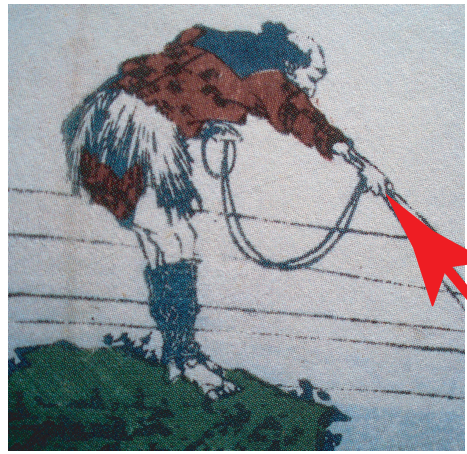
Modelling tensions

physical realism



constitutive model

mathematical elegance

numerical implementation

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you can achieve anything if you do not mind who gets the credit

- testing of soil elements
- observation implies a pre-existing model
- model neutral test specification: avoid inappropriate bias
- our vision is never correct but only provisional
- it is tempting to assume that things that you choose not to observe do not exist
- absence of evidence is not the same as evidence of absence

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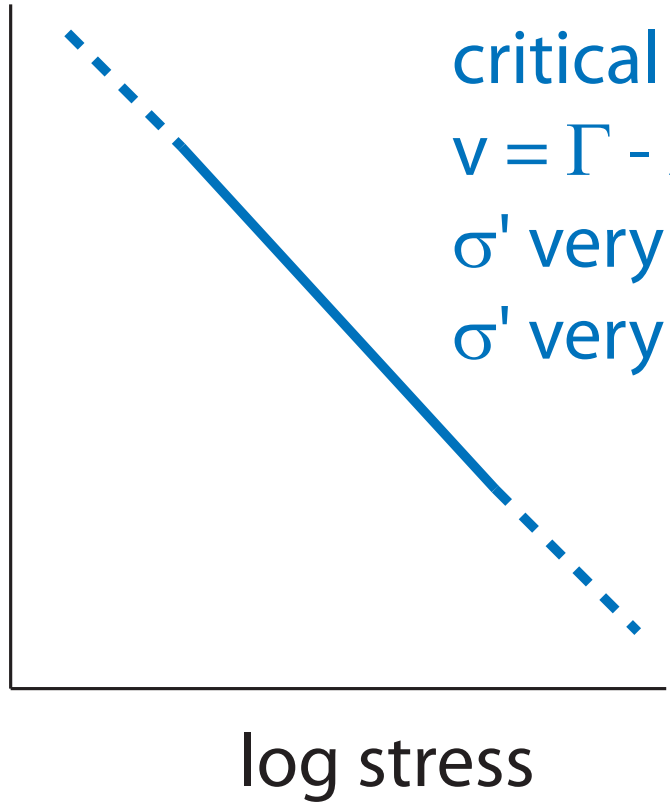
why?



- critical state line $v = \Gamma - \lambda \ln p'$
- $p' \to 0; v \to \infty$, $p' \to \infty; v \to -\infty$
- other forms which give more control over range of v
- liquefaction?

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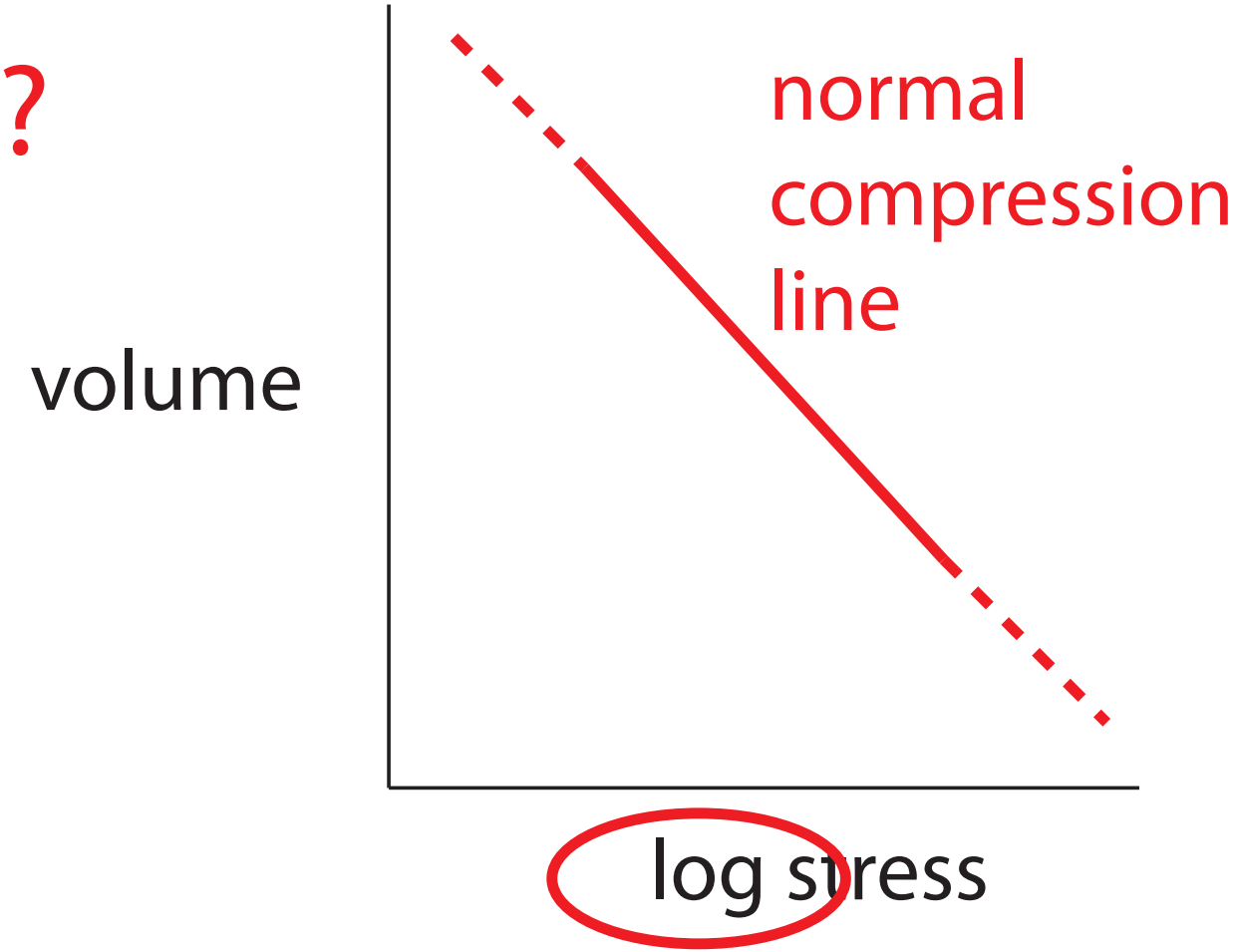
why?



- stiffness $\propto$ stress$^{\alpha}$ (Janbu)
- $\alpha = 0$ constant stiffness
- $\alpha = 1$ stiffness $\propto$ 1/stress: $\log v/v_i = \kappa \log p'/p'_i$

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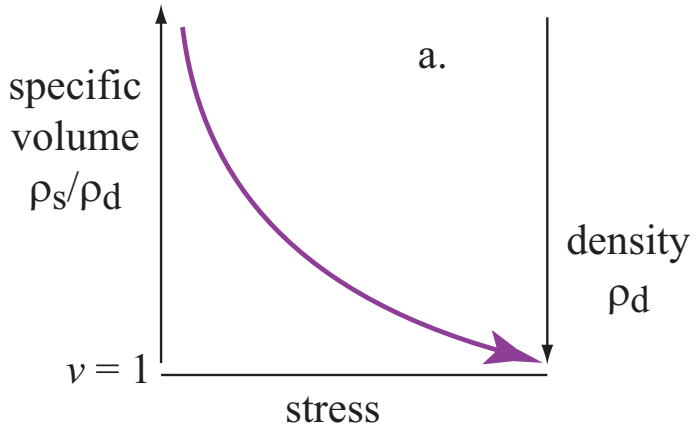
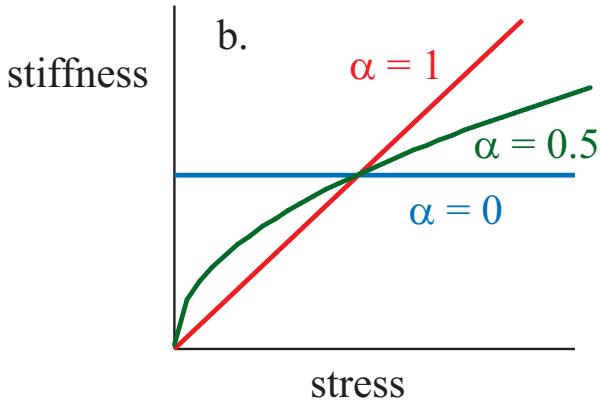
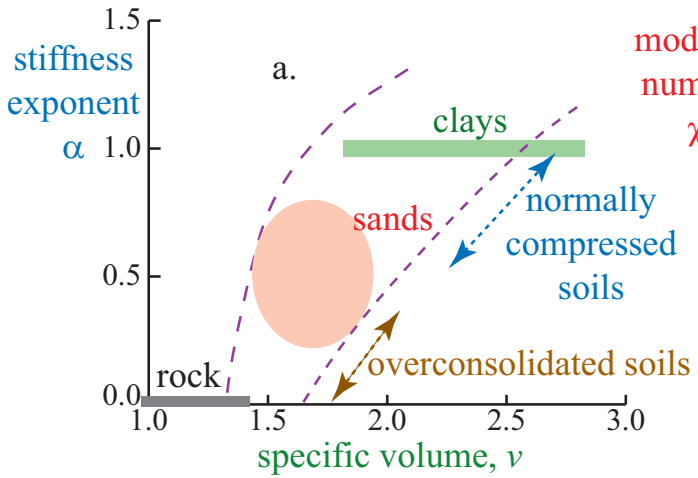
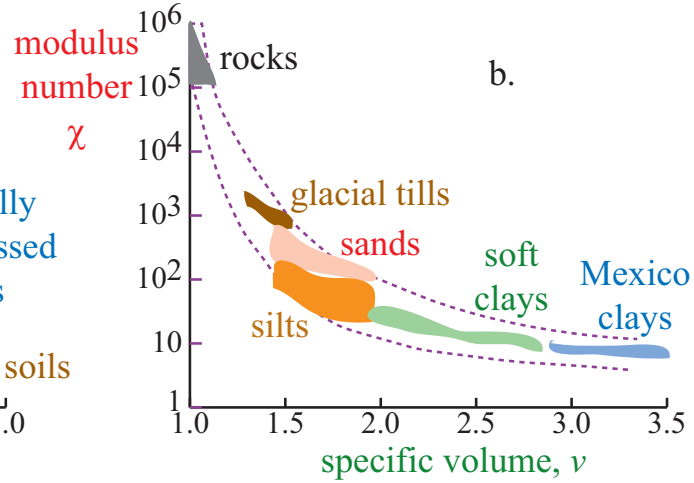




expect density ↑ (stress ↑) stiffness ↑: $\frac{E_o}{\sigma_{ref}} = \chi \left(\frac{\sigma'_z}{\sigma_{ref}} \right)^{\alpha}$





$\alpha = 0$: E_o = constant; $\alpha = 1$: $\varepsilon_z = \frac{1}{\chi} \ln \frac{\sigma'_z}{\sigma_i}$

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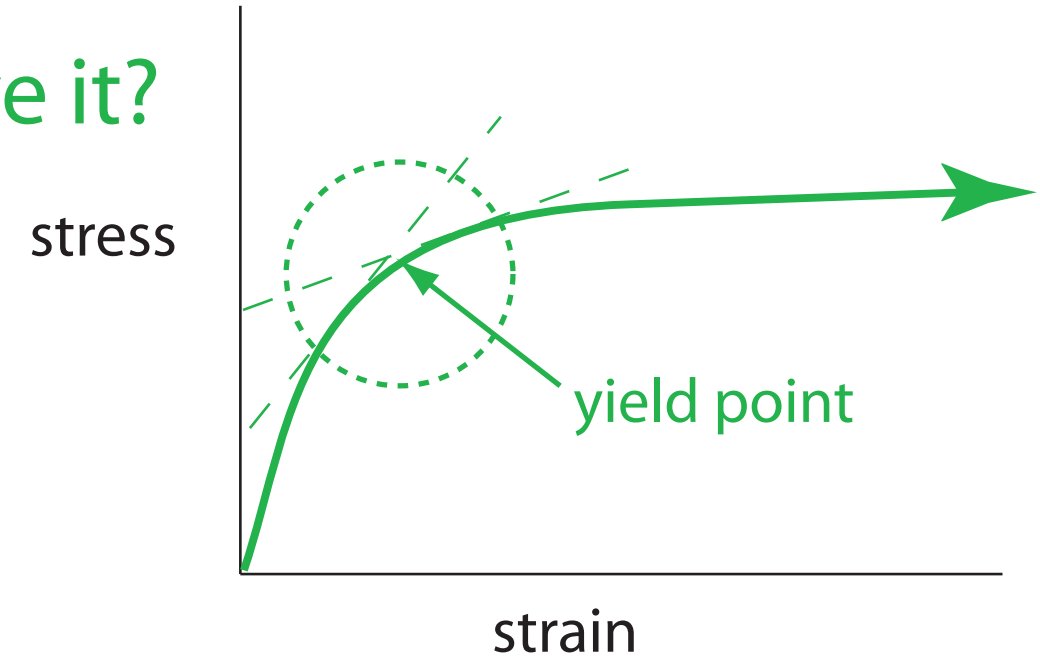
do you believe it?



- ingredients of model never tested
- do yield loci exist?
- can we objectively detect/identify yield points?

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hypothesis X and B

need for collections of comprehensive data and field observation

parameter game: roughly 2 parameters per model component - anisotropy, critical states, rate dependency, memory, small strain, …

controlled rotation of principal axes - important, neglected, difficult area of soil testing: 'simple' shear? hollow cylinder torsional shear?

Ko - sensitivity to very small deformations - is it a snark?

(plastic analysis of steel structures - what are the stresses in steel beams/columns? - residual stresses etc)

fabric/structure of soils

peat - contribution of fibres?

new theory creeps into practice … education, education, education