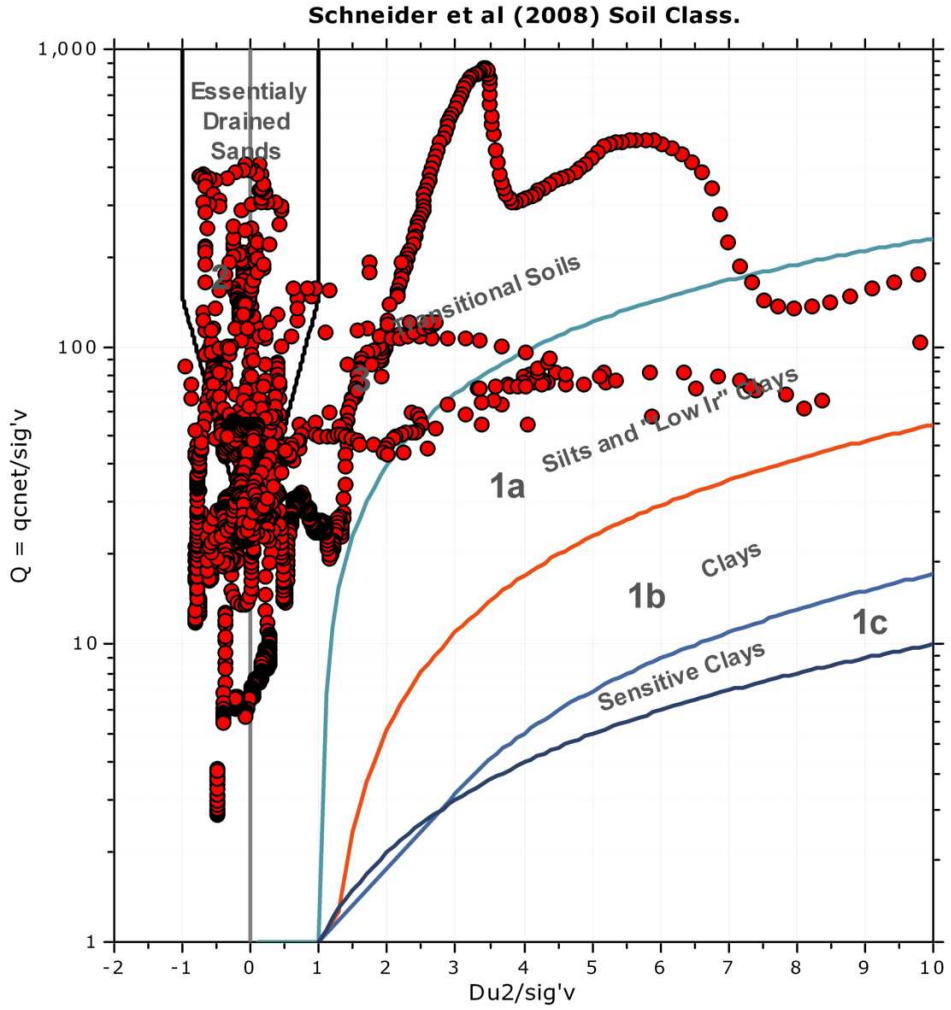


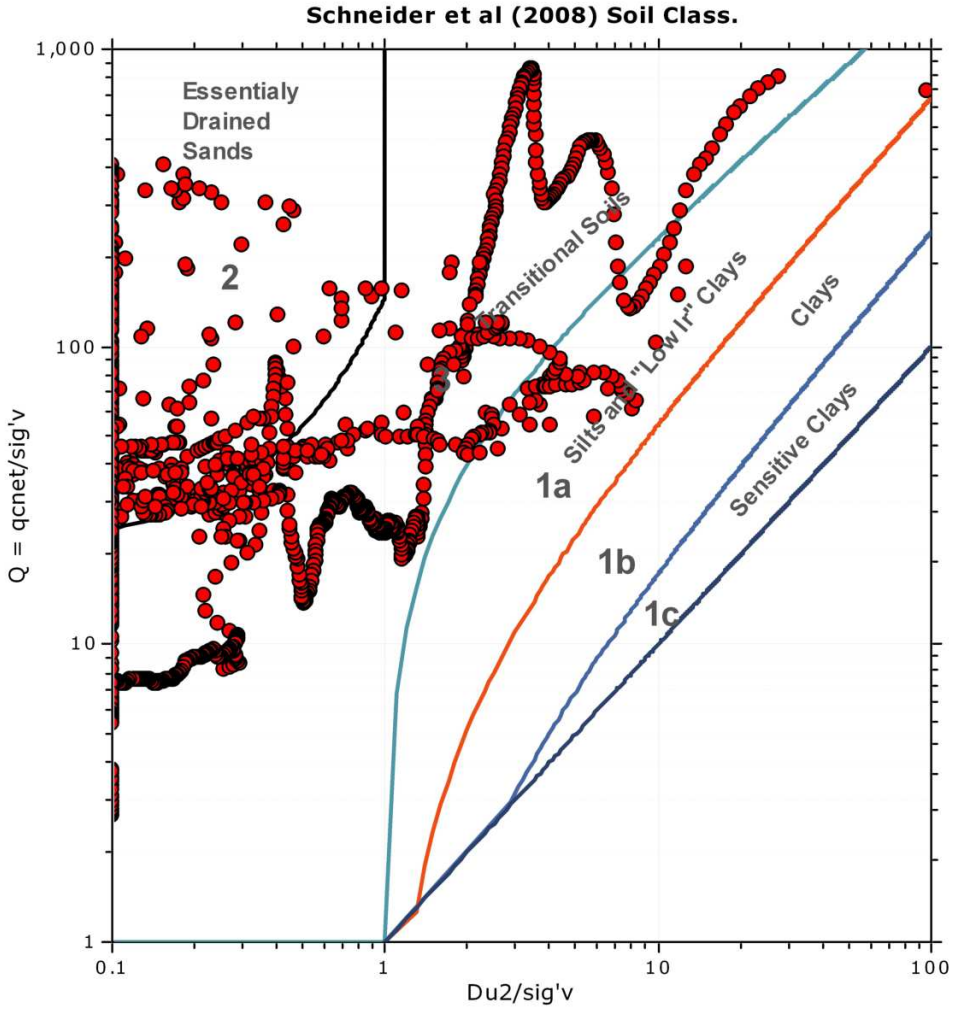



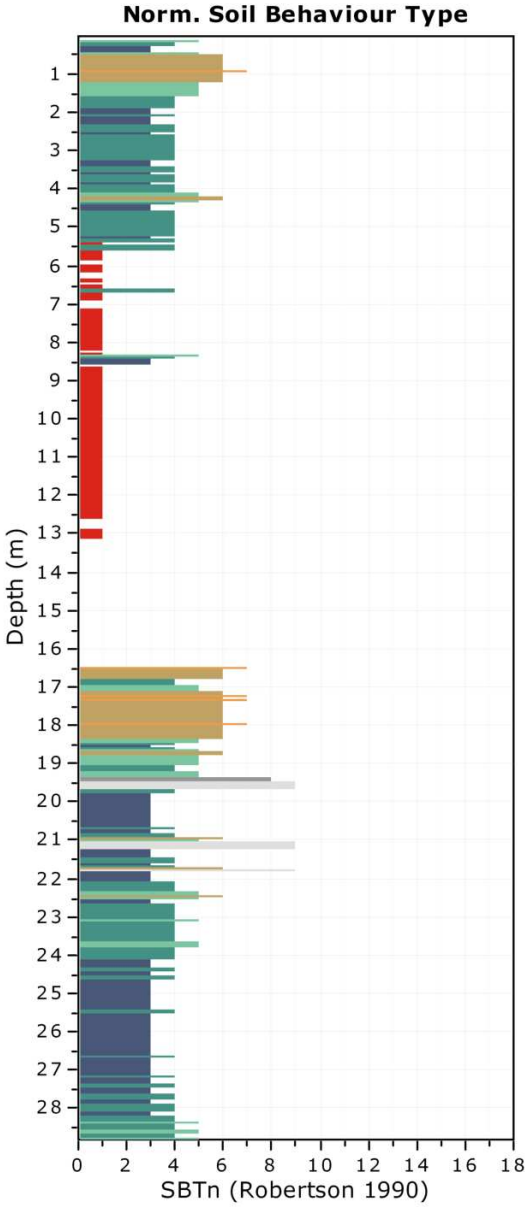

**SBTn legend**

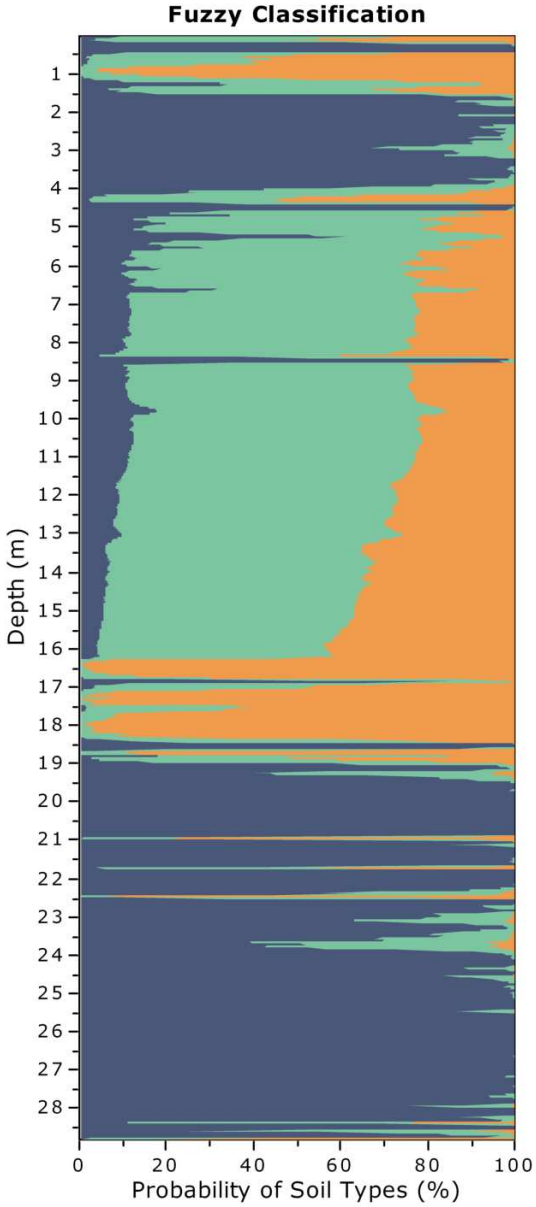
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



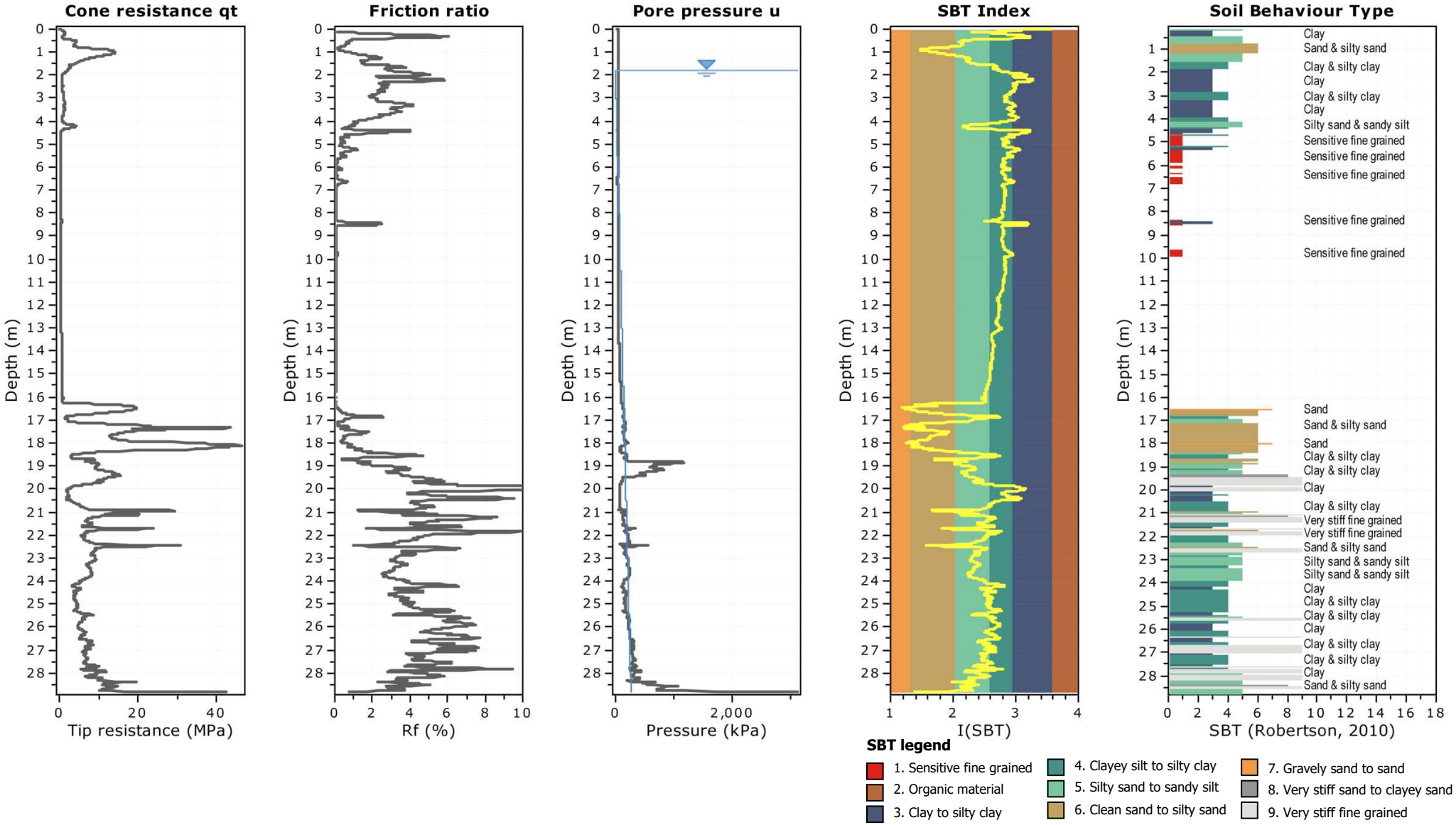



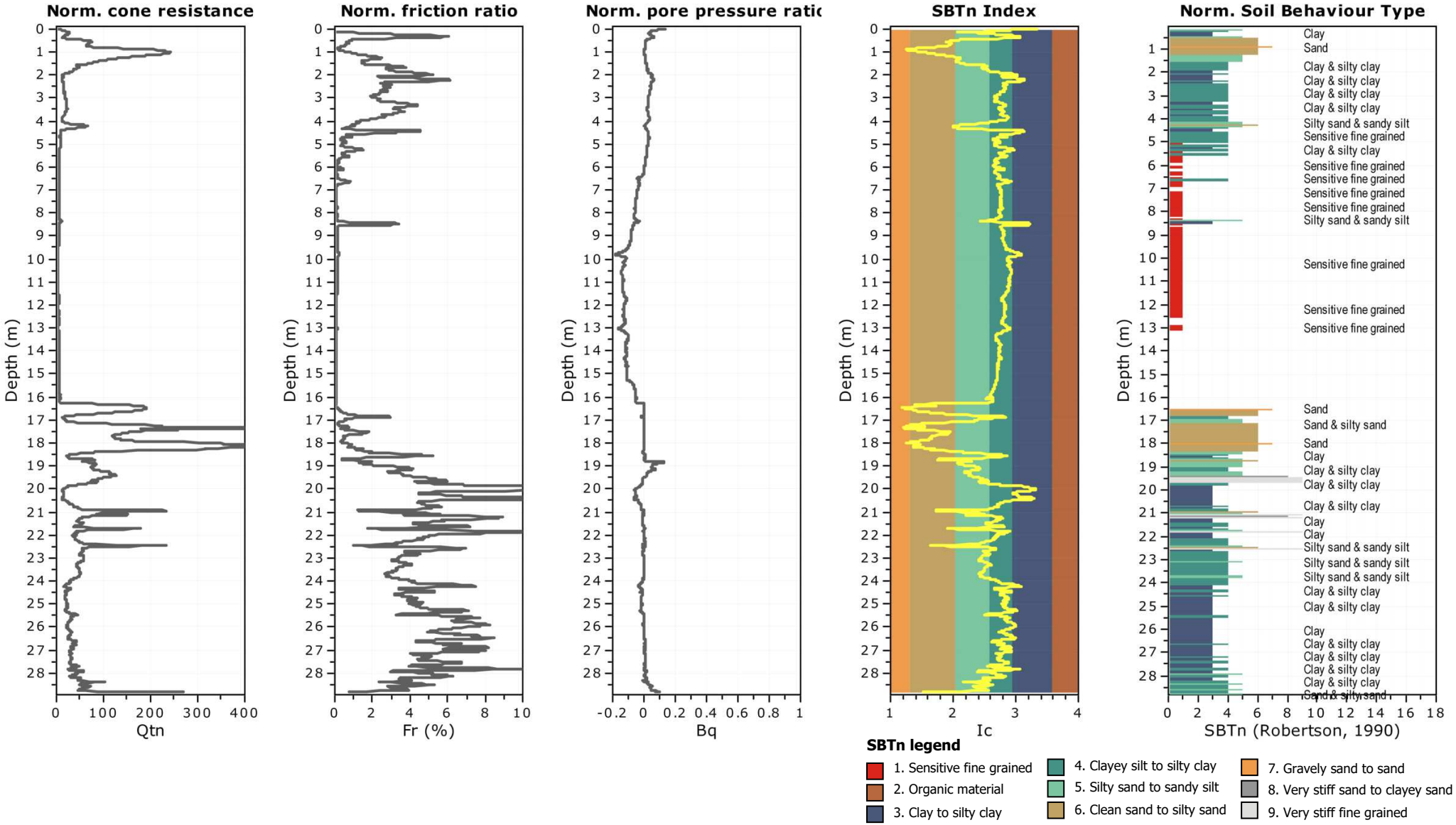


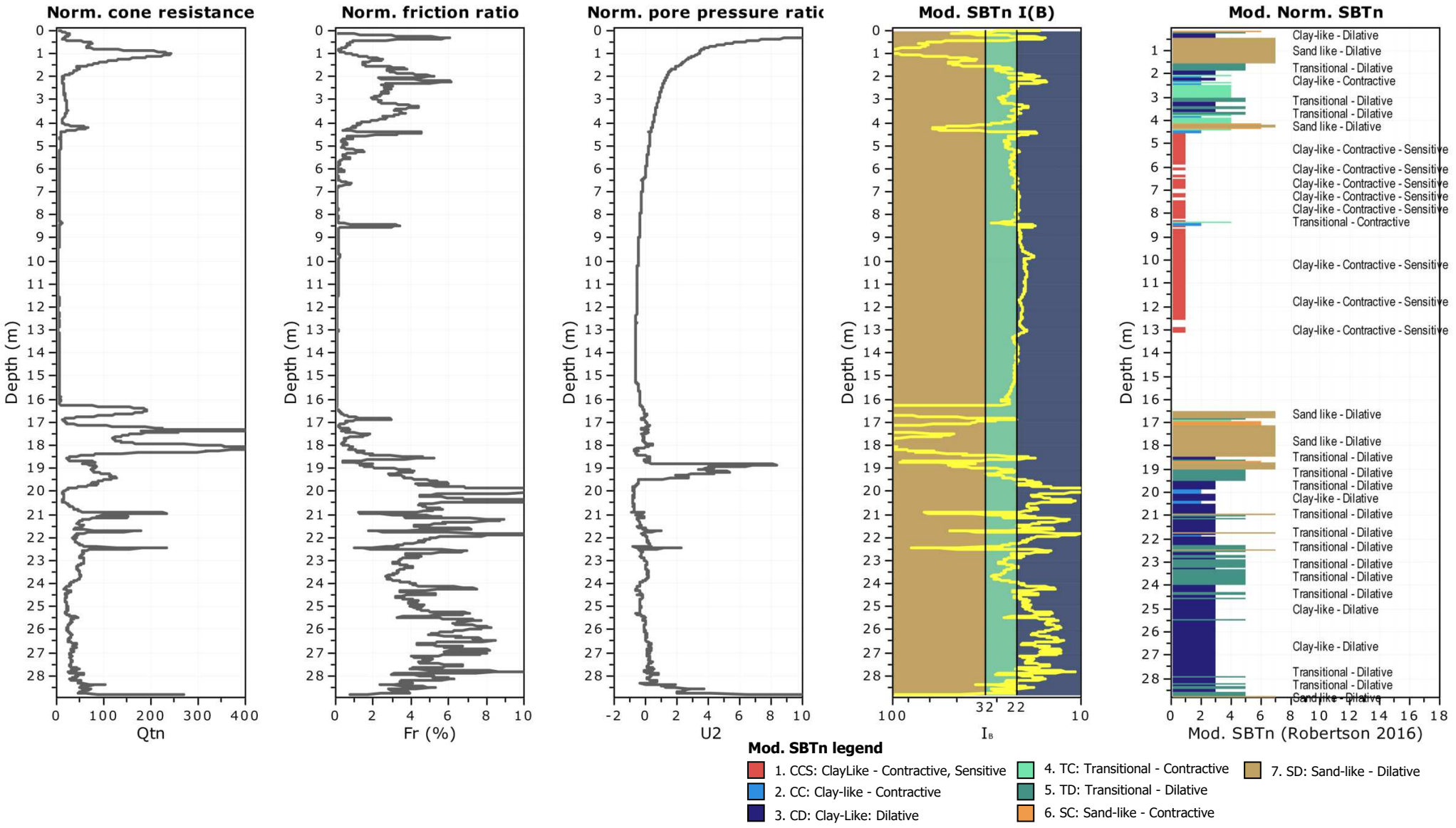




**Fuzzy classifiaction legend**

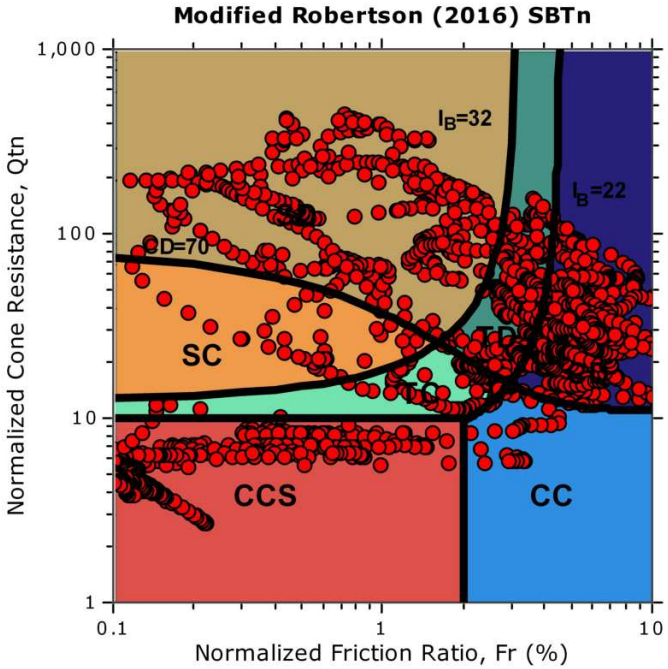
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

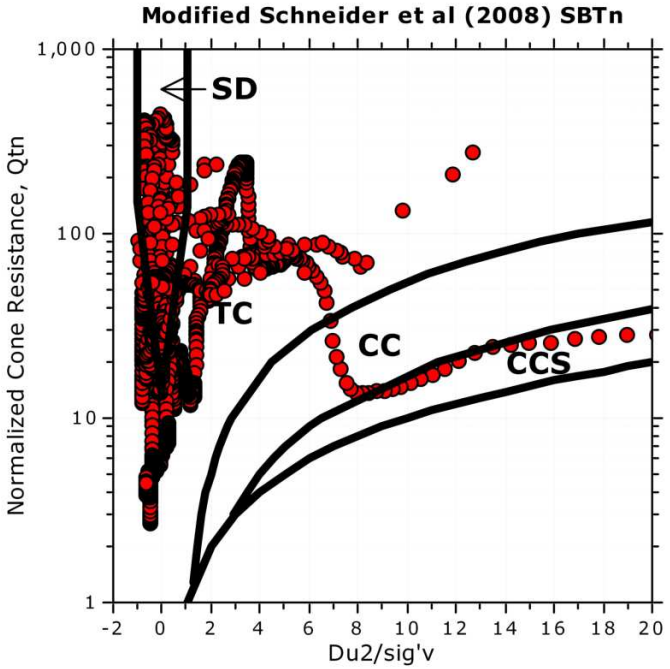

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Clay
Sand & silty sand
Clay & silty clay
Silty sand & sandy silt
Sensitive fine grained
Sand
Very stiff fine grained
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

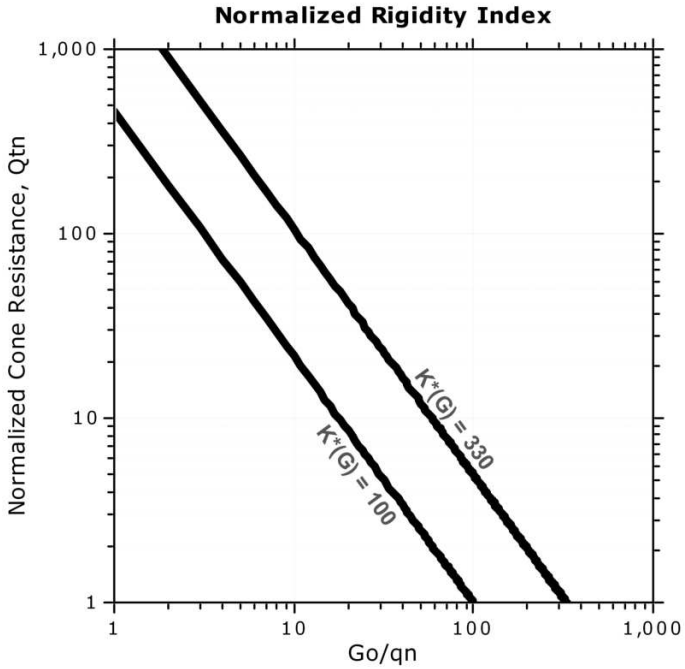

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Ib
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

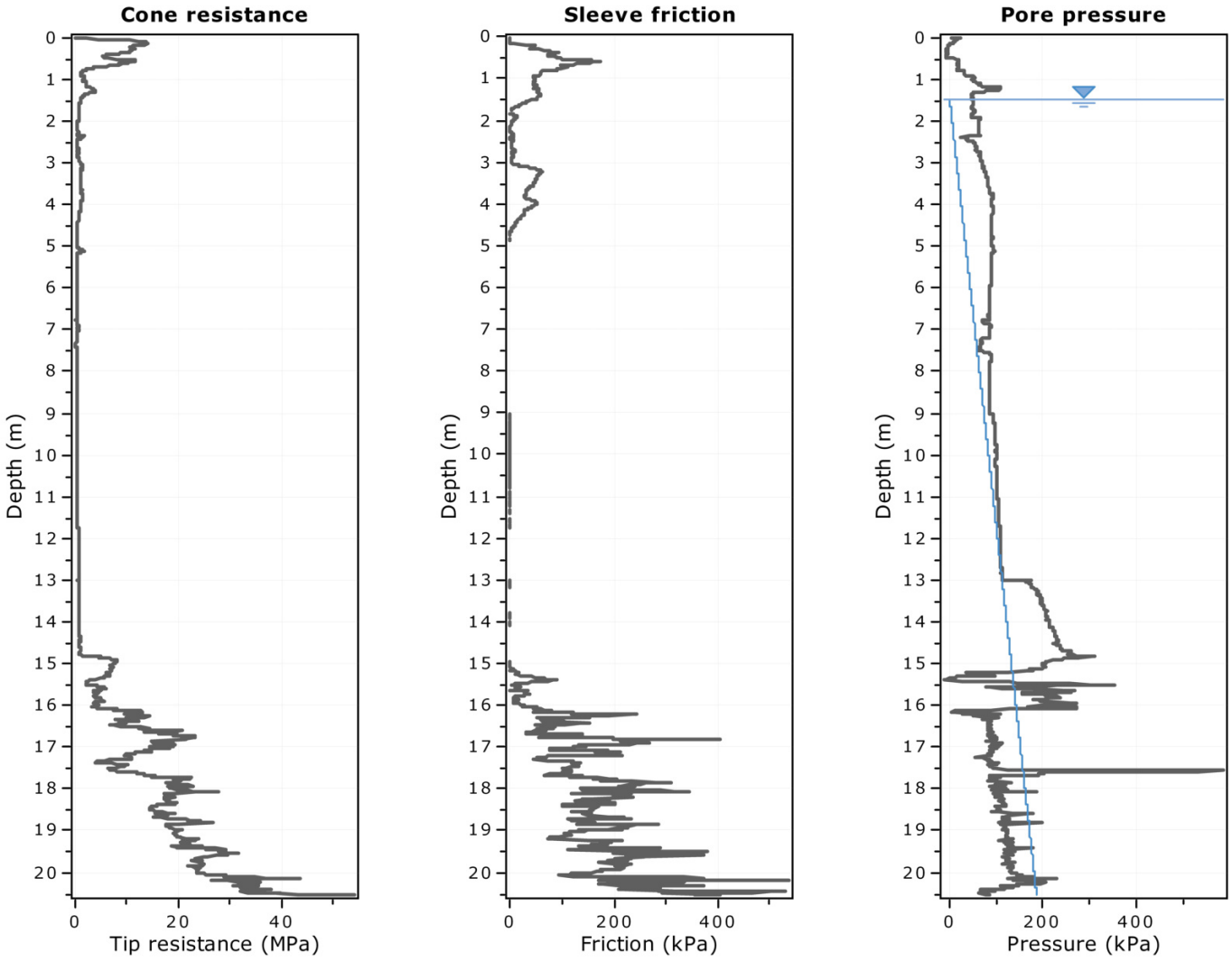


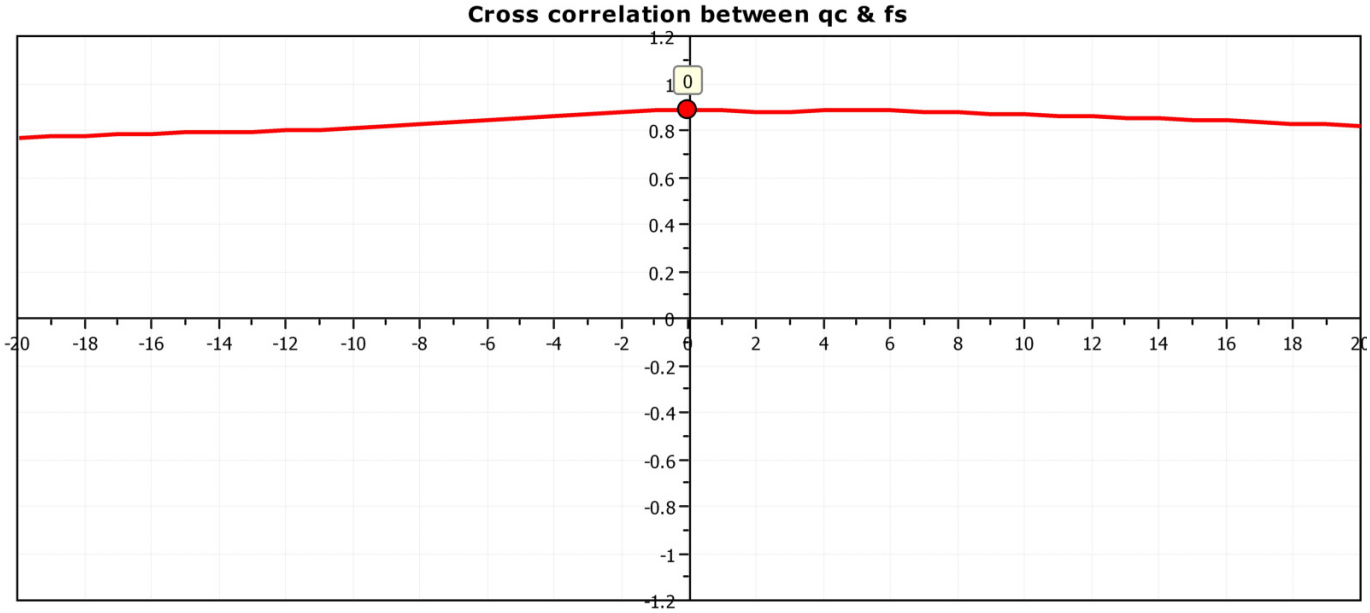




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

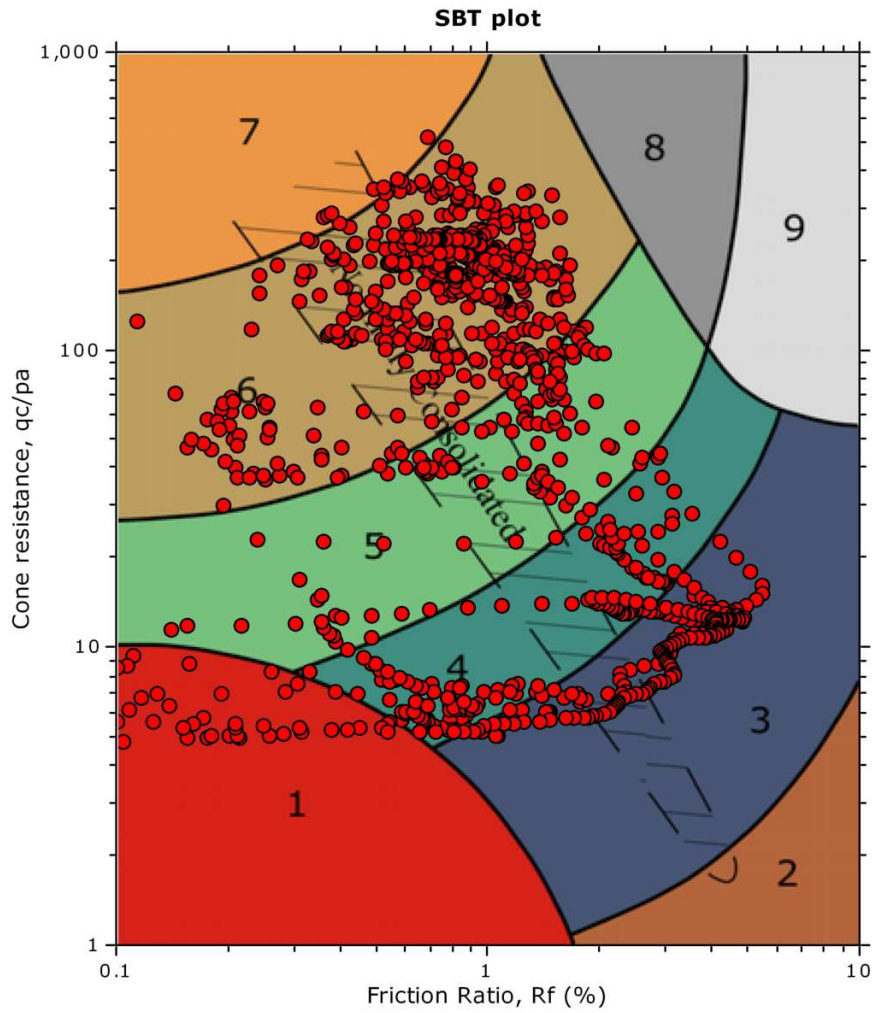
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

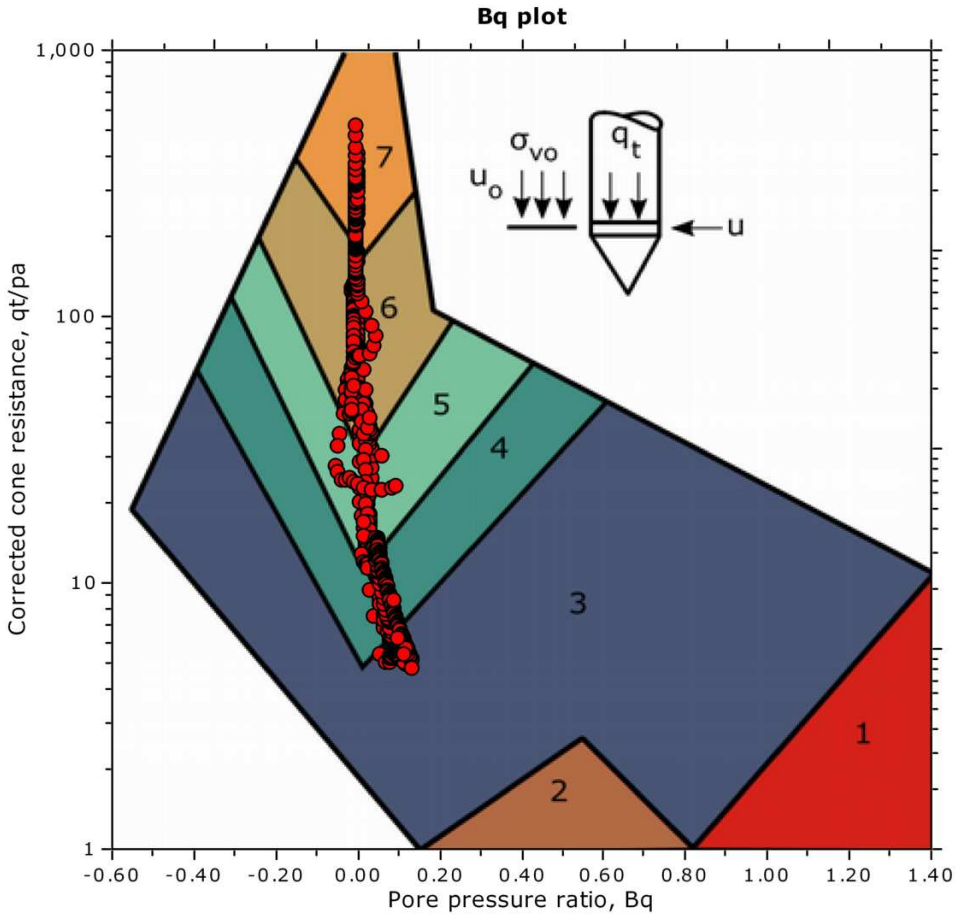



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



## SBT - Bq plots

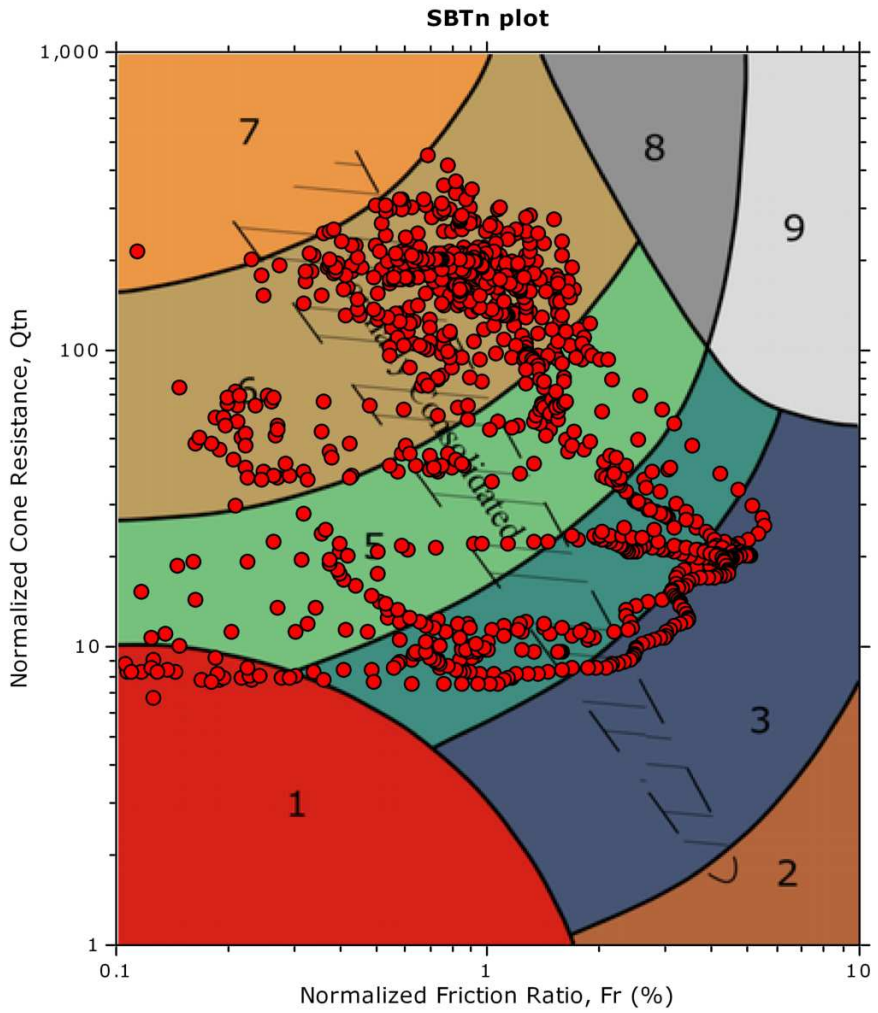


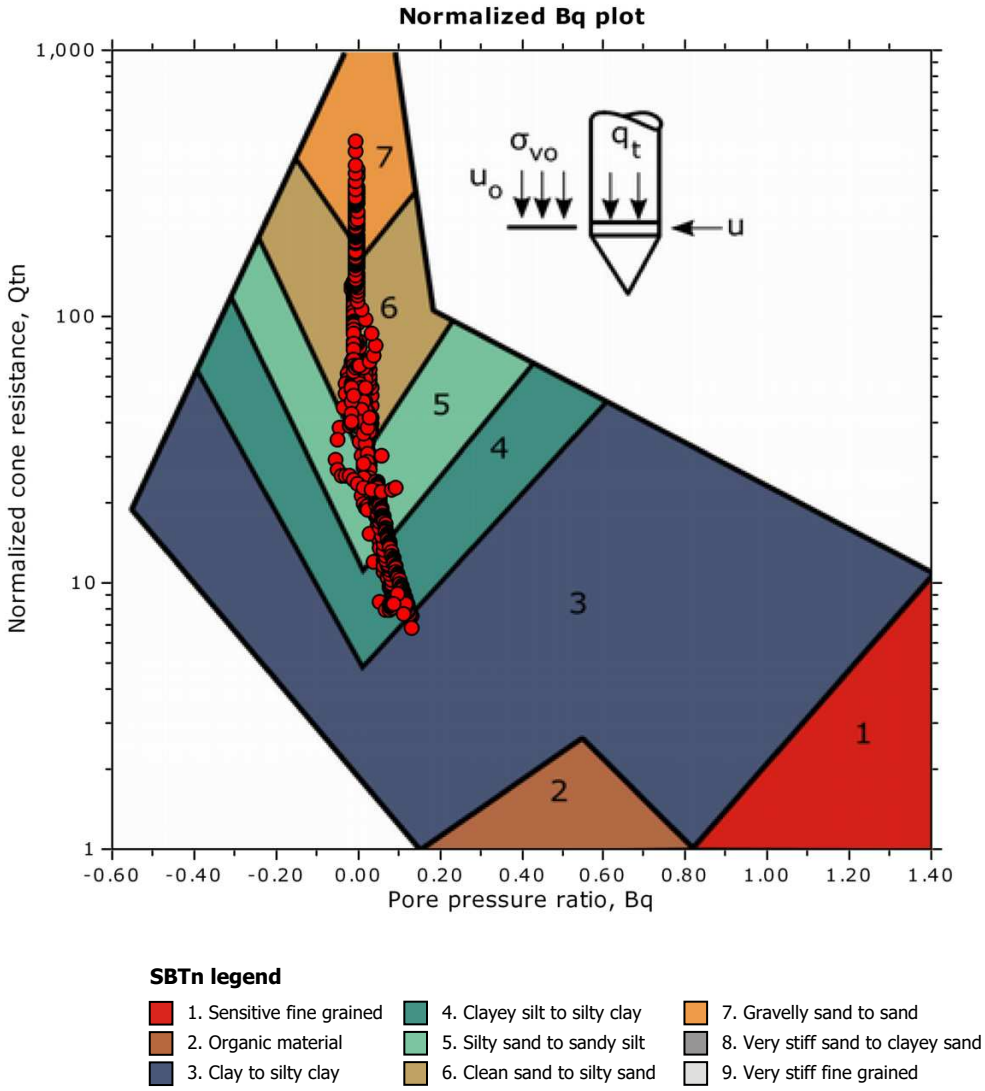




**SBT legend**

| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## SBT - Bq plots (normalized)

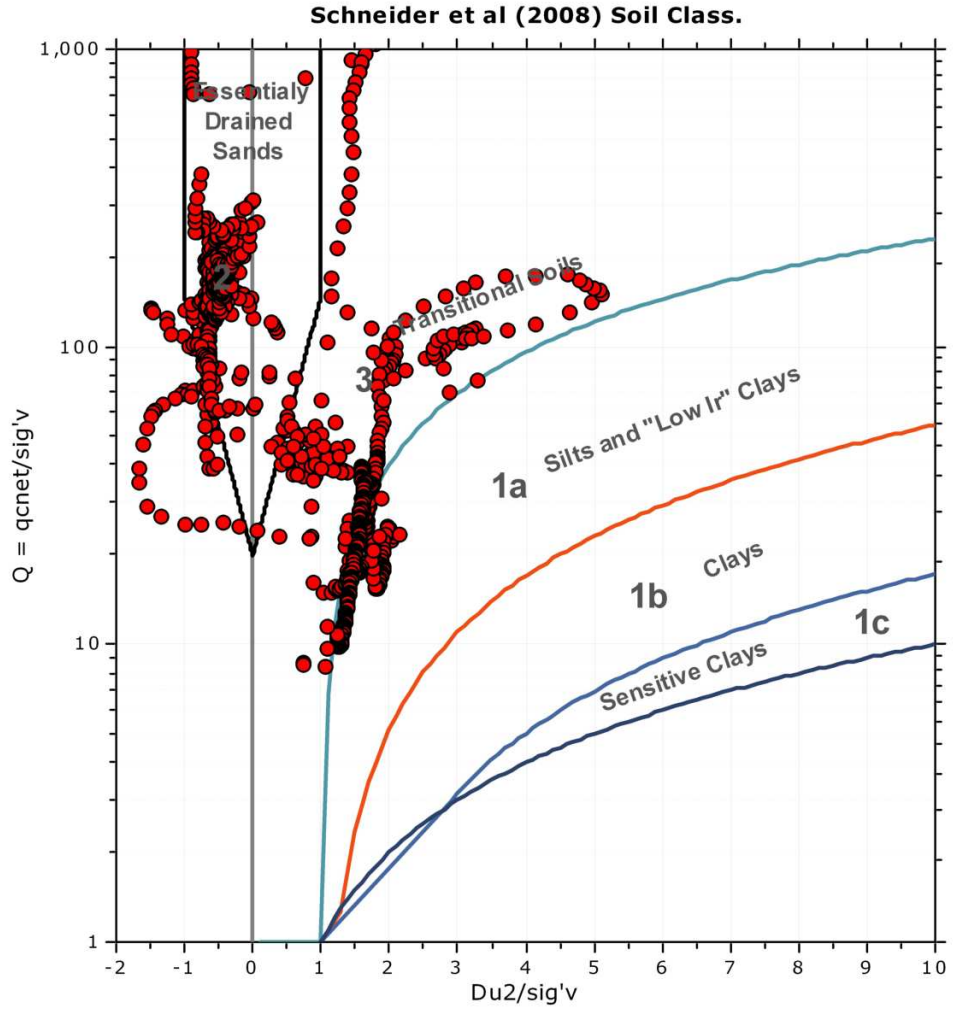


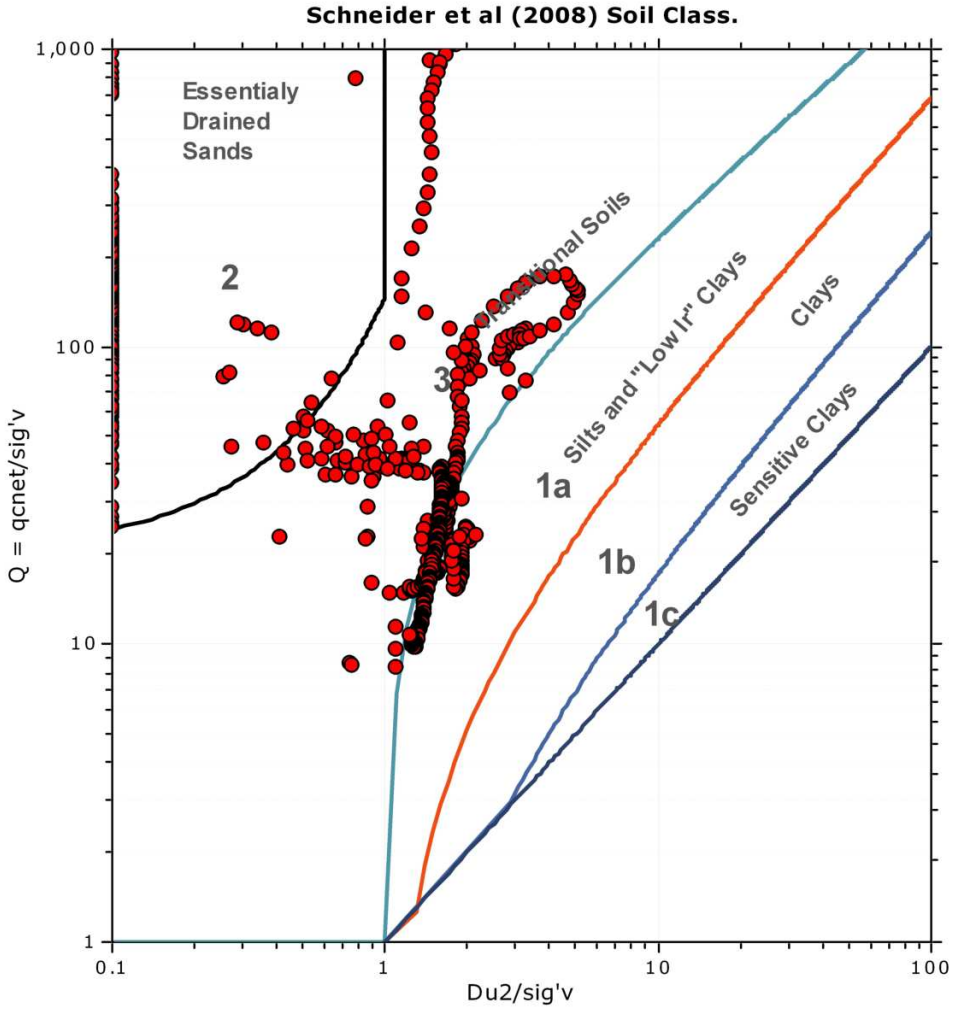



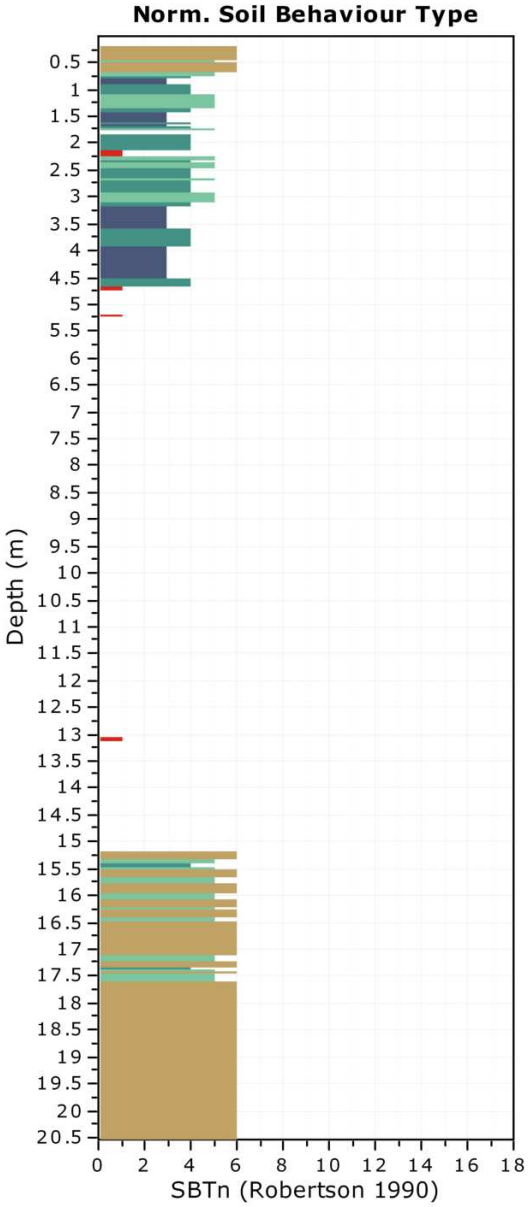

**SBTn legend**

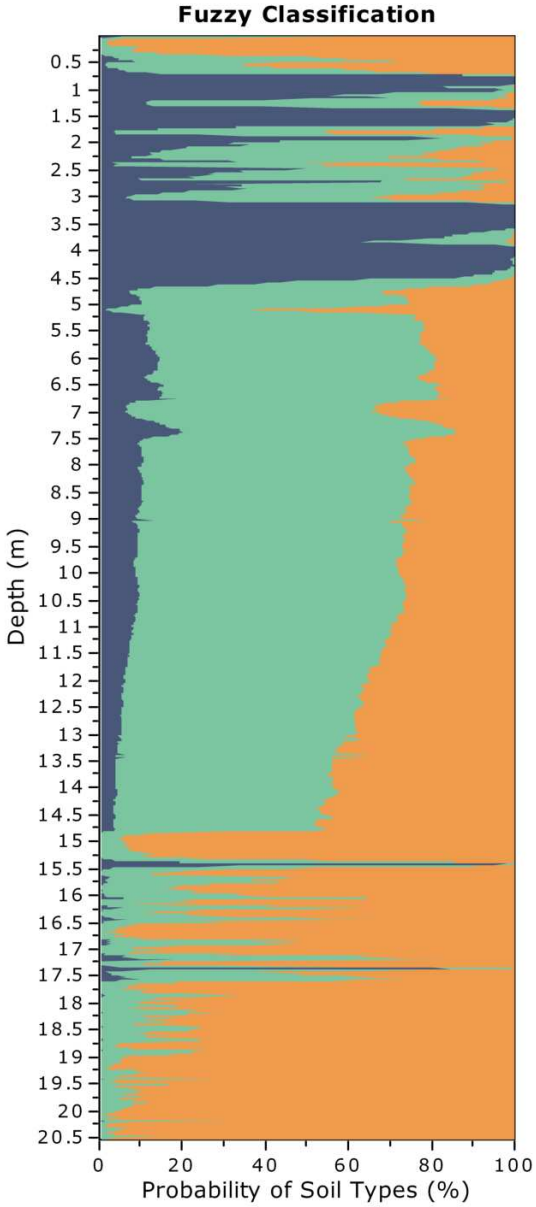
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



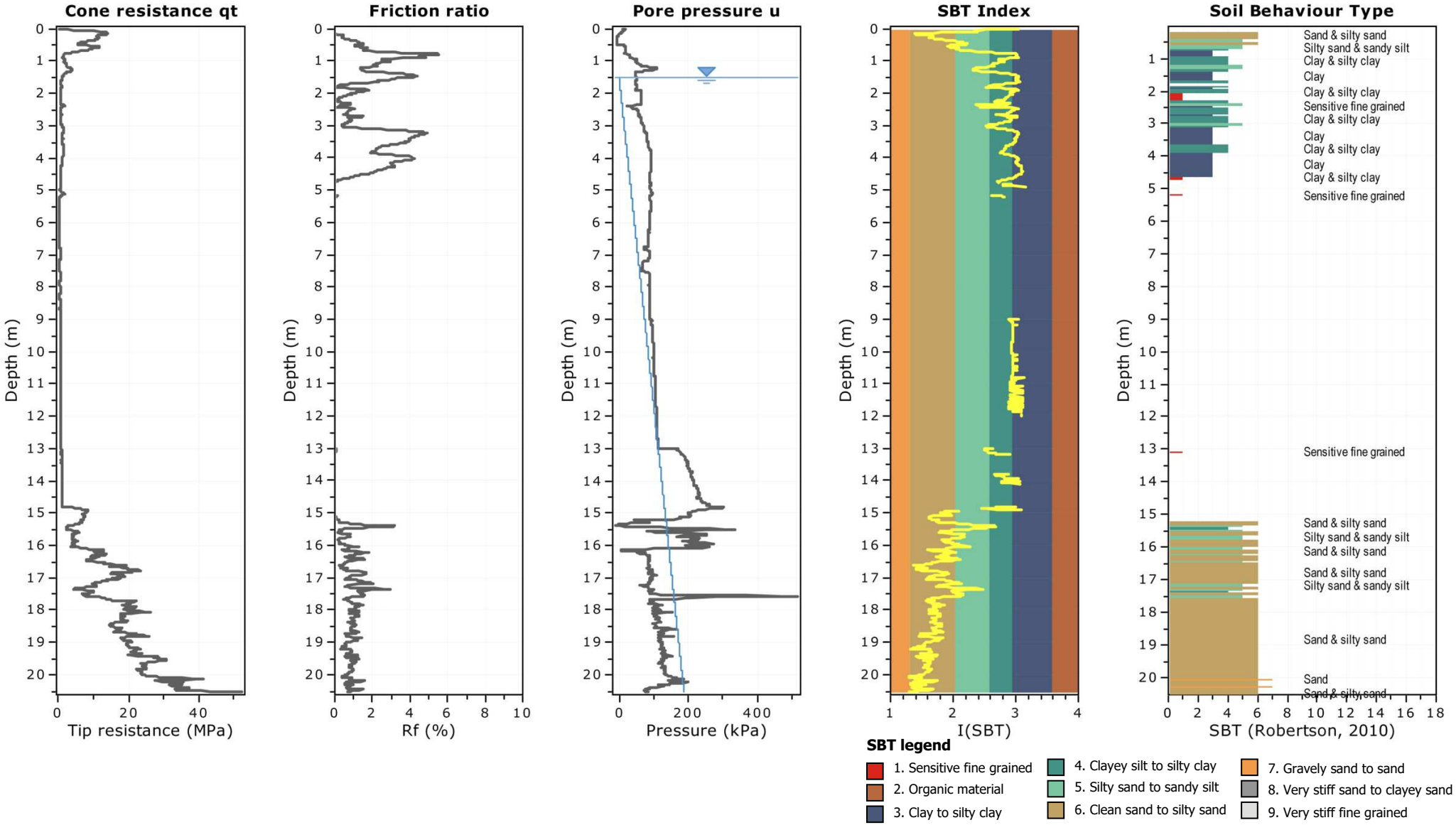



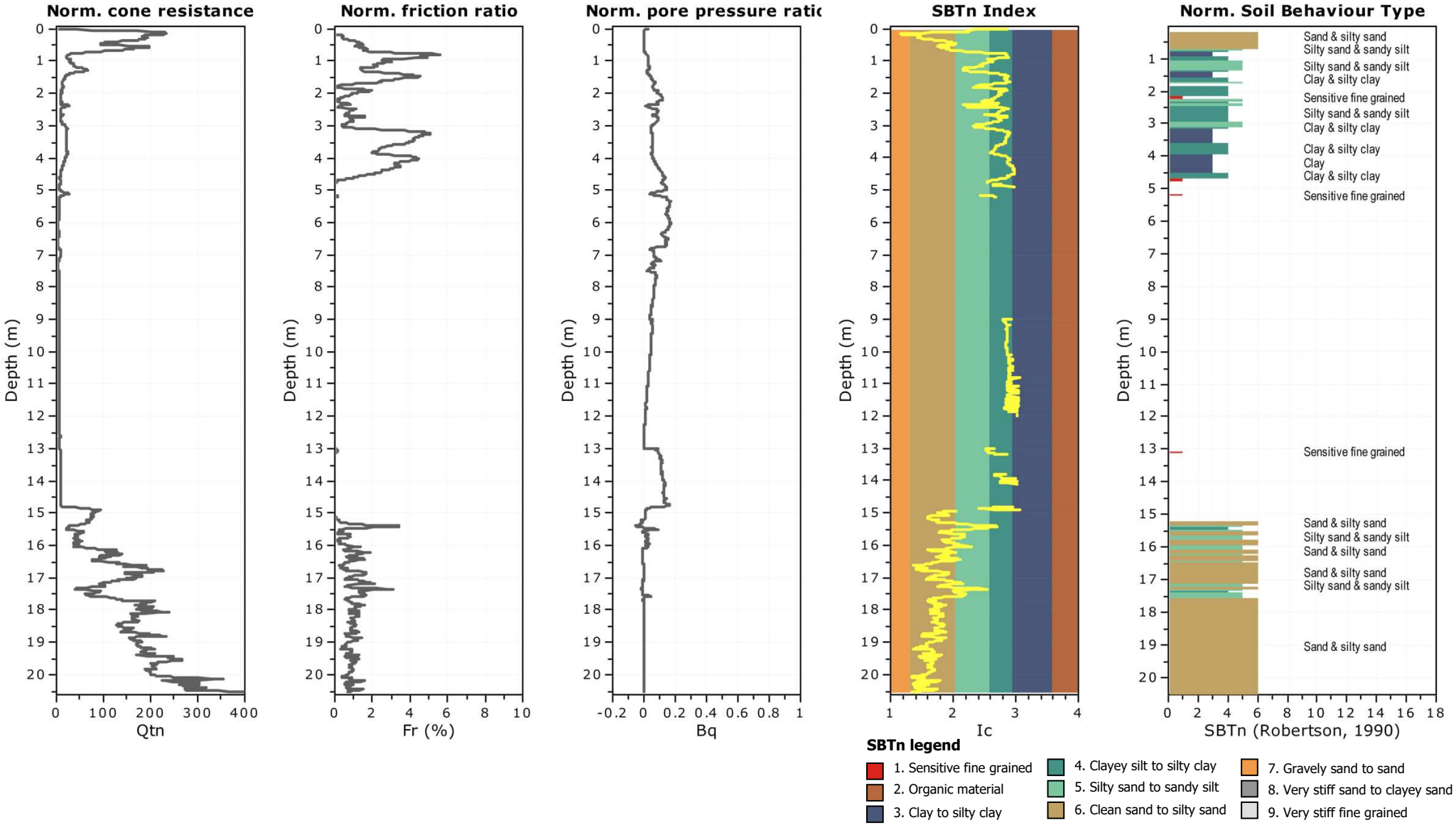


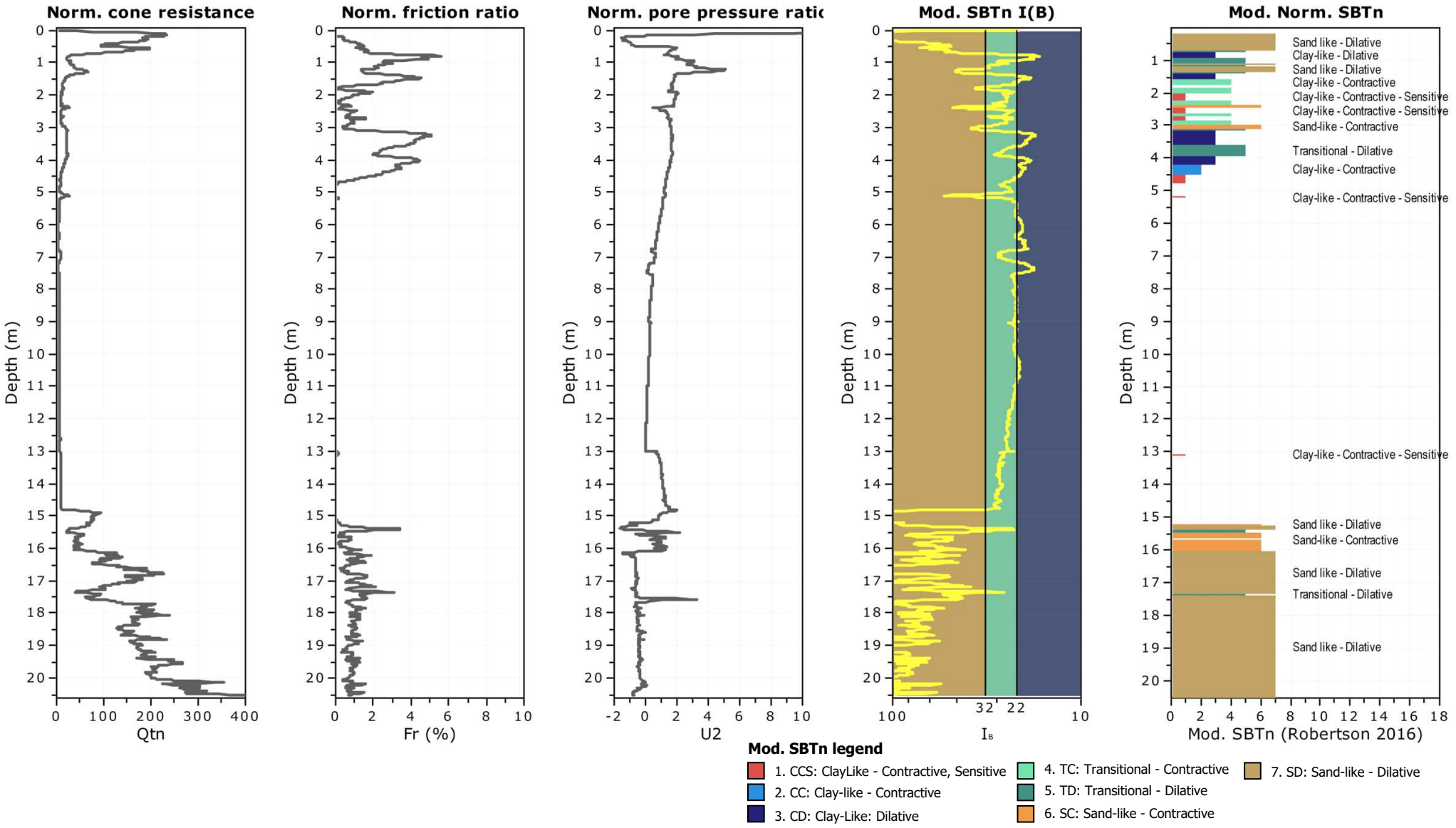




**Fuzzy classifiaction legend**

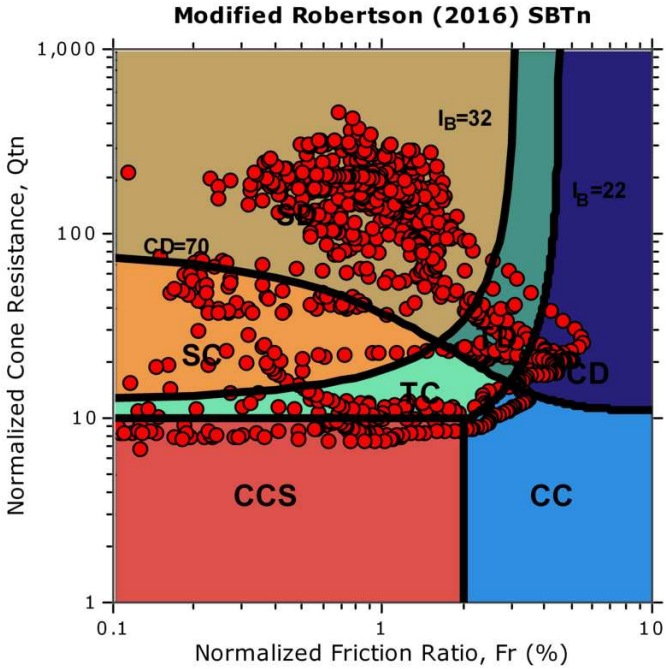
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

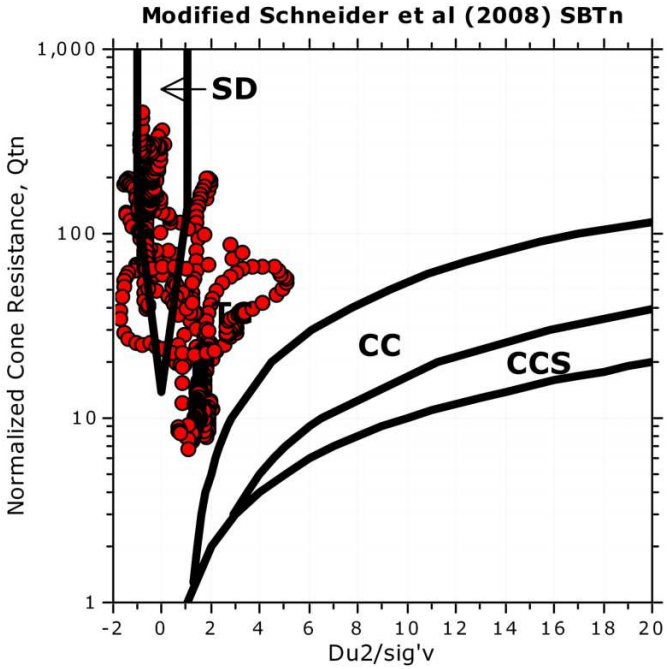

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Sand & silty sand
Silty sand & sandy silt
Clay & silty clay
Clay
Clay & silty clay
Sensitive fine grained
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Sensitive fine grained
Sensitive fine grained
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
Sand
Sand & silty sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

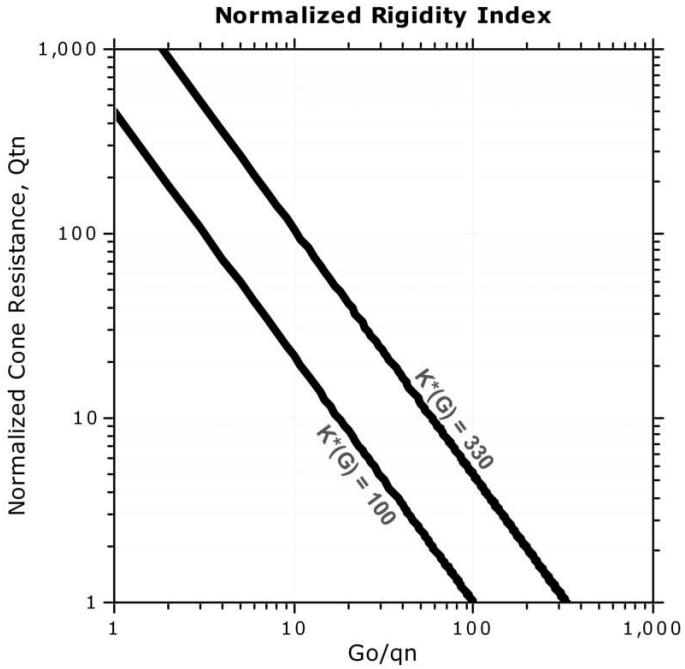

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Sensitive fine grained
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Clay
Clay & silty clay
Sensitive fine grained
Sensitive fine grained
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
Sand & silty sand
Silty sand & sandy silt
Sand & silty sand
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure ratio
U2
Mod. SBTn I(B)
Ib
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Depth (m)
Sand like - Dilative
Clay-like - Dilative
Sand like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Sand-like - Contractive
Transitional - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Sand like - Dilative
Sand-like - Contractive
Sand like - Dilative
Transitional - Dilative
Sand like - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots

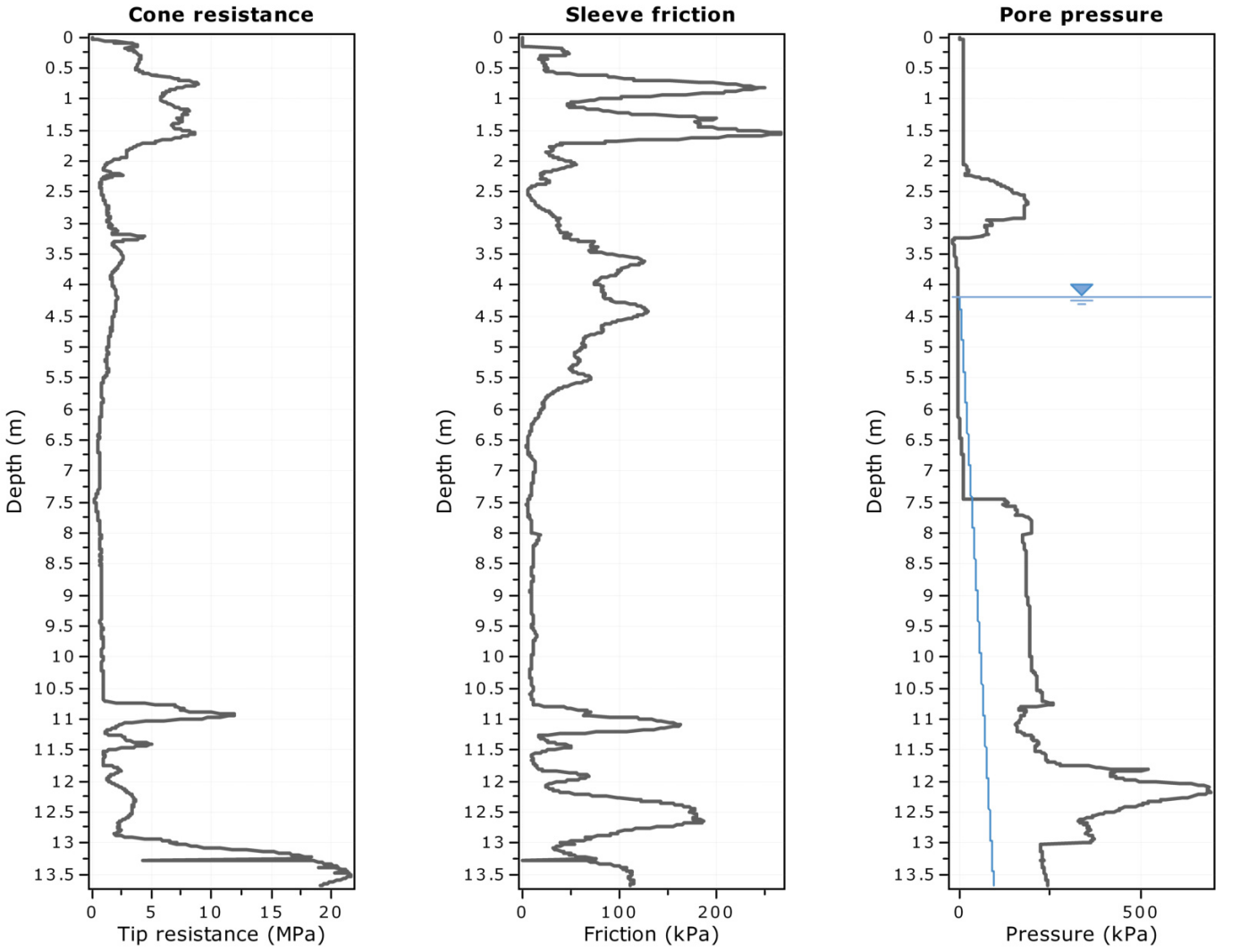


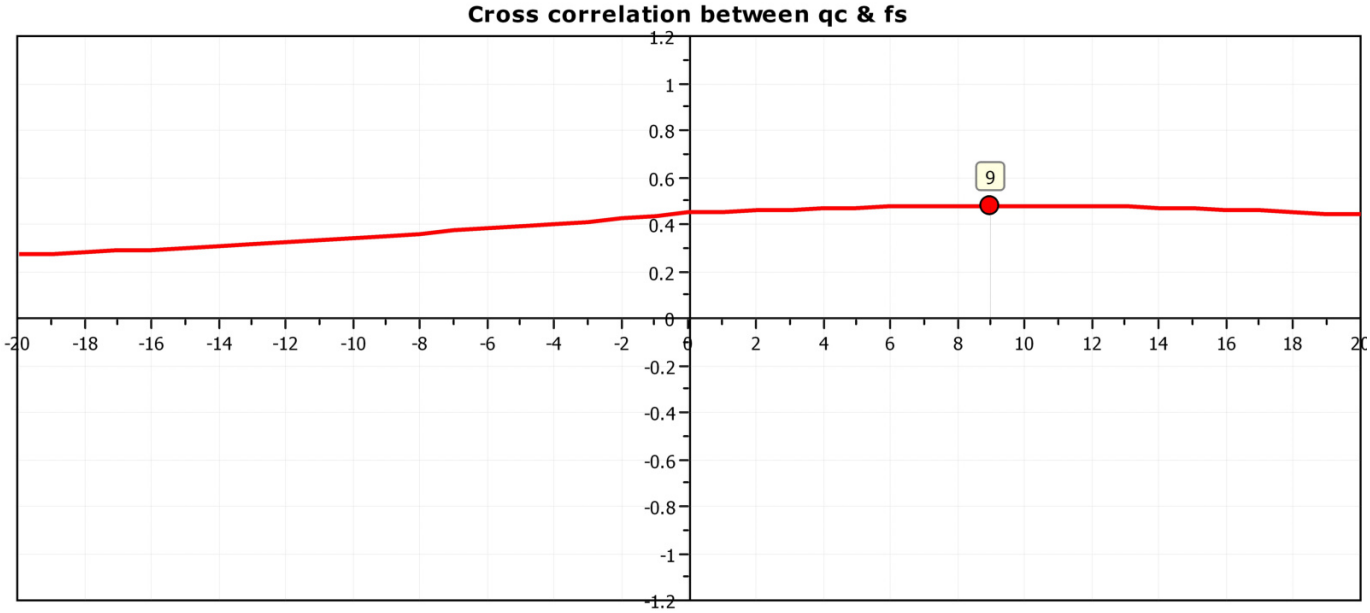




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

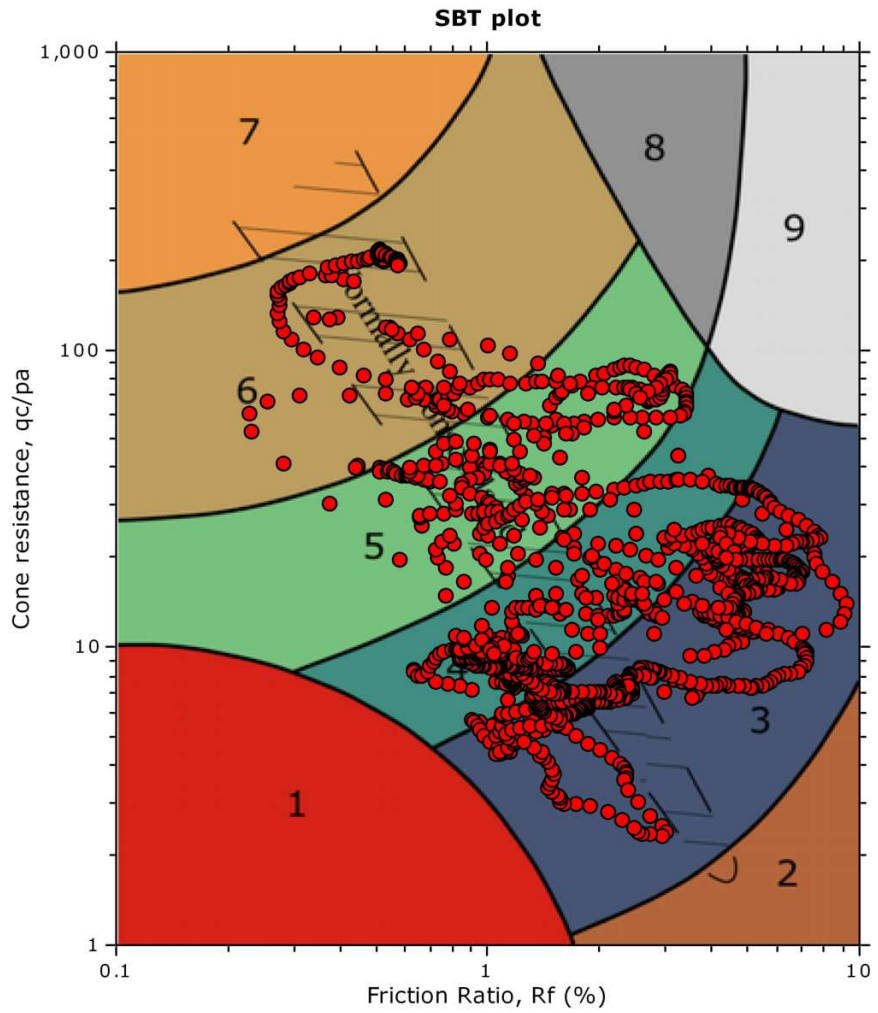
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

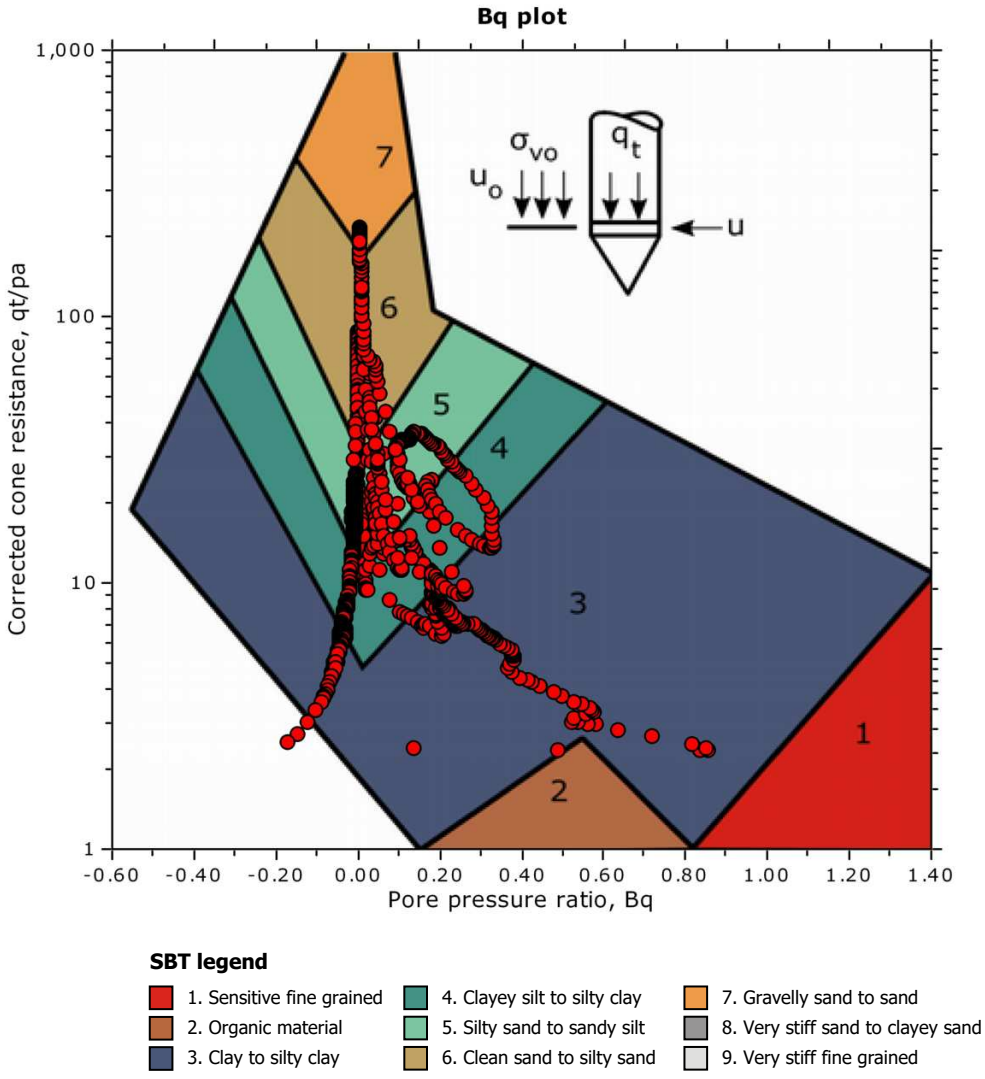



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

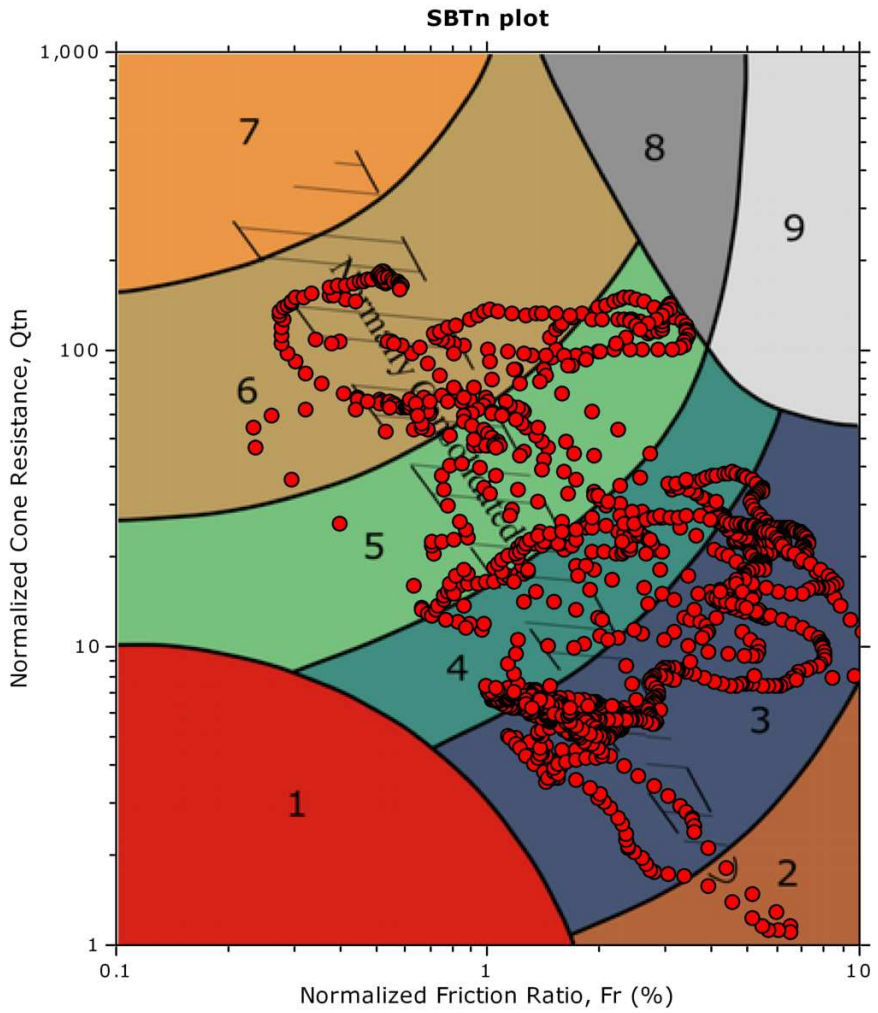


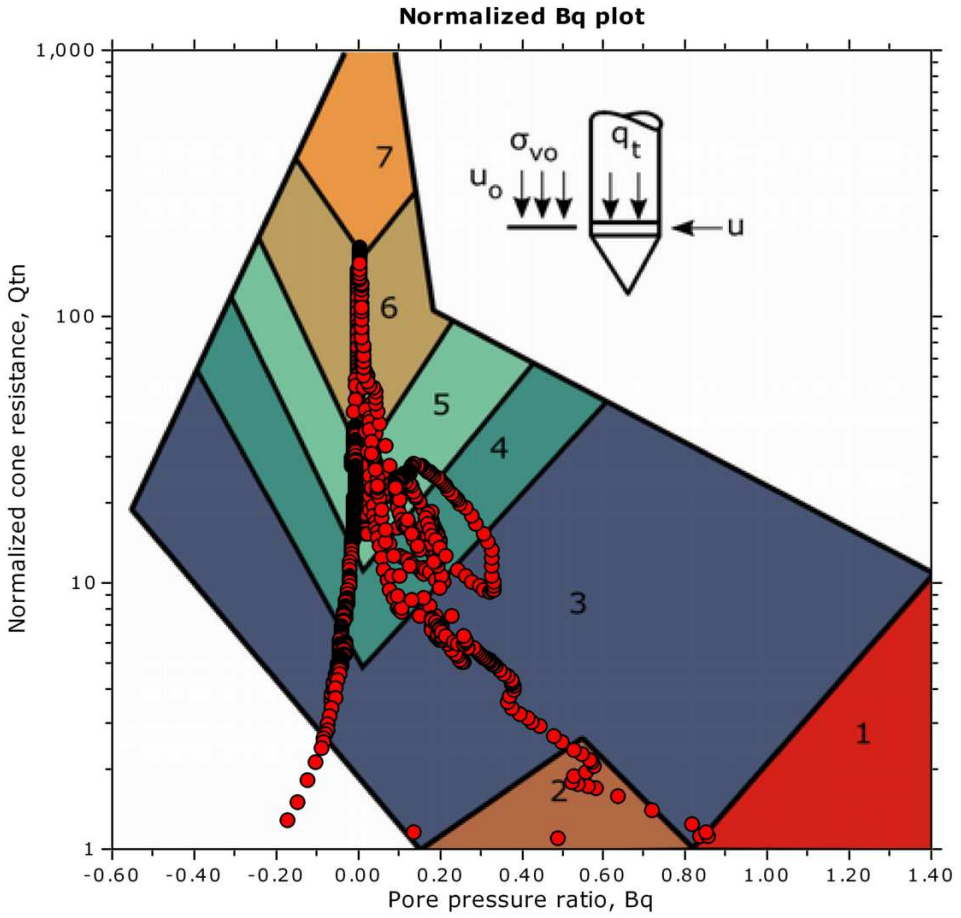
## SBT - Bq plots


SBT plot
Cone resistance, qc/pa
Friction Ratio, Rf (%)
1,000
100
10
1
0.1
1
10
1
2
3
4
5
6
7
8
9


Bq plot
Corrected cone resistance, qt/pa
Pore pressure ratio, Bq
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
σvo
uo
qt
u
1
2
3
4
5
6
7
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

## SBT - Bq plots (normalized)

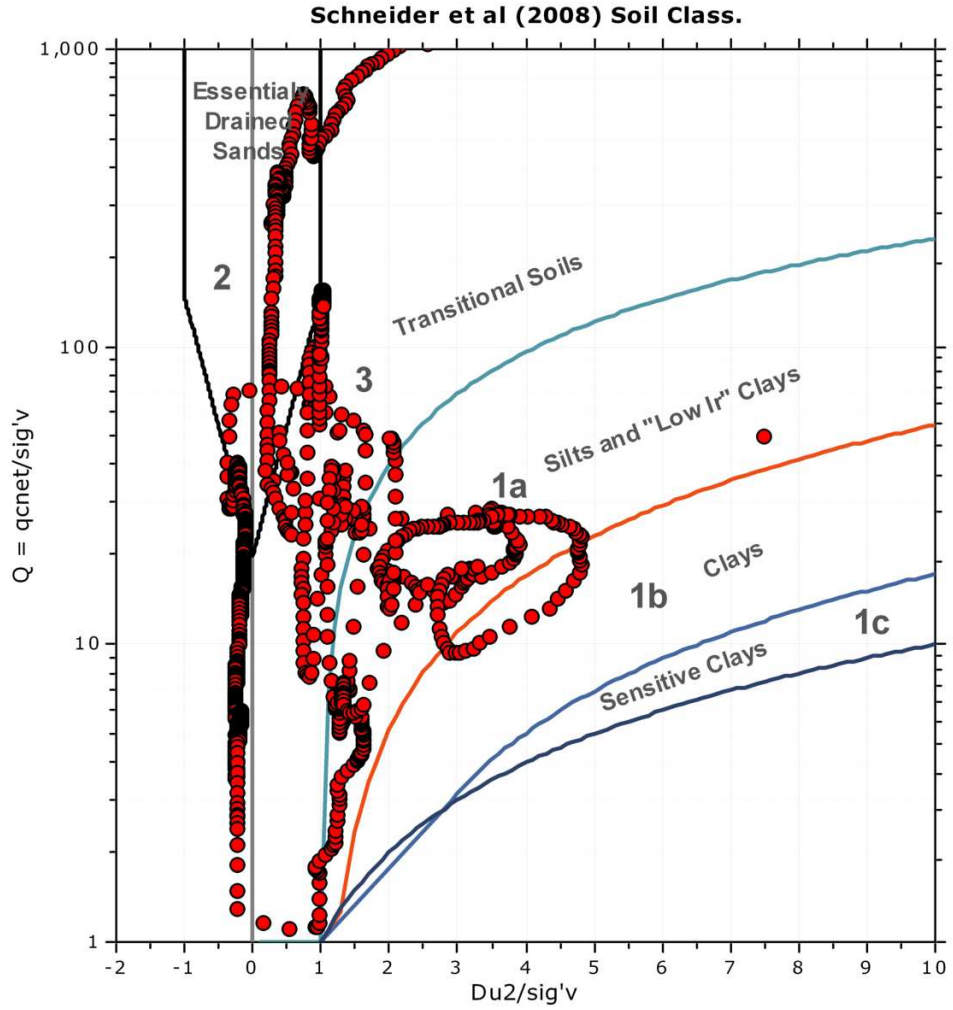


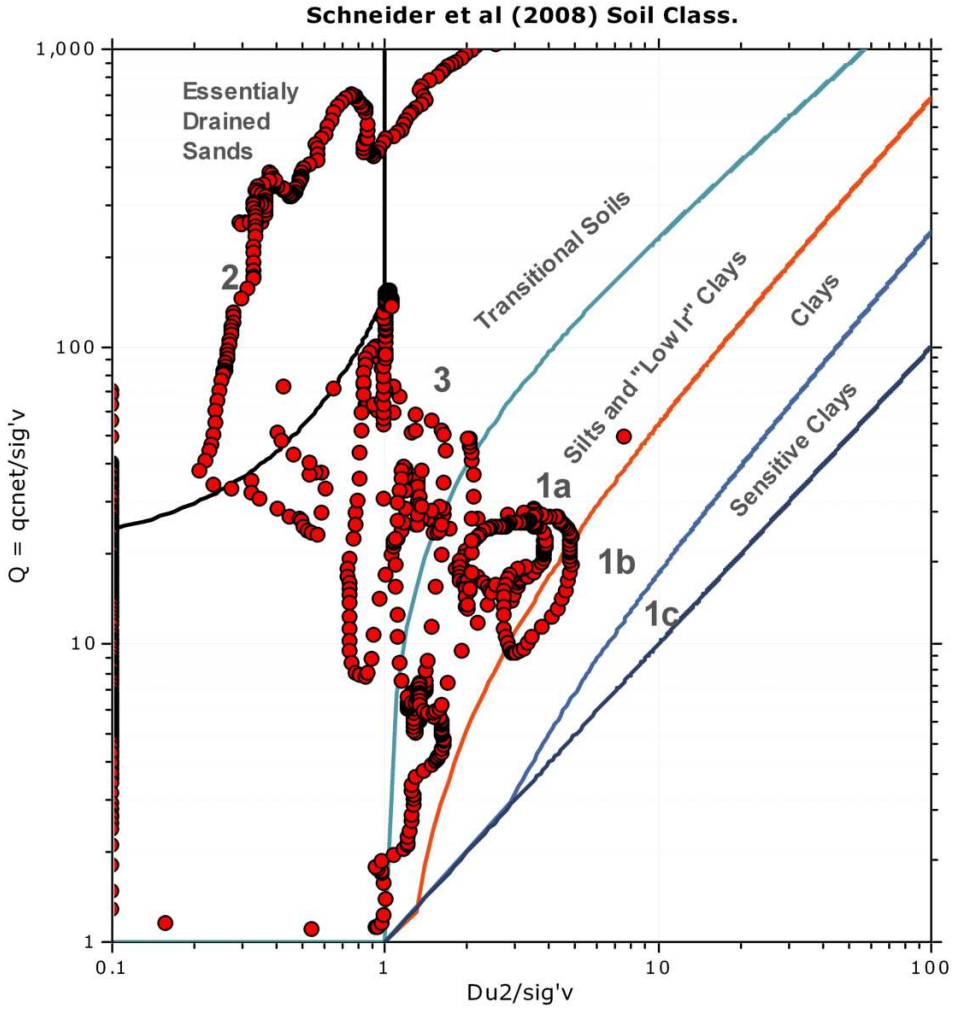



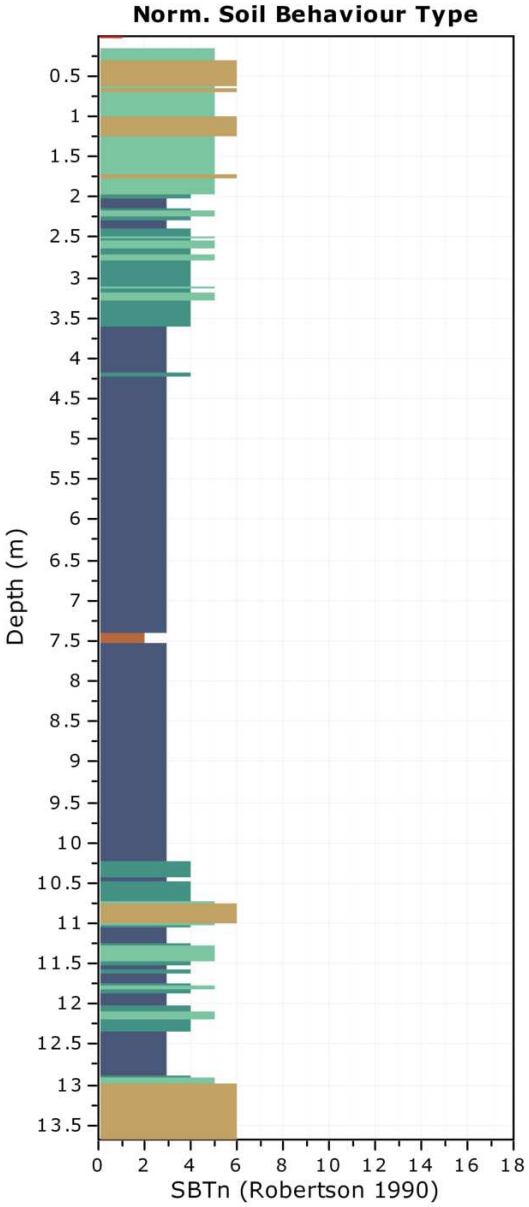

**SBTn legend**

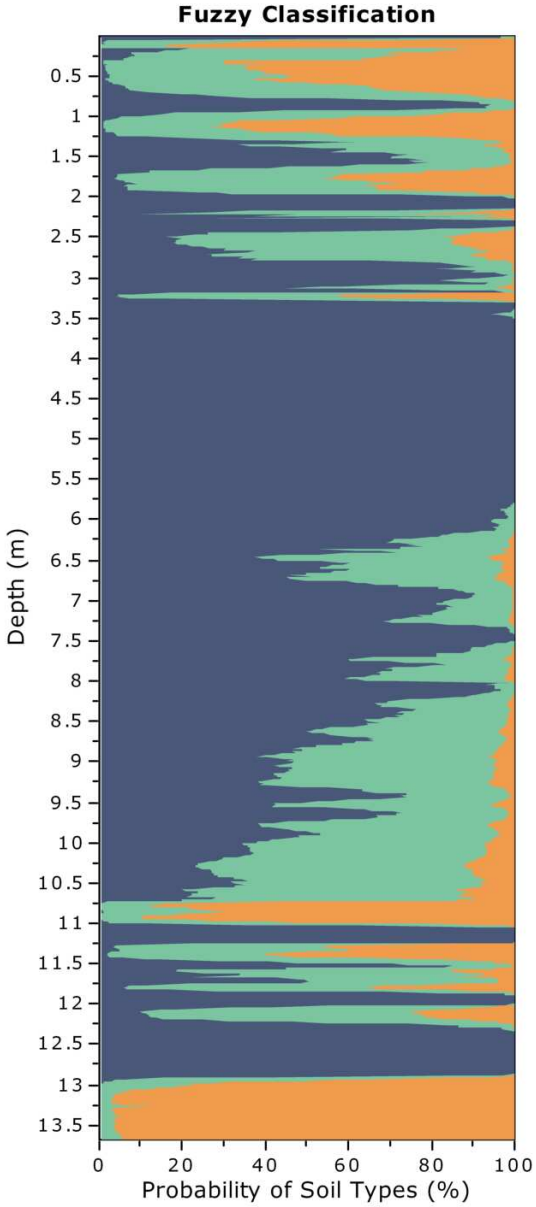
| | | |
|---|---|---|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

## Bq plots (Schneider)



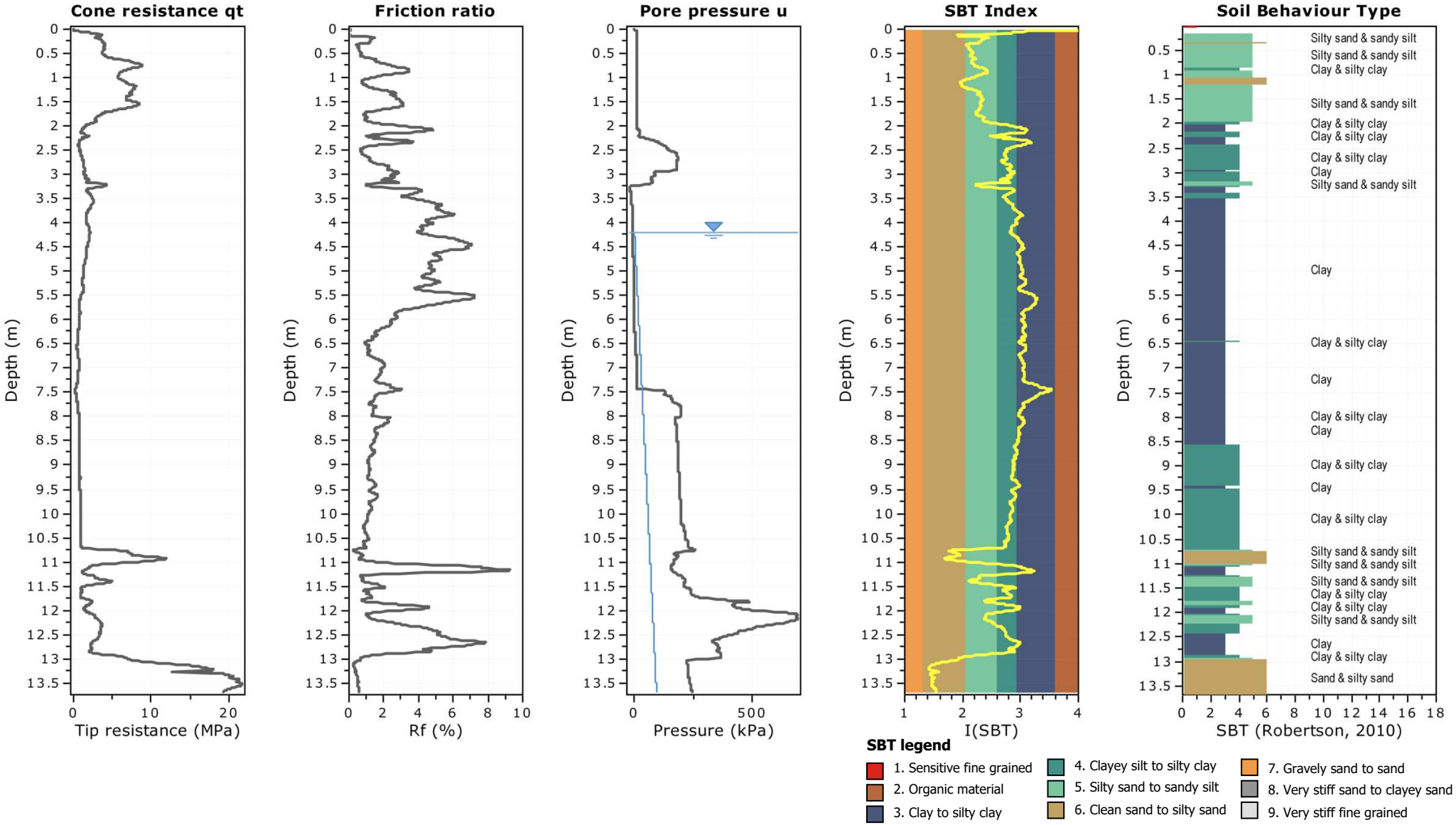



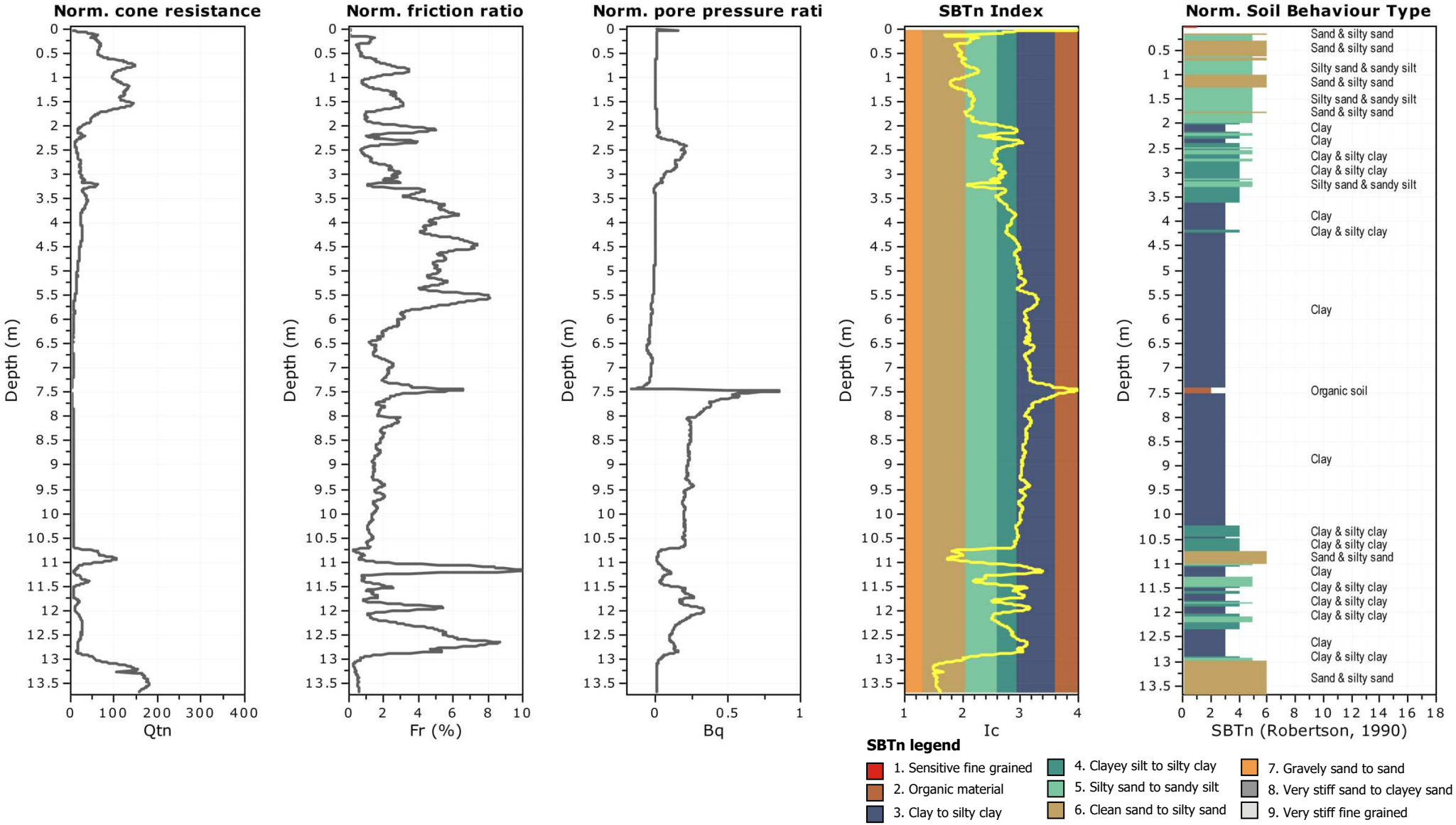


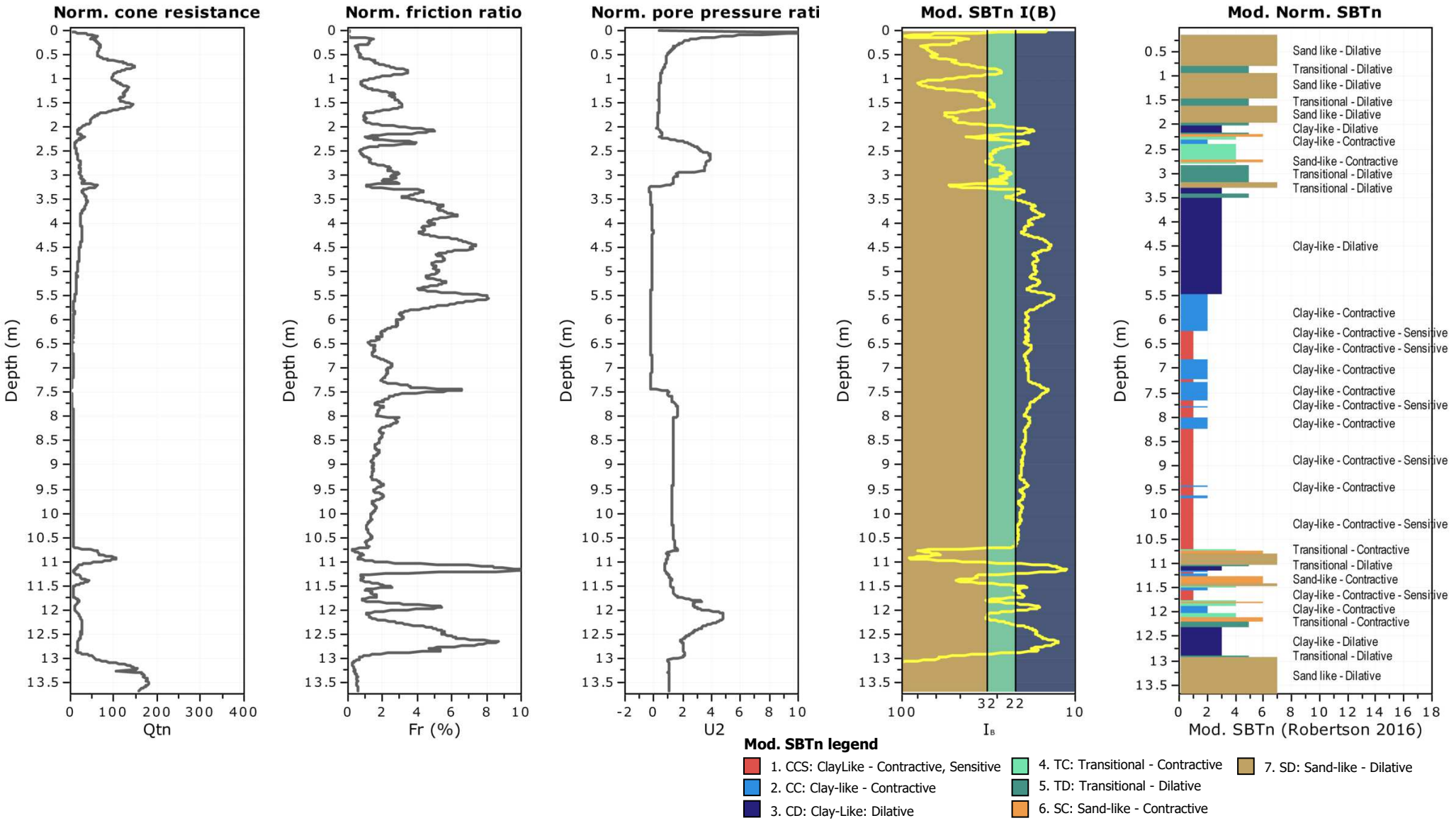




**Fuzzy classifiaction legend**

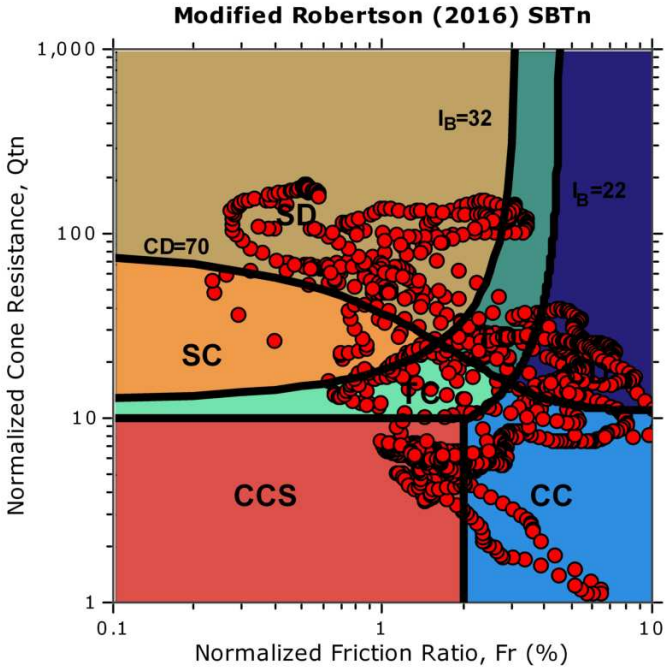
- Highly probable clayey soil
- Highly probable mixture soil
- Highly probable sandy soil

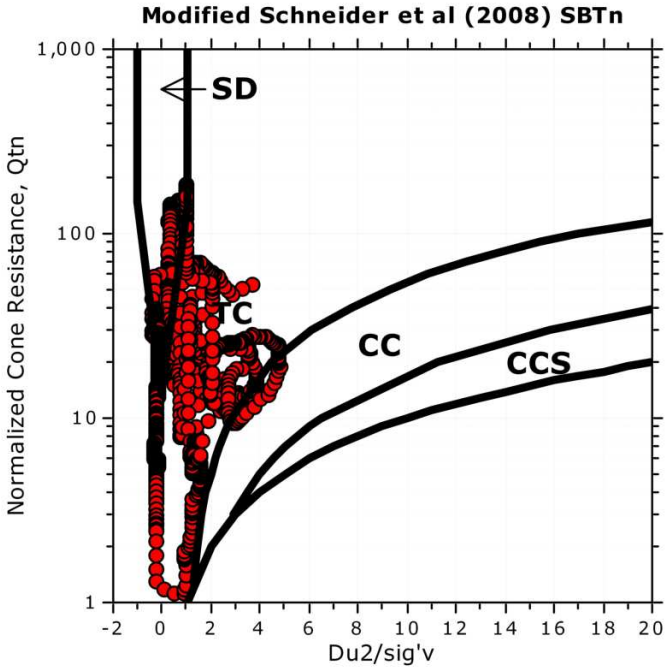

Cone resistance qt
Depth (m)
Tip resistance (MPa)
Friction ratio
Rf (%)
Pore pressure u
Pressure (kPa)
SBT Index
I(SBT)
Soil Behaviour Type
SBT (Robertson, 2010)
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Clay & silty clay
Clay
Silty sand & sandy silt
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Silty sand & sandy silt
Silty sand & sandy silt
Silty sand & sandy silt
Clay & silty clay
Clay & silty clay
Silty sand & sandy silt
Clay
Clay & silty clay
Sand & silty sand
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

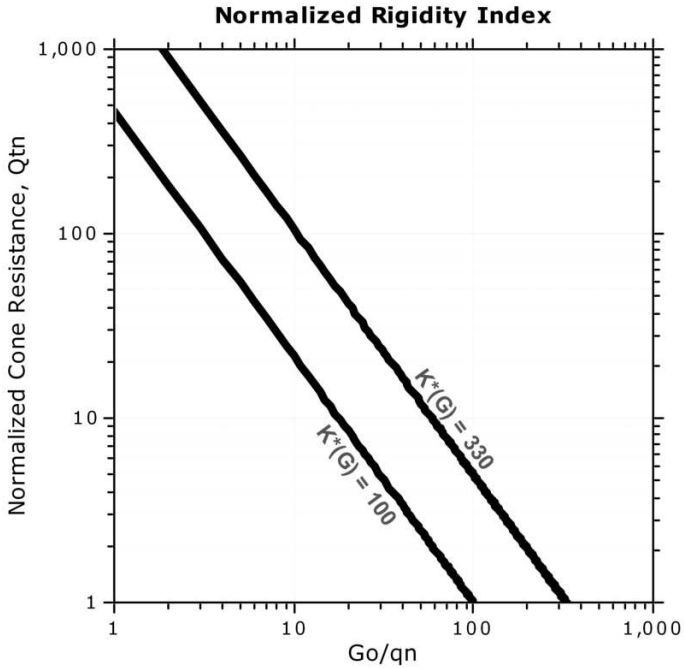

Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
Bq
SBTn Index
Ic
Norm. Soil Behaviour Type
SBTn (Robertson, 1990)
Sand & silty sand
Silty sand & sandy silt
Clay
Clay & silty clay
Organic soil
SBTn legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained


Norm. cone resistance
Depth (m)
Qtn
Norm. friction ratio
Fr (%)
Norm. pore pressure rati
U2
Mod. SBTn I(B)
$I_B$
Mod. Norm. SBTn
Mod. SBTn (Robertson 2016)
Sand like - Dilative
Transitional - Dilative
Sand like - Dilative
Transitional - Dilative
Sand like - Dilative
Clay-like - Dilative
Clay-like - Contractive
Sand-like - Contractive
Transitional - Dilative
Transitional - Dilative
Clay-like - Dilative
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive - Sensitive
Clay-like - Contractive
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive
Transitional - Contractive
Transitional - Dilative
Sand-like - Contractive
Clay-like - Contractive - Sensitive
Clay-like - Contractive
Transitional - Contractive
Clay-like - Dilative
Transitional - Dilative
Sand like - Dilative
Mod. SBTn legend
1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

## Updated SBTn plots




CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

K(G) > 330: Soils with significant microstructure (e.g. age/cementation)