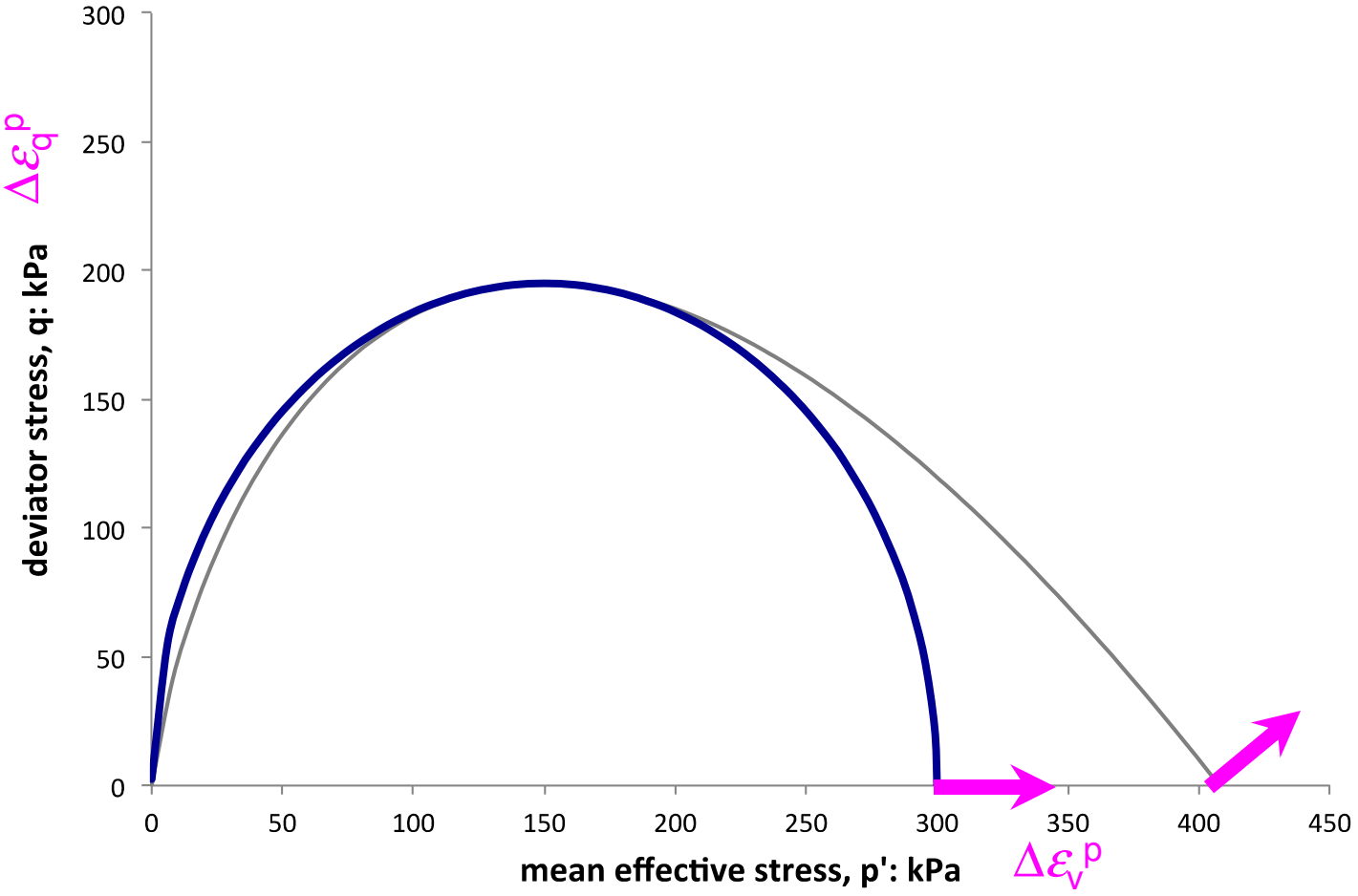
Developing confidence in critical state soil mechanics

5. Modified Cam Clay (MCC)

Mike Jefferies, PEng
Dr. Dawn Shuttle, PEng

January, 2015

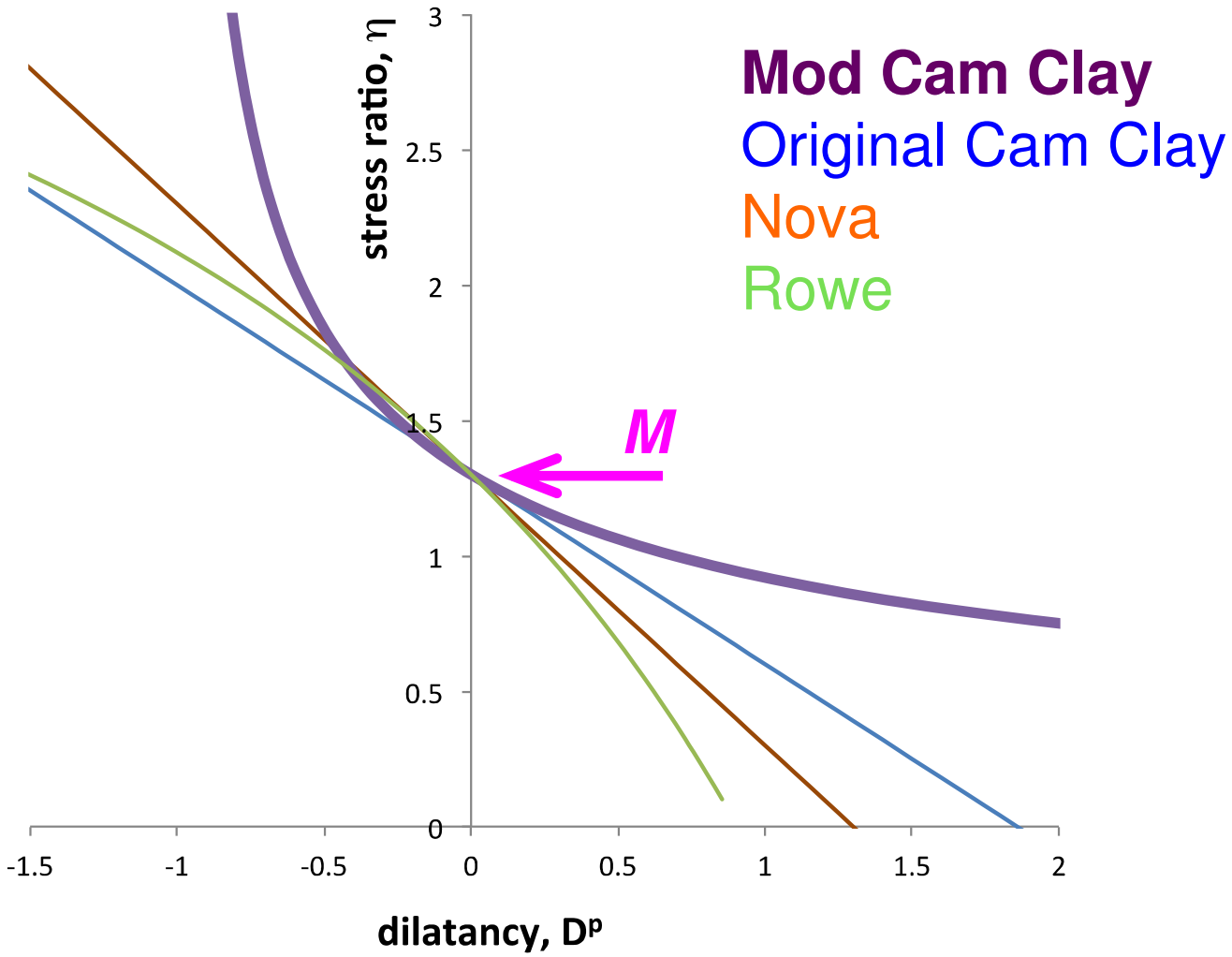
Why Modified Cam Clay (MCC) ?



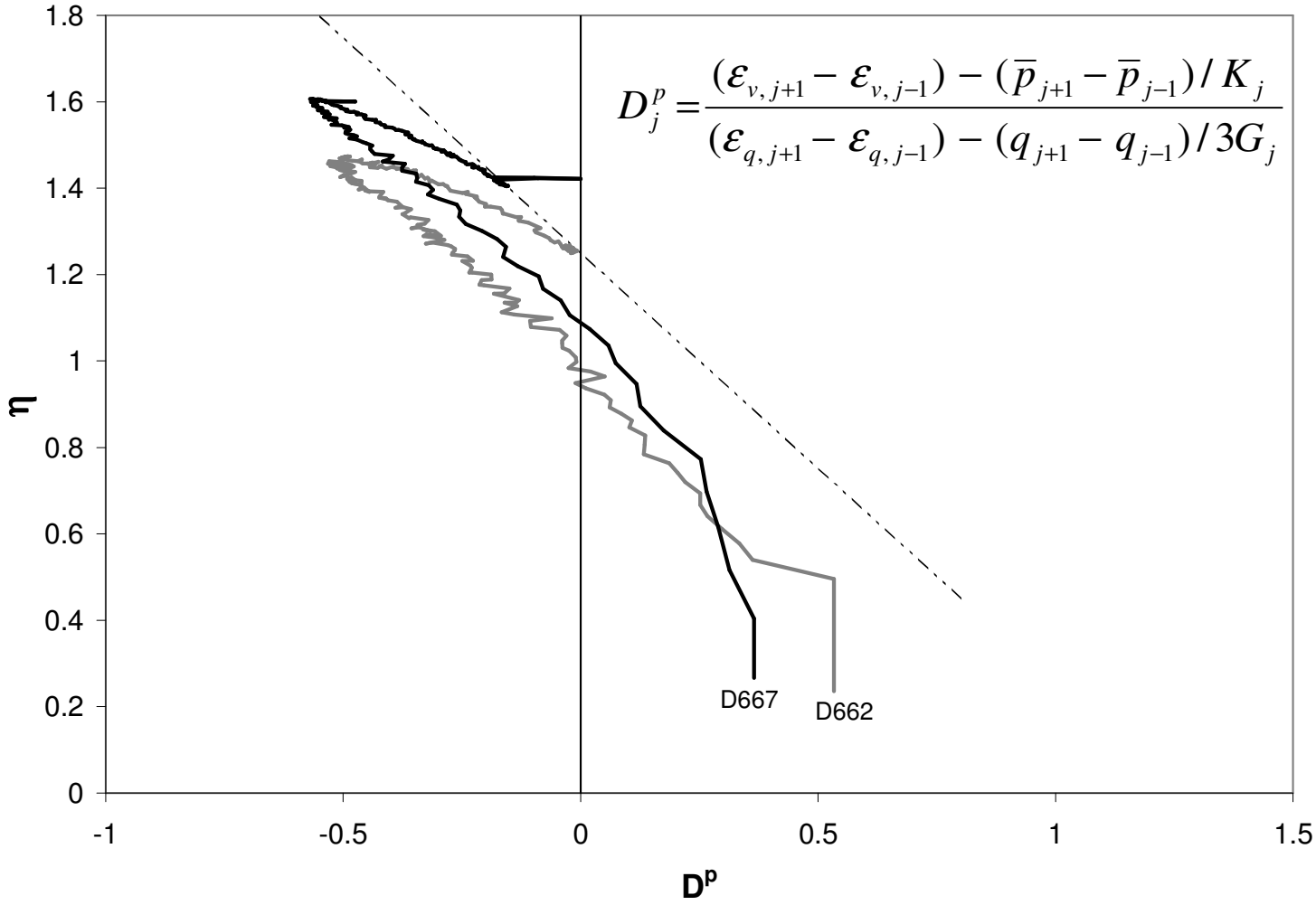
Modified vs Original Cam Clay

	OCC	MCC
Flowrule	$D^p = M - \eta$	$D^p = \frac{M^2 - \eta^2}{\eta^2}$
Yield Surface	$\frac{\eta}{M} = 1 - \ln\left(\frac{p}{p_c}\right)$	$\frac{\eta}{M} = \sqrt{\left(\frac{2p_c}{p} - 1\right)}$
Hardening	$\frac{\dot{p}_c}{p_c} = \frac{1+e}{\lambda - \kappa}\dot{\varepsilon}_v^p$	$\frac{\dot{p}_c}{p_c} = \frac{1+e}{\lambda - \kappa}\dot{\varepsilon}_v^p$

Stress dilatancy (= flowrule)



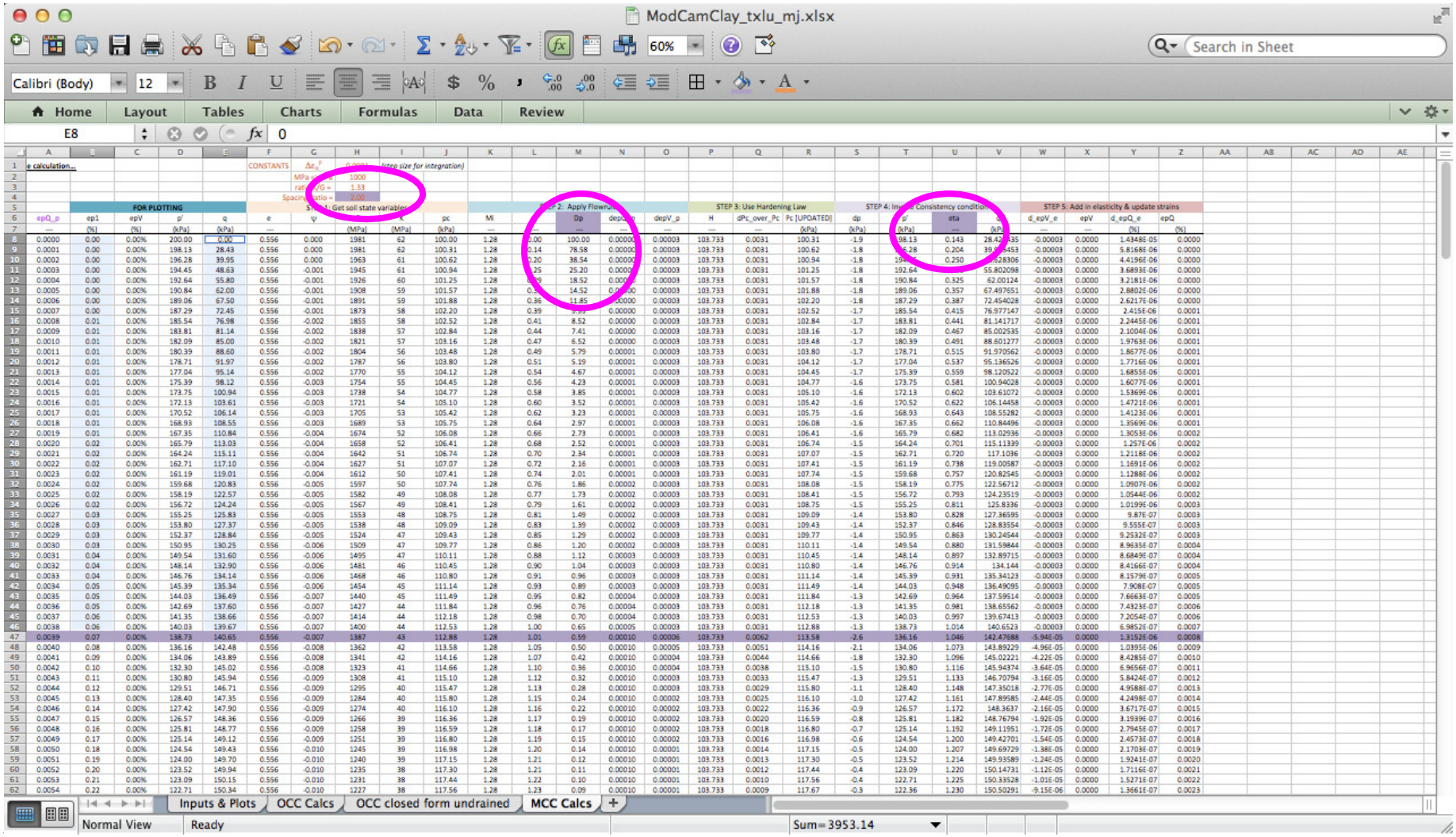
Stress dilatancy of Erksak sand



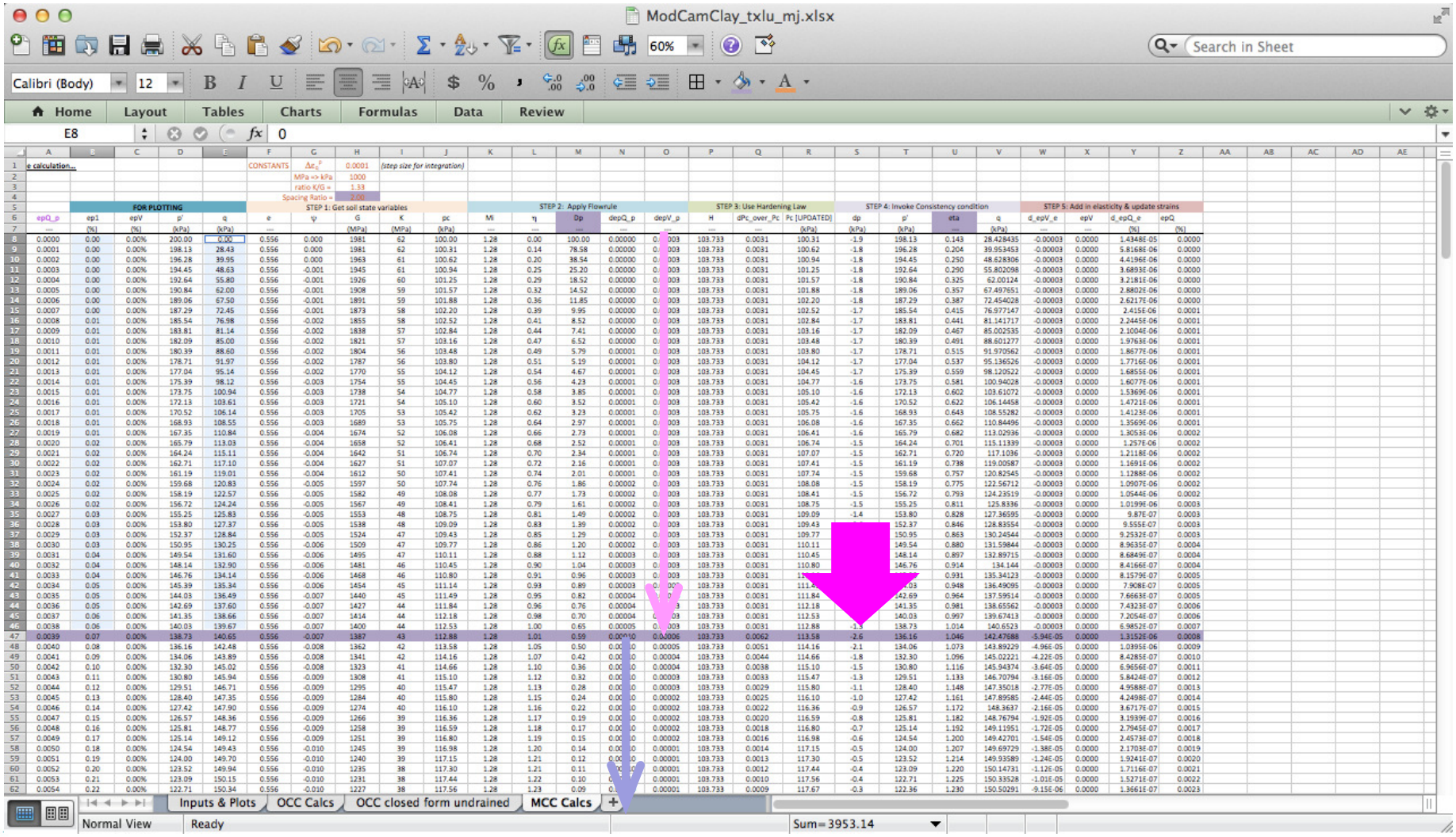
Implementing MCC

- Make copy of the OCC worksheet
  - Rename it MCC
- Change
  - Spacing ratio to 2
  - D^p equation to MCC dilation
  - η equation to MCC yield surface
- MCC is “pathological” on dilation
  - Must kludge the spreadsheet
  - Switch to incrementing volumetric strain for first ~0.5% strain
  - Thereafter revert to incrementing shear strain

Implementing MCC by modifying MCC sheet



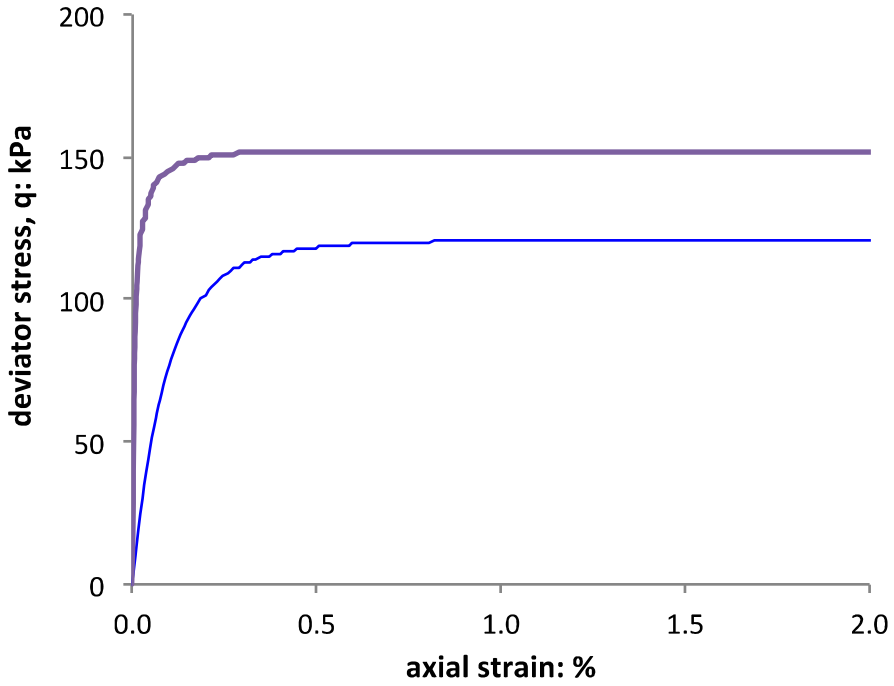
Implementing MCC by modifying MCC sheet

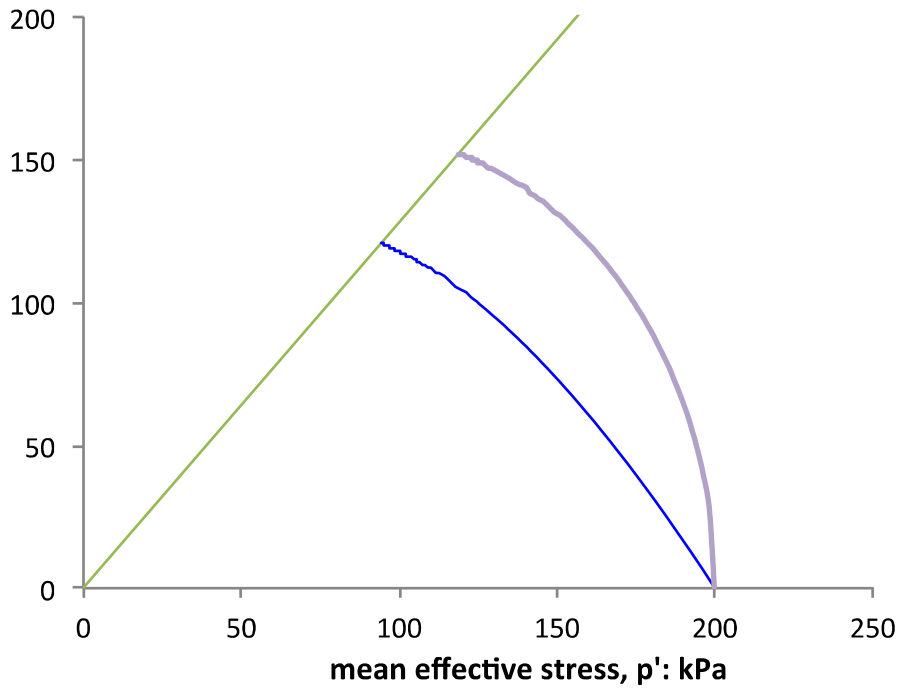


Over to you…

Computed soil response

Original Cam Clay
Modified Cam Clay





Mod Cam Clay

- “Improved theory” simply shows lack of understanding
- Work dissipation is unclear / unreasonable
- Mathematically “pathological” to implement
- Does not fit any known soil data