FP2 project #QC009/16013

LIQUEFACTION RESISTANCE OF PARTIALLY SATURATED CHRISTCHURCH SOILS

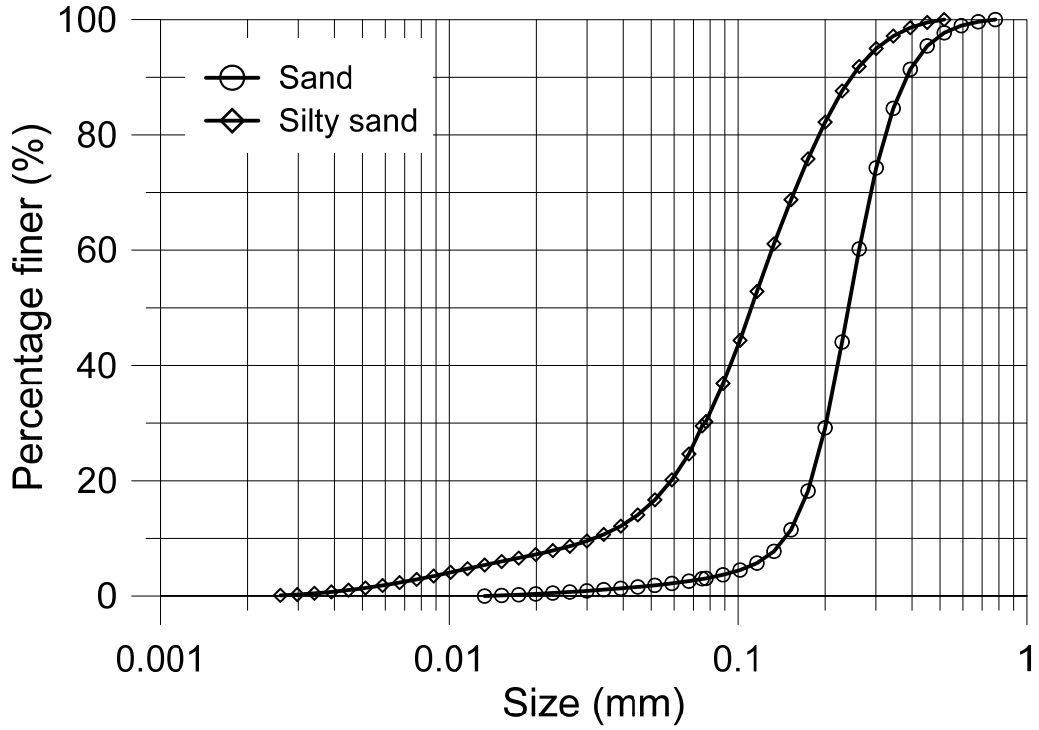
QuakeCoRE
NZ Centre for Earthquake Resilience

UC
UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Tonkin+Taylor

Tested Soils

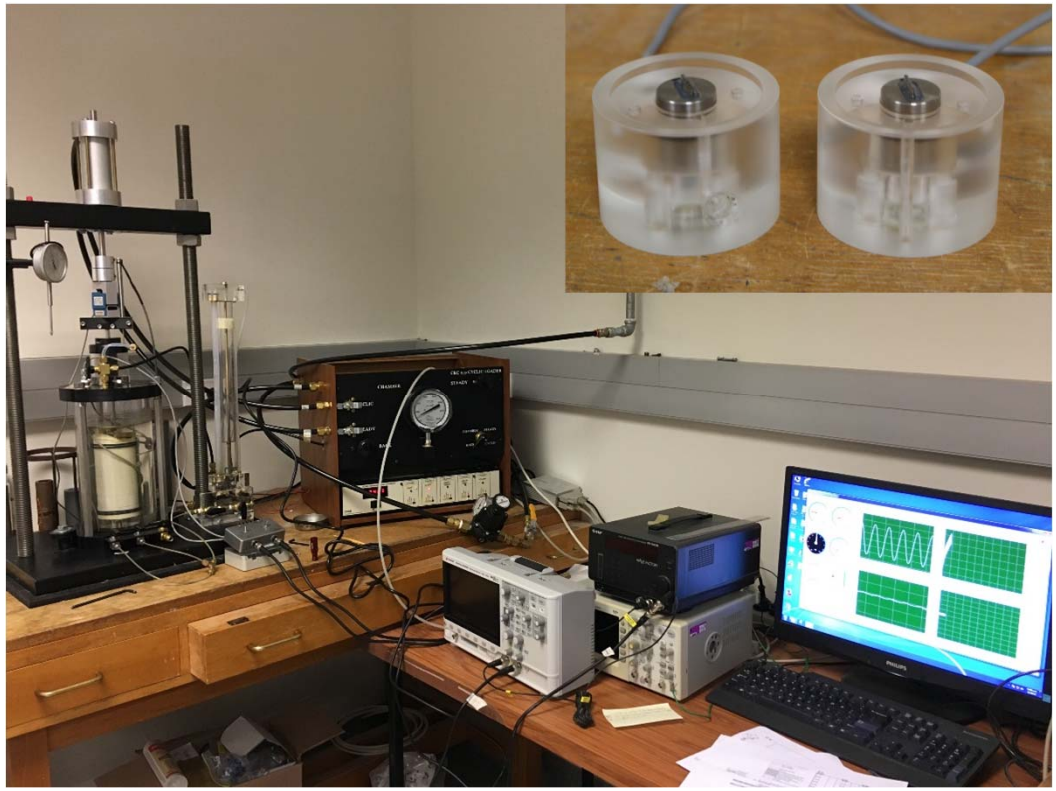
Materials	Fines content (%)	D_{50}: mm	D_{10}: mm	Specific gravity, Gs	Uniformity coefficient, C_u	Maximum void ratio, e_{max}	Minimum void ratio, e_{min}
Sand	3	0.24	0.15	2.67	1.79	1.048	0.635
Silty sand	30	0.11	0.03	2.69	4.33	1.154	0.646



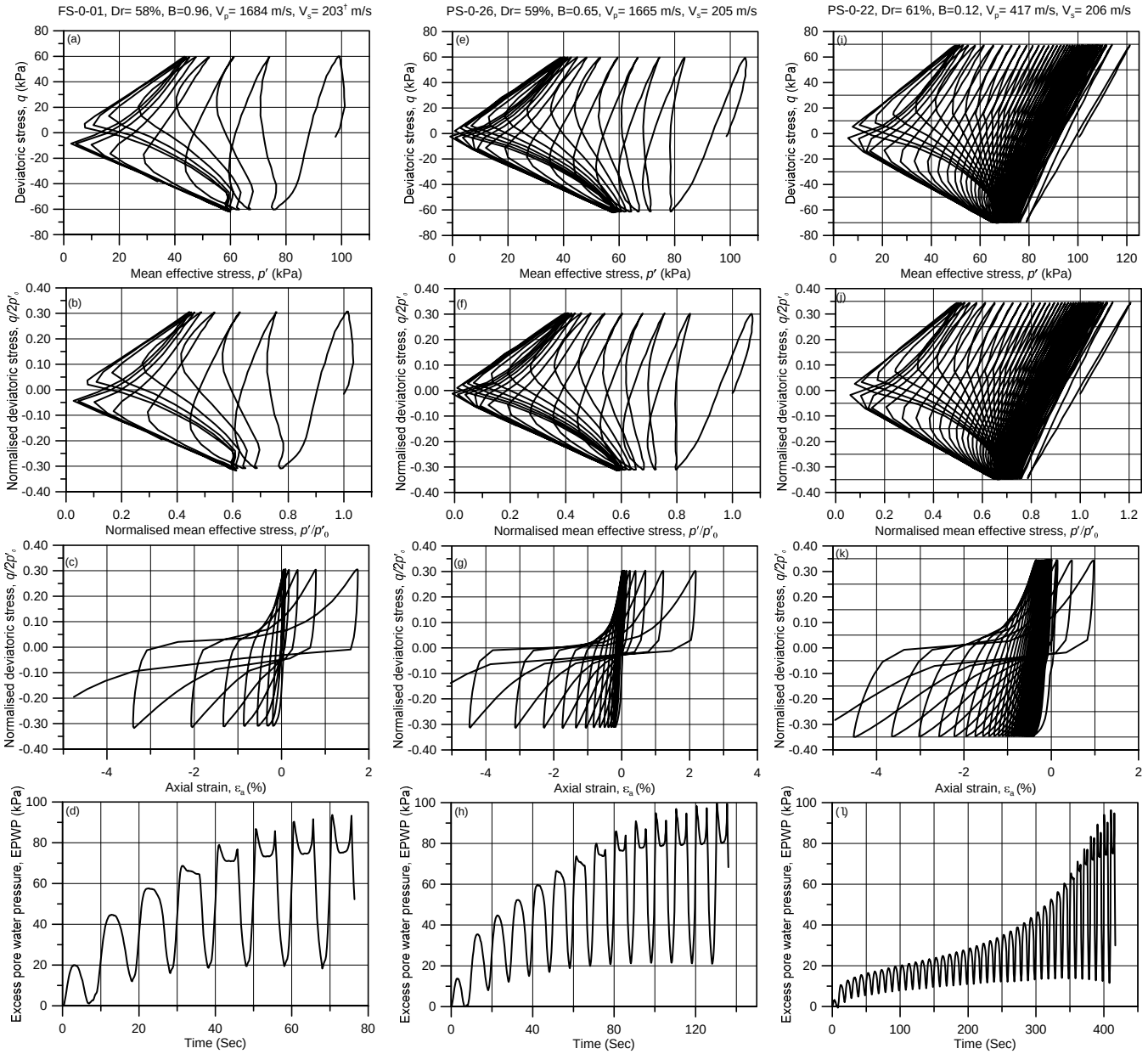
Testing Program

- Cyclic triaxial testing (CKC device)

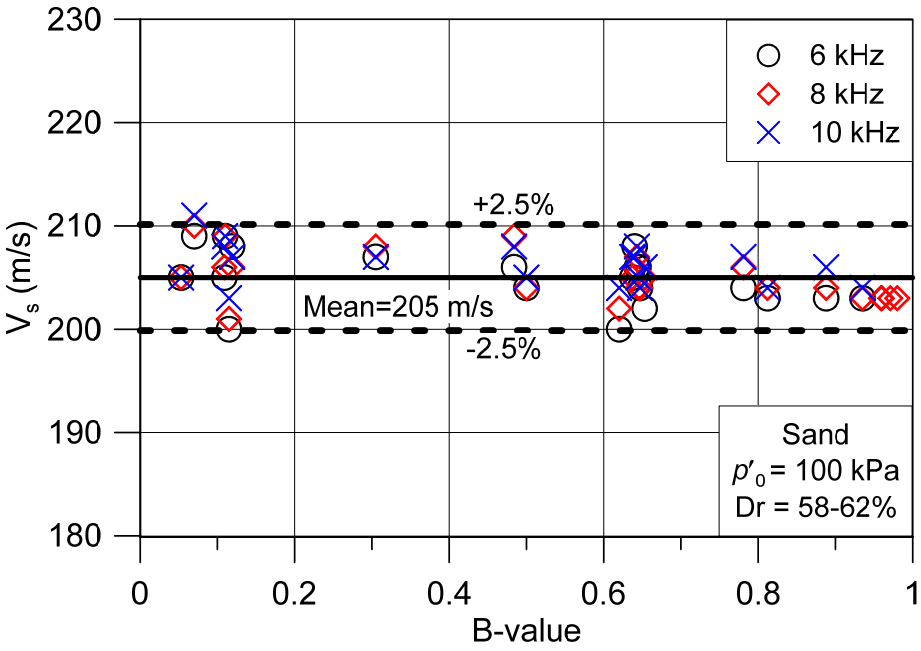
Soils	Dr (%)	p'_0 (kPa)	V_p & V_s	B-values	f (Hz)	Back Pressure, BP (kPa)
Sand	55-60	100	√	0.10-1.0	0.10	0-350 (mostly at 60)
Silty sand		100	√	0.05-1.0		100
		40	√	0.17-1.0		40



Typical Cyclic Triaxial Tests Results

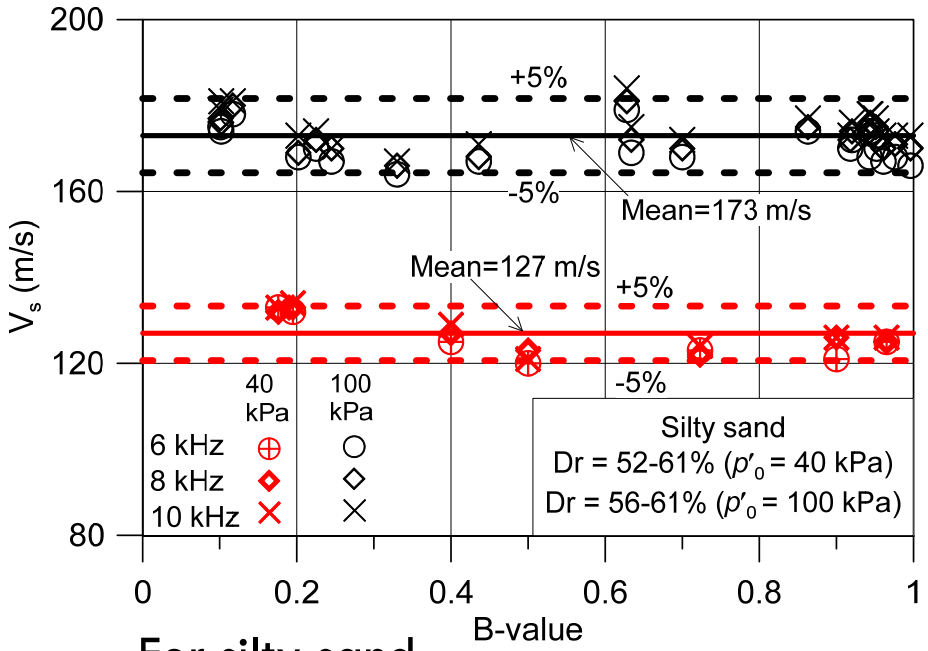


S-wave velocity (V_s)



For sand,

V_s varied from 202 m/s to 209 m/s with an average value of 205 m/s

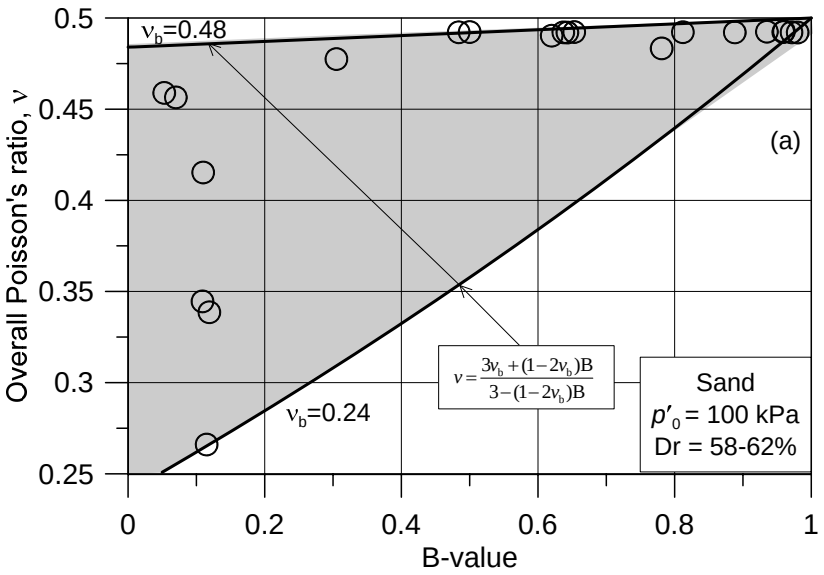


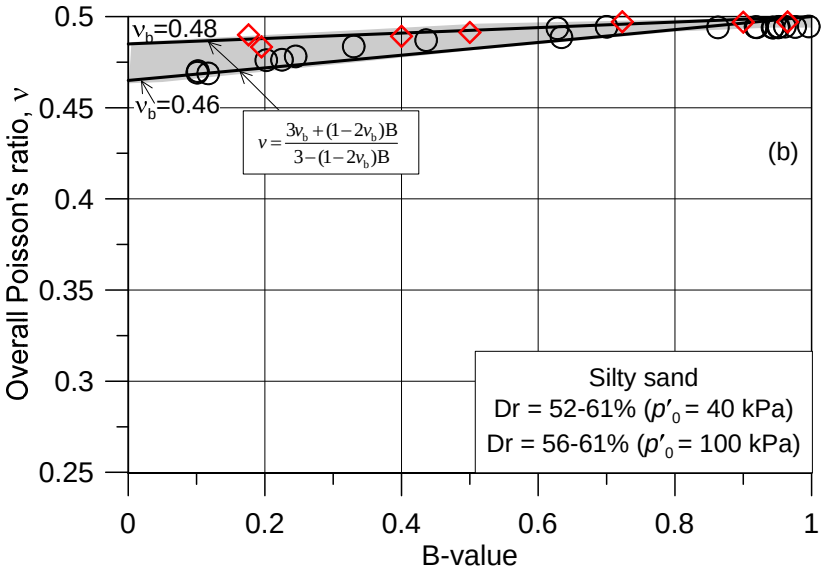
For silty sand,

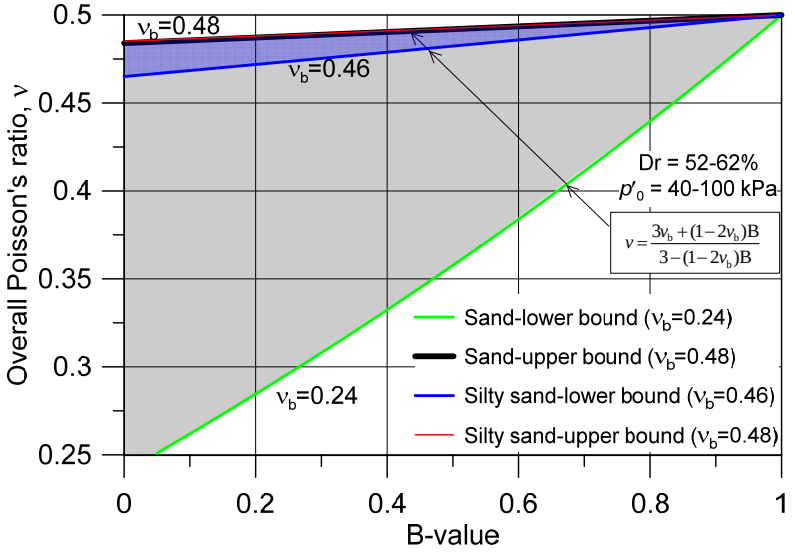
For p'_0 =100 kPa tests; V_s varied from 166 m/s to 180 m/s with an average V_s of 173 m/s

For p'_0 =40 kPa tests; V_s varied from 122 m/s to 133 m/s with an average V_s of 127 m/s

Poisson's ratio, ν







ν= overall Poisson's ratio

$$\left(\frac{V_p}{V_s}\right)^2 = \frac{2(1-\nu)}{1-2\nu}$$

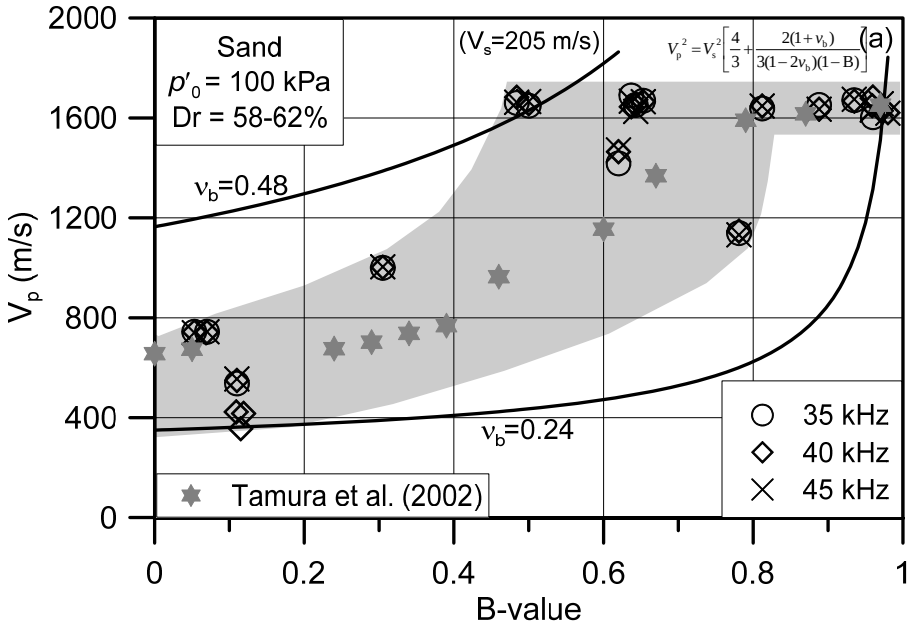
ν_b= skeleton Poisson's ratio

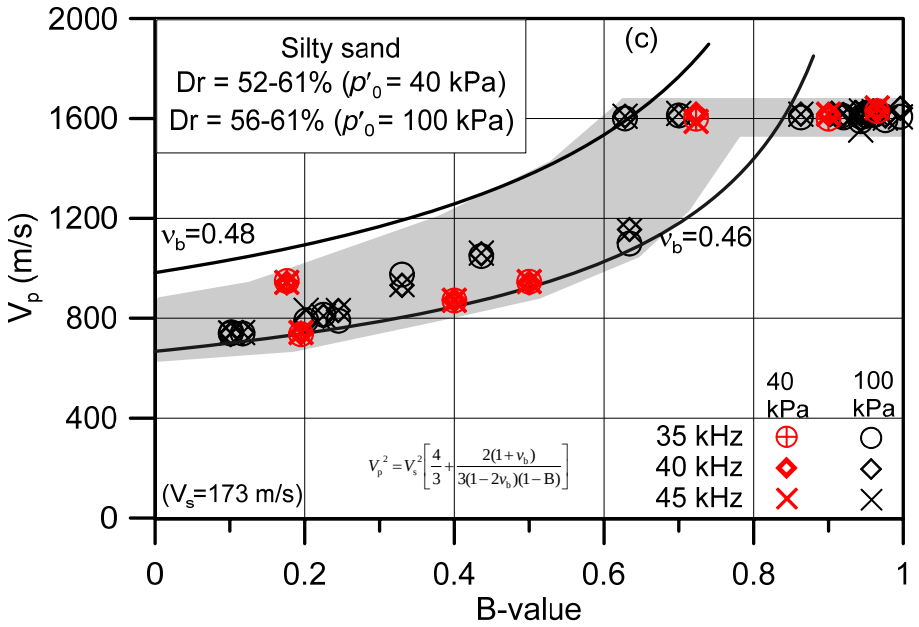
$$\nu = \frac{3\nu_b + (1-2\nu_b)B}{3-(1-2\nu_b)B}$$

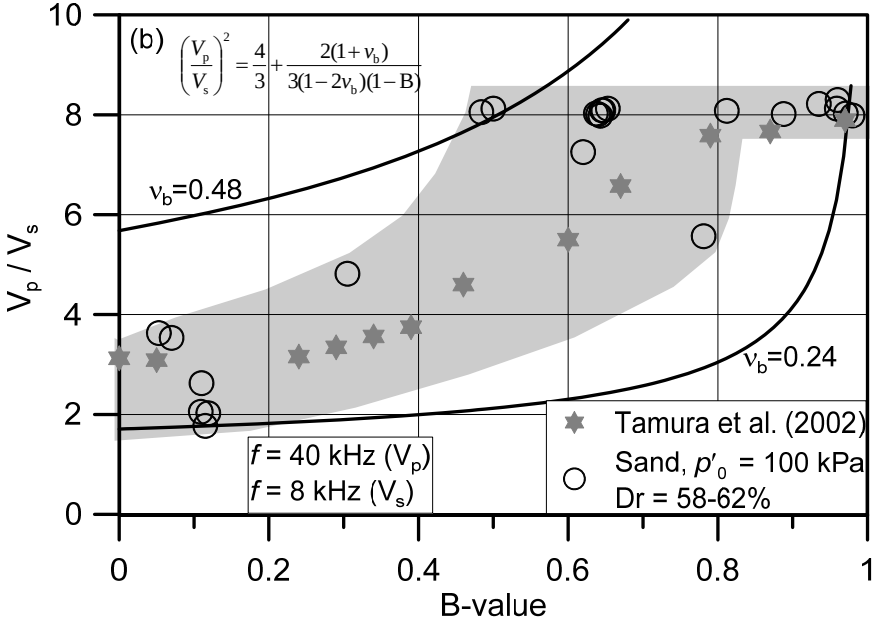
$\nu = \nu_b$ when B=0

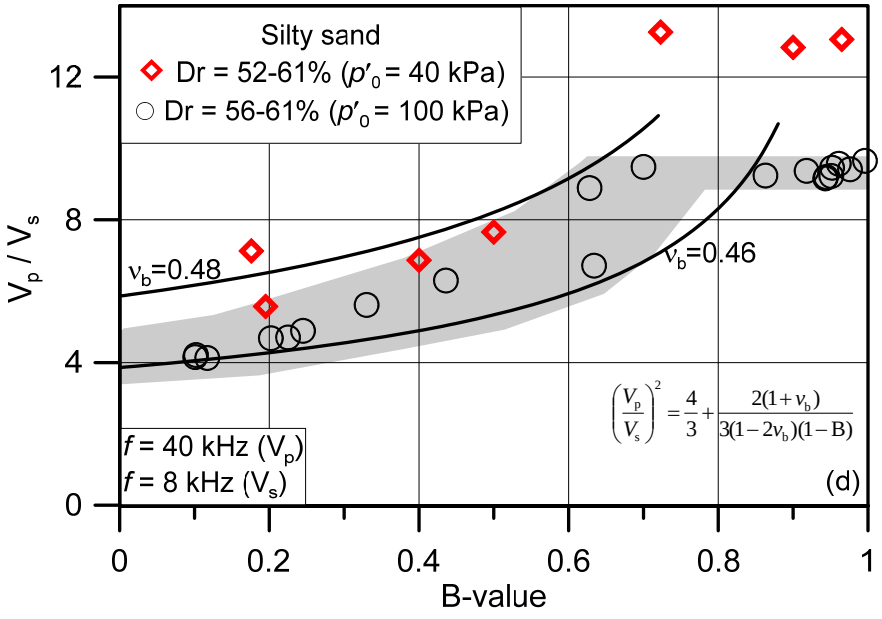
[ν_b is the Poission's ratio when there is no pore pressure buildup]

P-wave velocity (V_p)

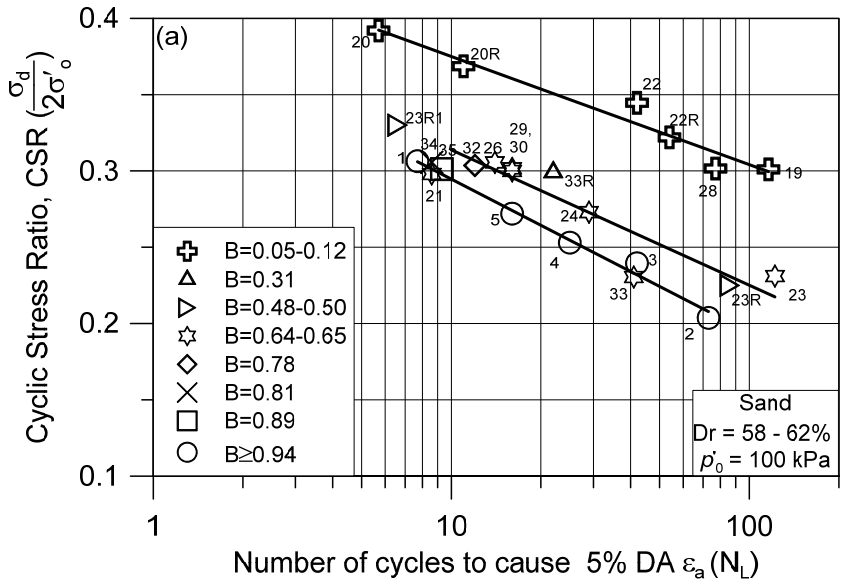


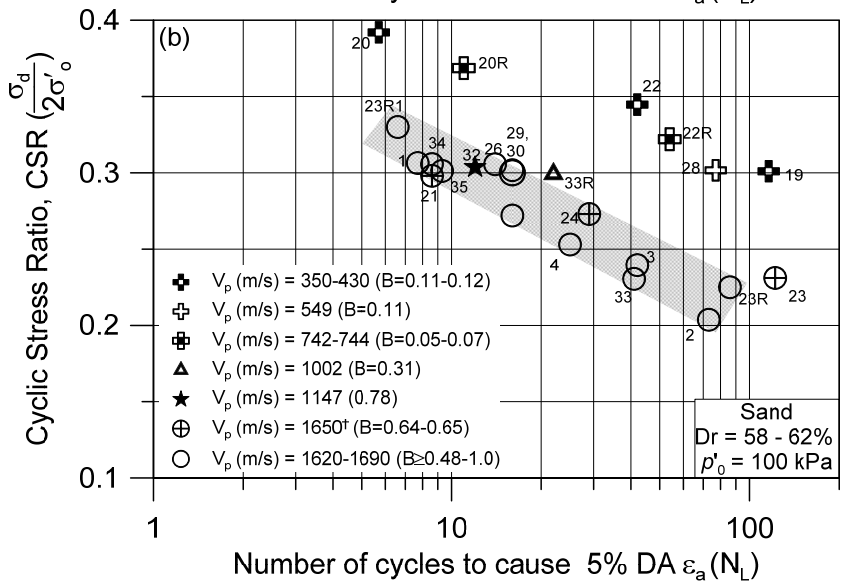


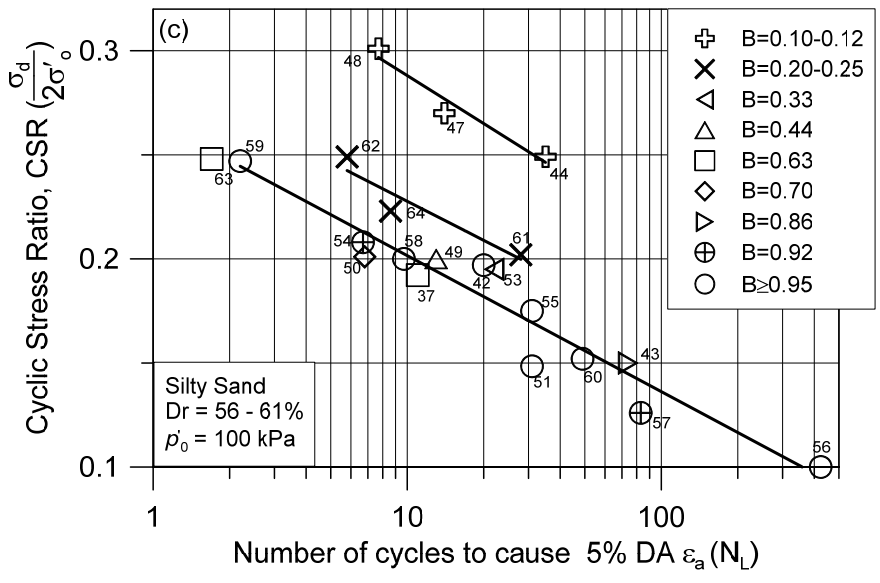


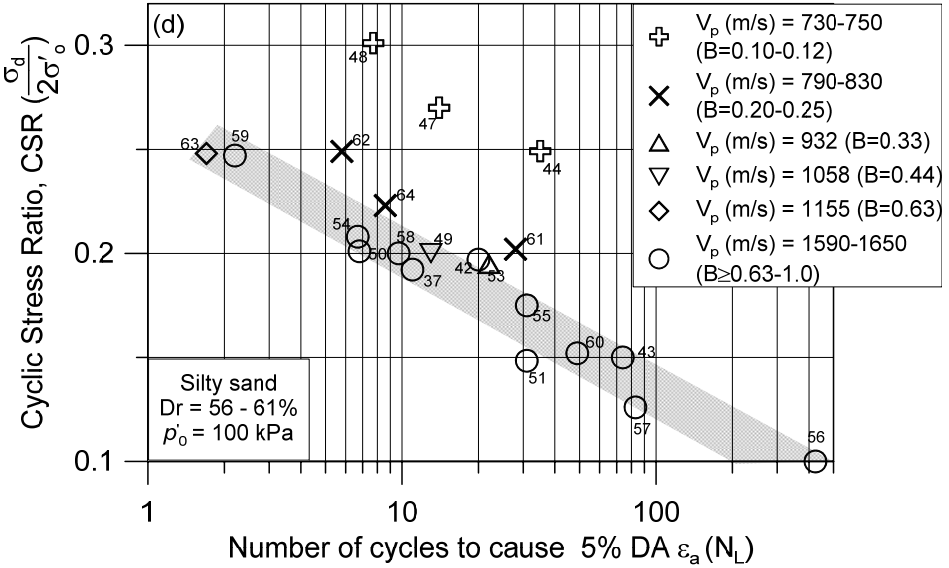


Liquefaction Resistance-Sand & Silty Sand

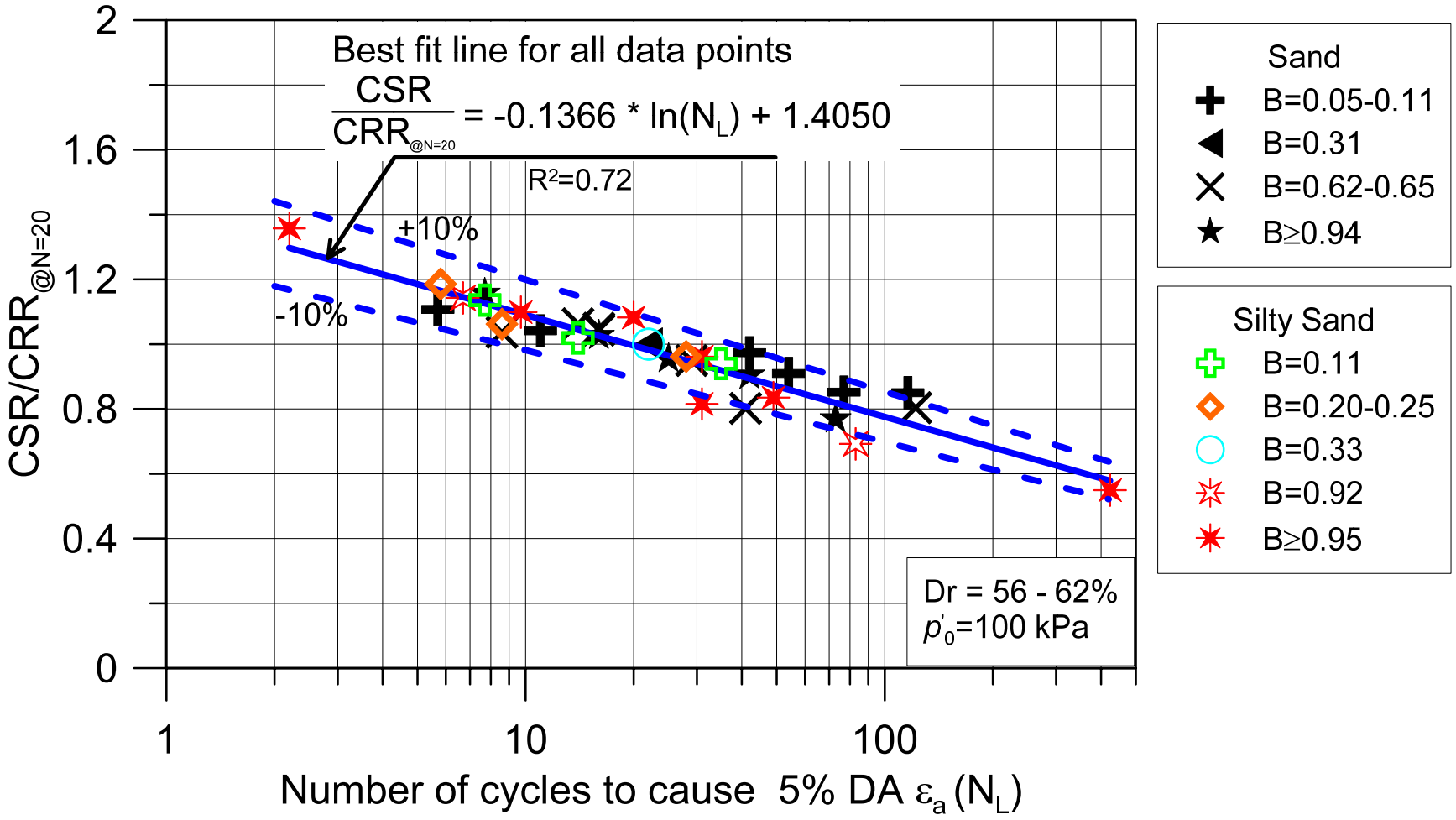








Liquefaction Strength (Sand & Silty Sand)



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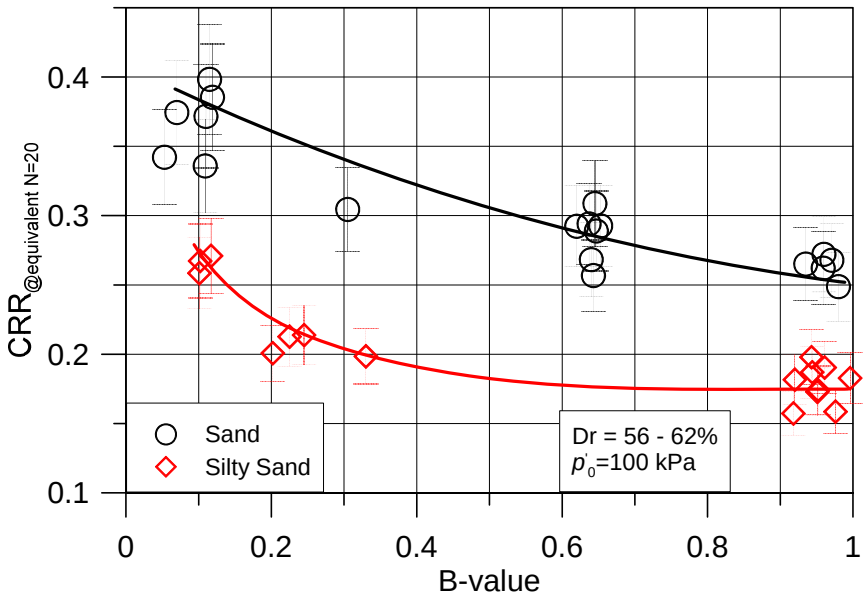

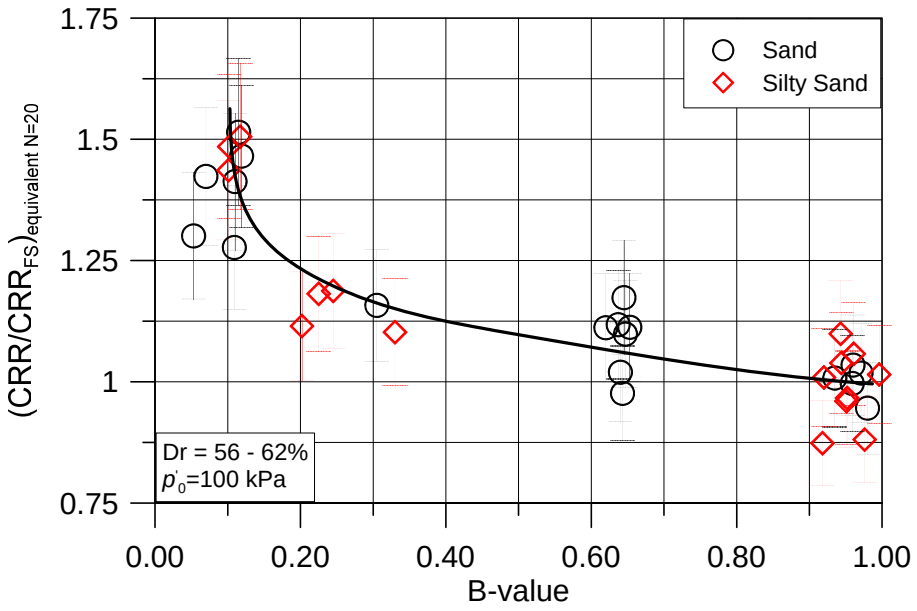

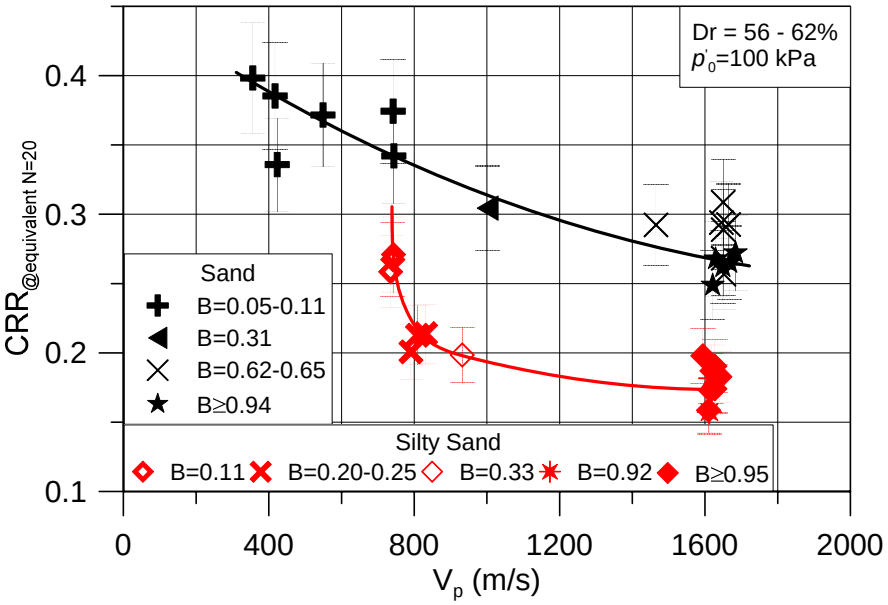

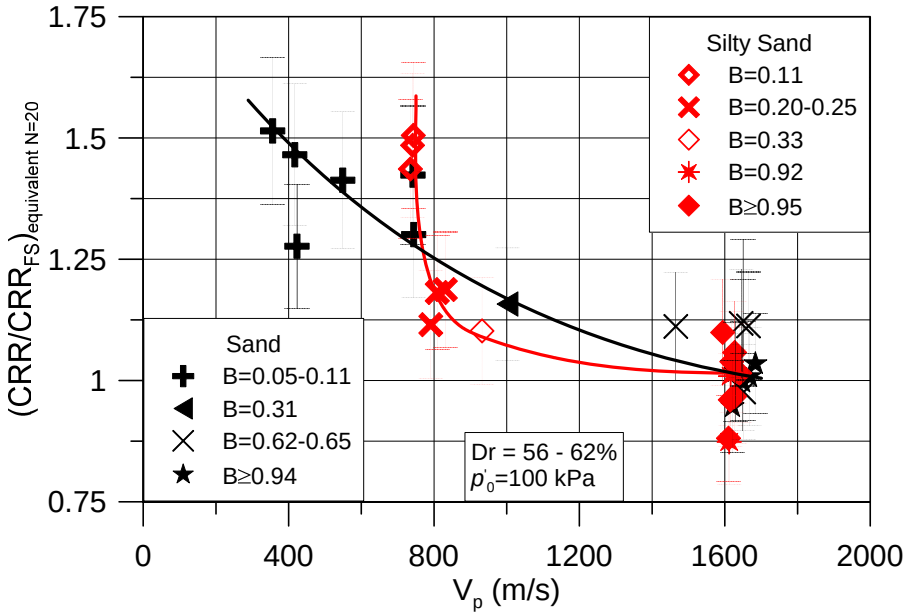

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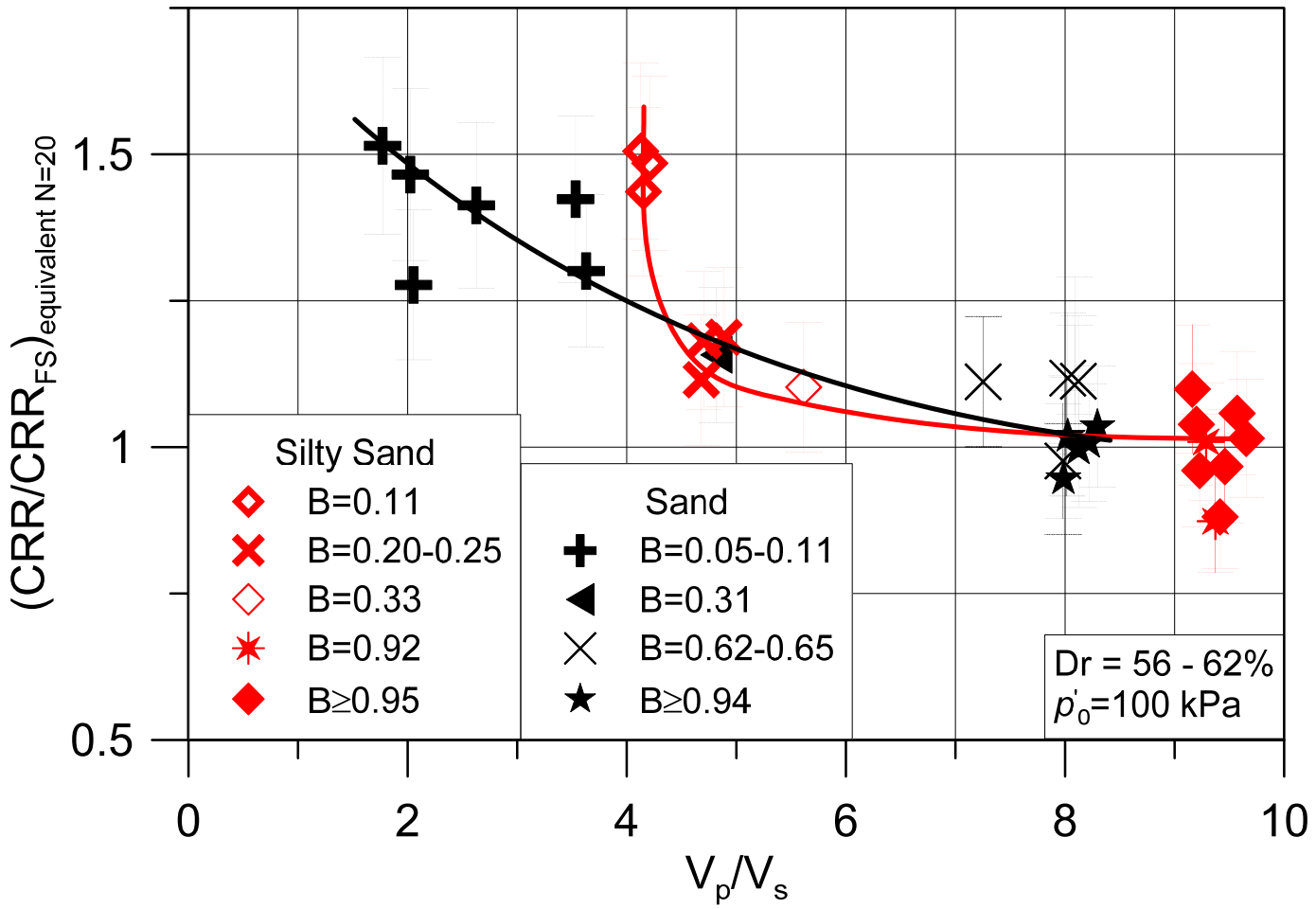
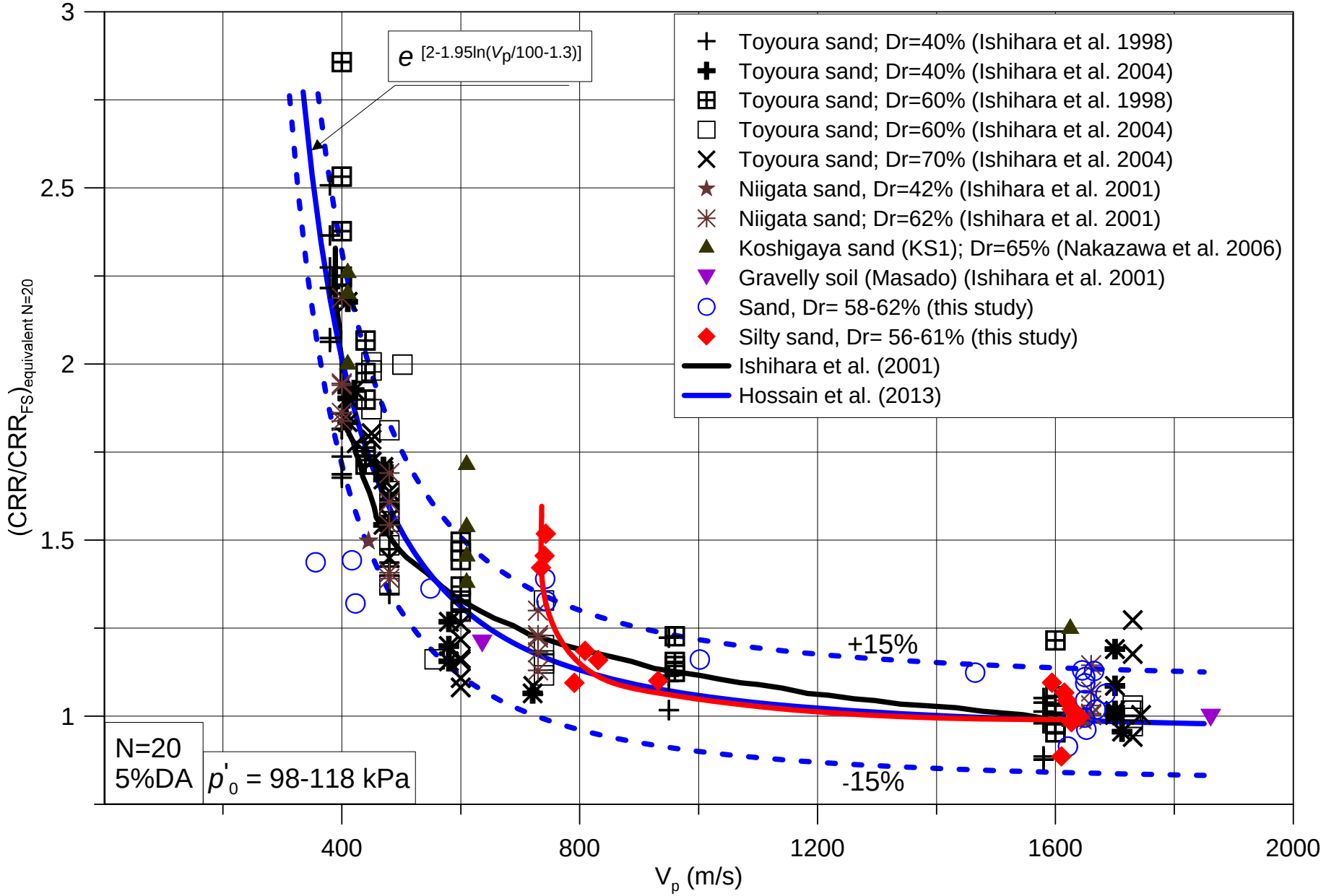


Liquefaction Strength-Published Data



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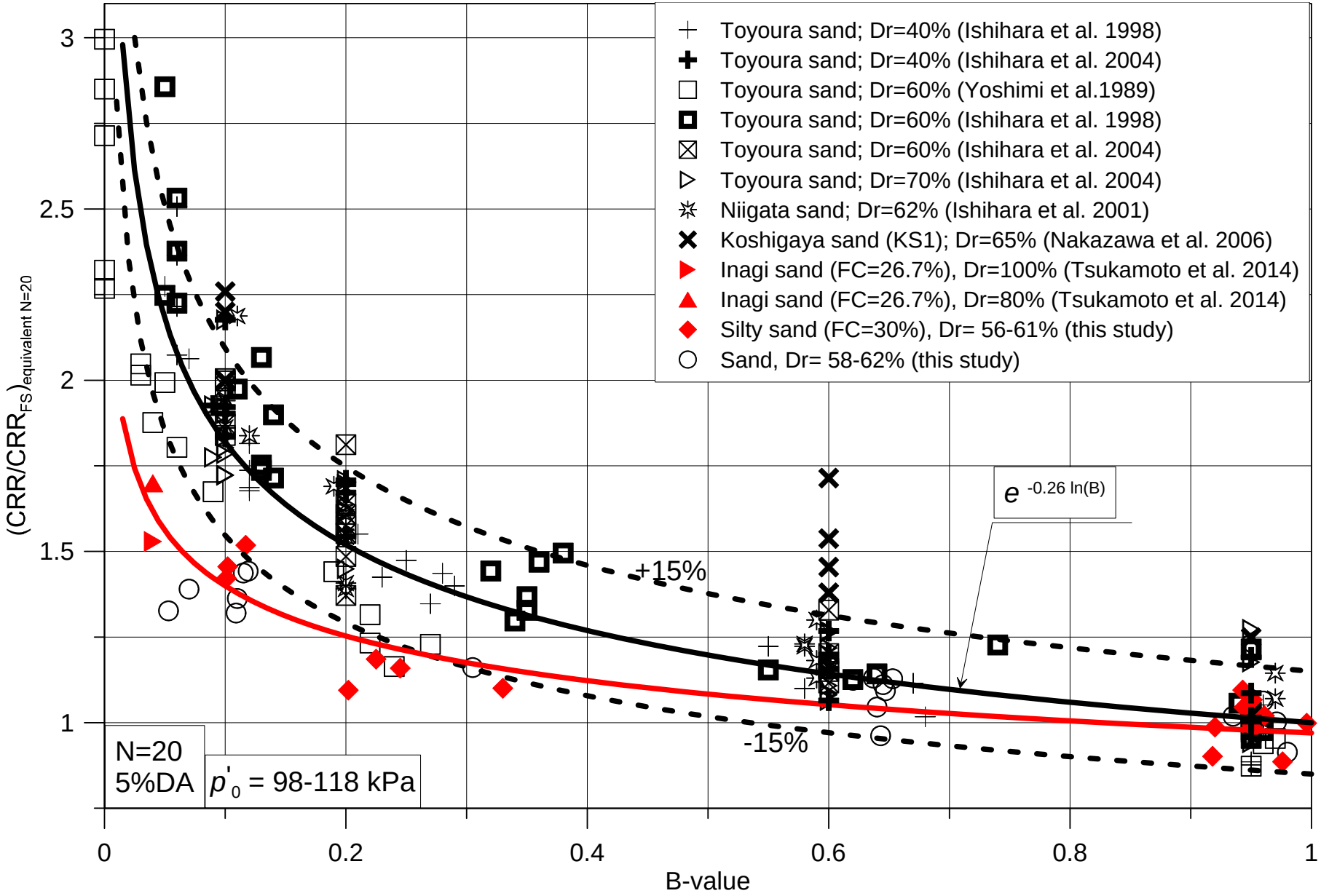

Thank you!