



Developing confidence in critical state soil mechanics

9. Fraser River Sand triaxial tests

Dr. Dawn Shuttle, PEng

Mike Jefferies, PEng

January, 2015



Find file...

- Folder: [/data_and_progs](#)
- [NorSandM_txl_FRS.xls](#)
 - Fraser River Sand triaxial data – CID & CIU
 - NorSandM VBA – drained triaxial
 - NorSandM VBA – undrained triaxial
 - Assorted functions, e.g. Mi



Fraser River Sand dataset

- 13 tests are included in the spreadsheet
- 4 no. dense CID
 - the primary dataset for calibration
- 3 no. loose CID
 - Used to determine CSL
 - Helps to constrain hardening
- 6 no. loose CIU
 - CIU not used for the calibration
 - 3 no loose
 - 2 no. compact
 - 1 no. dense



Plotting the triaxial data

- Goto "params and plots" sheet

1 - 4 dense CID
 5 - 7 loose CID
 8 - 13 CIU

Initial soil state...

$w_0 = 0$
 $\Rightarrow e_0 = 0.669$
 $p_0 = 80 \text{ kPa}$
 $K_0 = 1$ ---
 (sig1...) 80
 OCR ("R") = 1 ---

Update Model

Strain Mode

Engineering NOTE: most labs report engineering (= "small") strain (change choice inside VBA)

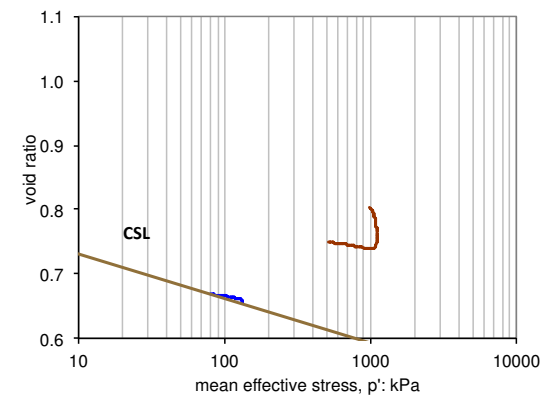
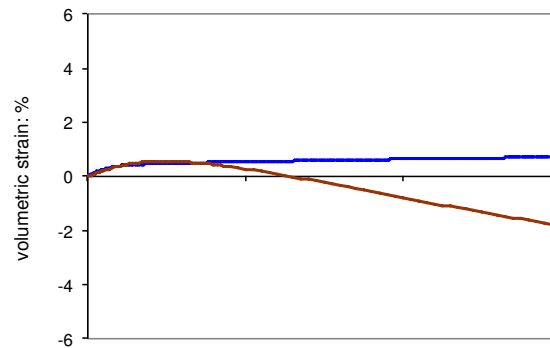
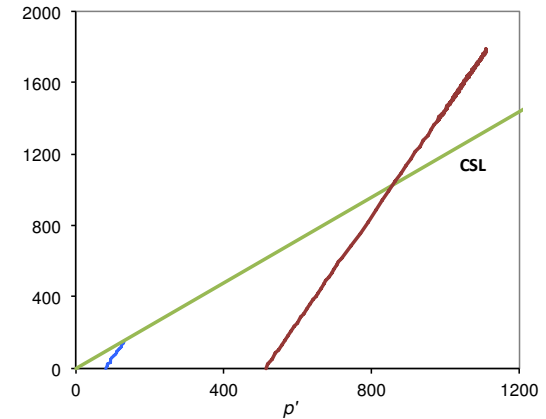
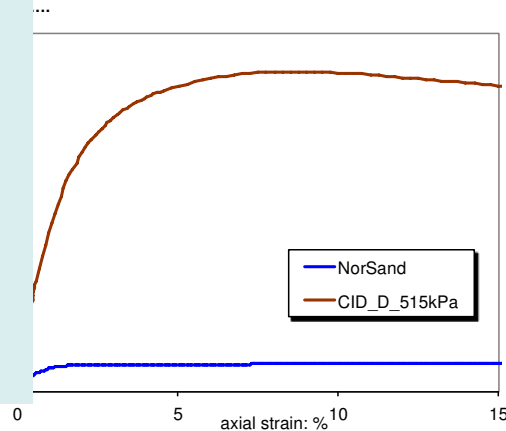
Choose Test to Plot

Choice is:

4

Plot Data

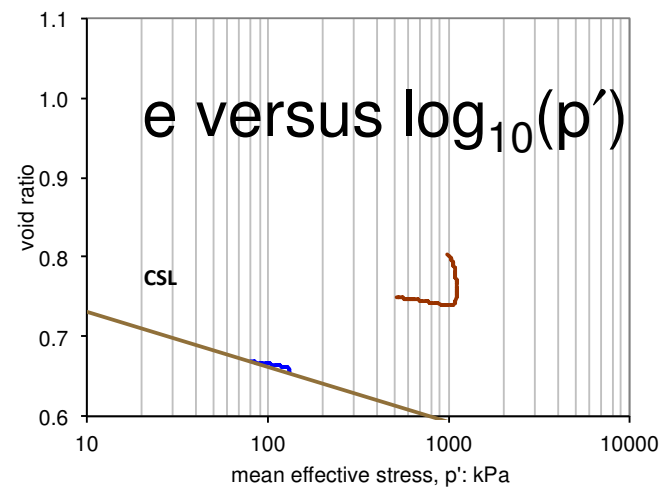
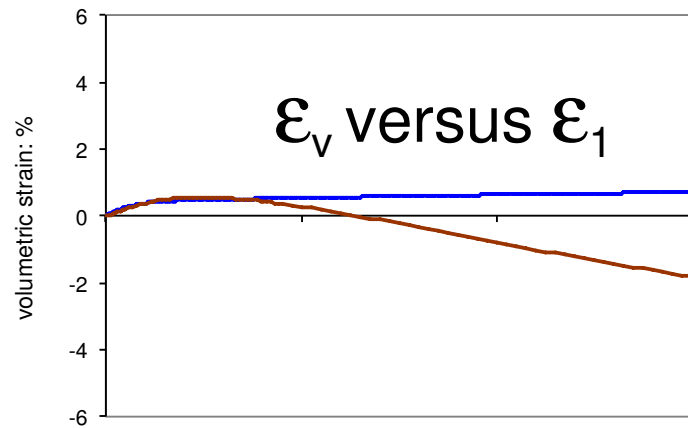
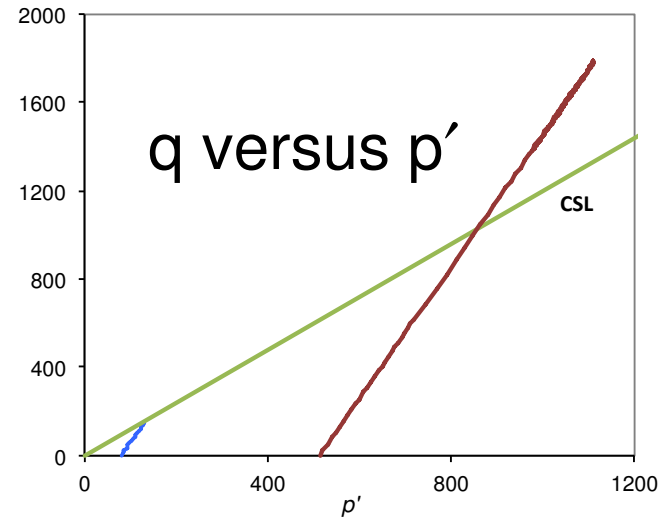
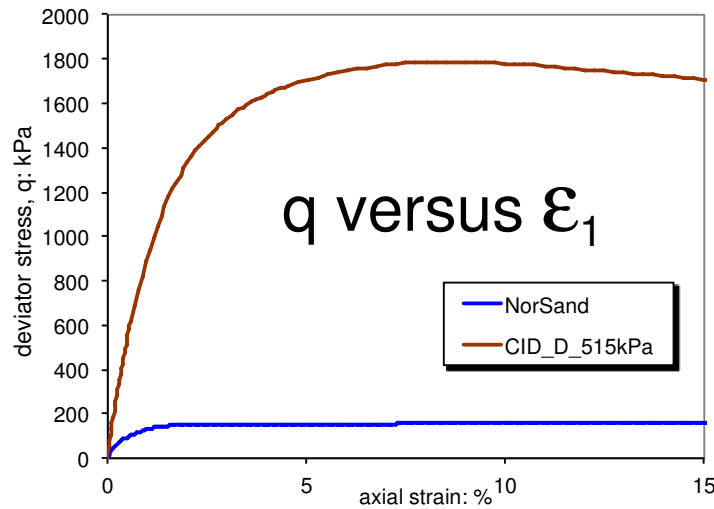
To run this simulation, you must first define the material properties and then select the "Update Model" button
 Values shown in brackets after the blue model parameters are calculated equivalents that may be of interest





Plotting the triaxial data

DRAINED TXL....





Layout of the data

■ Goto CID_D_50kPa

Test type	CID
-----------	-----

Lab	GOLDER(V)
-----	-----------

Job number

Test date

Material tested	FRASER RIVER SAND
-----------------	-------------------

Preparation method	MOIST TAMPED
--------------------	--------------

Specific gravity of solids	2.72
----------------------------	------

Post consolidation void ratio	0.813
-------------------------------	-------

K0	1.00
----	------

Post consolidation void ratio (recorded)	0.753
--	-------

Gamma correction for different gradation	0.06
--	------



Layout of the data

MEASURED				PROCESSED						
AXIAL STRAIN (%)	VOL STRAIN (%)	SIGMAA' (kPa)	SIGMAR' (kPa)	p (kPa)	q (kPa)	e (-)	eta (-)	epQ (%)	D (-)	psi (-)
0.000	0.000	50.341	50.341	50.341	0.000	0.813	0.000	0.000		0.130
0.114	0.001	56.608	49.316	51.747	7.291	0.813	0.141	0.113		0.131
0.211	0.031	74.537	50.136	58.270	24.401	0.812	0.419	0.200	0.181	0.134
0.316	0.054	94.532	50.007	64.849	44.525	0.812	0.687	0.298	0.211	0.137
0.407	0.070	111.988	49.889	70.589	62.099	0.812	0.880	0.384	0.125	0.139
0.503	0.078	131.356	50.190	77.245	81.166	0.811	1.051	0.477	0.036	0.142
0.600	0.078	147.243	50.873	82.996	96.370	0.811	1.161	0.574	-0.048	0.144
0.696	0.068	159.833	50.550	86.978	109.282	0.812	1.256	0.673	-0.129	0.145
0.795	0.051	170.239	50.243	90.241	119.996	0.812	1.330	0.778	-0.202	0.147
0.890	0.026	178.913	50.252	93.139	128.661	0.812	1.381	0.882	-0.253	0.148
0.995	-0.008	187.342	49.907	95.719	137.435	0.813	1.436	0.998	-0.301	0.150
1.104	-0.045	193.313	50.164	97.880	143.149	0.814	1.462	1.119	-0.348	0.151
1.195	-0.083	199.332	50.067	99.822	149.264	0.814	1.495	1.223	-0.382	0.152
1.285	-0.130	203.932	49.589	101.037	154.343	0.815	1.528	1.328	-0.410	0.154
1.386	-0.179	207.232	50.260	102.584	156.971	0.816	1.530	1.446	-0.428	0.155
1.490	-0.229	211.517	50.206	103.976	161.312	0.817	1.551	1.566	-0.444	0.156
1.597	-0.284	214.165	50.266	104.899	163.899	0.818	1.562	1.691	-0.459	0.157



Layout of the data

measured
lab data

MEASURED			
AXIAL STRAIN	VOL STRAIN	SIGMAA'	SIGMAR'
(%)	(%)	(kPa)	(kPa)
0.000	0.000	50.341	50.341
0.114	0.001	56.608	49.316
0.211	0.031	74.537	50.136
0.316	0.054	94.532	50.007
0.407	0.070	111.988	49.889
0.503	0.078	131.356	50.190
0.600	0.078	147.243	50.873
0.696	0.068	159.833	50.550
0.795	0.051	170.239	50.243
0.890	0.026	178.913	50.252
0.995	-0.008	187.342	49.907
1.104	-0.045	193.313	50.164
1.195	-0.083	199.332	50.067
1.285	-0.130	203.932	49.589
1.386	-0.179	207.232	50.260
1.490	-0.229	211.517	50.206
1.597	-0.284	214.165	50.266



Layout of the data

data processed
in Excel

PROCESSED						
p (kPa)	q (kPa)	e (-)	eta (-)	epQ (%)	D (-)	psi (-)
50.341	0.000	0.813	0.000	0.000		0.130
51.747	7.291	0.813	0.141	0.113		0.131
58.270	24.401	0.812	0.419	0.200	0.181	0.134
64.849	44.525	0.812	0.687	0.298	0.211	0.137
70.589	62.099	0.812	0.880	0.384	0.125	0.139
77.245	81.166	0.811	1.051	0.477	0.036	0.142
82.996	96.370	0.811	1.161	0.574	-0.048	0.144
86.978	109.282	0.812	1.256	0.673	-0.129	0.145
90.241	119.996	0.812	1.330	0.778	-0.202	0.147
93.139	128.661	0.812	1.381	0.882	-0.253	0.148
95.719	137.435	0.813	1.436	0.998	-0.301	0.150
97.880	143.149	0.814	1.462	1.119	-0.348	0.151
99.822	149.264	0.814	1.495	1.223	-0.382	0.152
101.037	154.343	0.815	1.528	1.328	-0.410	0.154
102.584	156.971	0.816	1.530	1.446	-0.428	0.155
103.976	161.312	0.817	1.551	1.566	-0.444	0.156
104.899	163.899	0.818	1.562	1.691	-0.459	0.157



Layout of the data

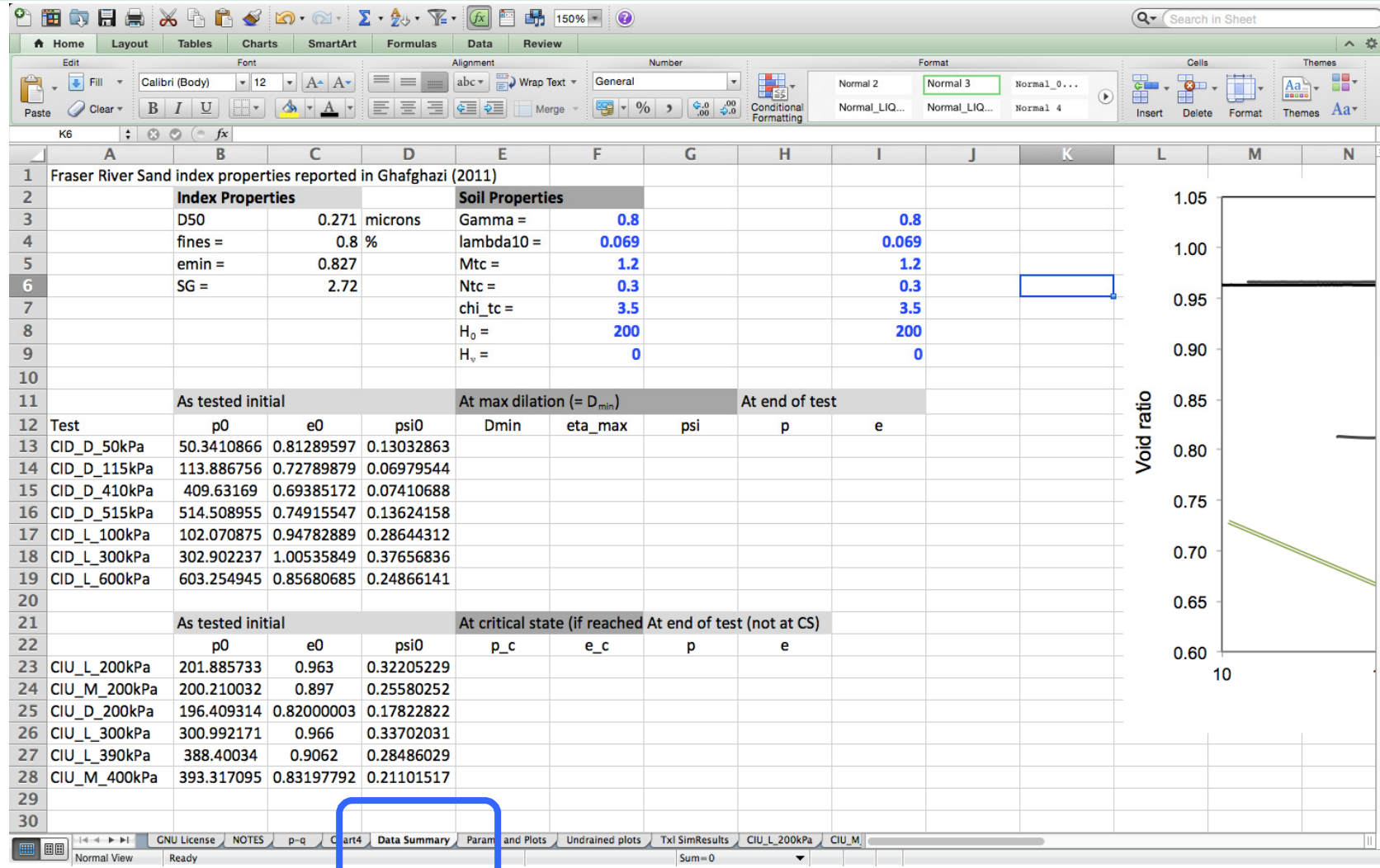
plotted in “params and plots” sheet

MEASURED				PROCESSED			PROCESSED			
AXIAL STRAIN (%)	VOL STRAIN (%)	SIGMAA' (kPa)	SIGMAR' (kPa)	p (kPa)	q (kPa)	e (-)	eta (-)	epQ (%)	D (-)	psi (-)
0.000	0.000	50.341	50.341	50.341	0.000	0.813	0.000	0.000		0.130
0.114	0.001	56.608	49.316	51.747	7.291	0.813	0.141	0.113		0.131
0.211	0.031	74.537	50.136	58.270	24.401	0.812	0.419	0.200	0.181	0.134
0.316	0.054	94.532	50.007	64.849	44.525	0.812	0.687	0.298	0.211	0.137
0.407	0.070	111.988	49.889	70.589	62.099	0.812	0.880	0.384	0.125	0.139
0.503	0.078	131.356	50.190	77.245	81.166	0.811	1.000			0.142
0.600	0.078	147.243	50.873	82.996	96.370	0.811	1.100			0.144
0.696	0.068	159.833	50.550	86.978	109.282	0.812	1.200			0.145
0.795	0.051	170.239	50.243	90.241	119.996	0.812	1.300			0.147
0.890	0.026	178.913	50.252	93.139	128.661	0.812	1.400			0.148
0.995	-0.008	187.342	49.907	95.719	137.435	0.813	1.436	0.998	-0.301	0.150
1.104	-0.045	193.313	50.164	97.880	143.149	0.814	1.462	1.119	-0.348	0.151
1.195	-0.083	199.332	50.067	99.822	149.264	0.814	1.495	1.223	-0.382	0.152
1.285	-0.130	203.932	49.589	101.037	154.343	0.815	1.528	1.328	-0.410	0.154
1.386	-0.179	207.232	50.260	102.584	156.971	0.816	1.530	1.446	-0.428	0.155
1.490	-0.229	211.517	50.206	103.976	161.312	0.817	1.551	1.566	-0.444	0.156
1.597	-0.284	214.165	50.266	104.899	163.899	0.818	1.562	1.691	-0.459	0.157

not included for the CIU tests



Layout of the data





Layout of the data