

LaMEM short course

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How to link rheology to rock type?

The most complex rheologies in LaMEM are visco-elasto-viscoplastic



Visco-Elasto-Viscoplastic

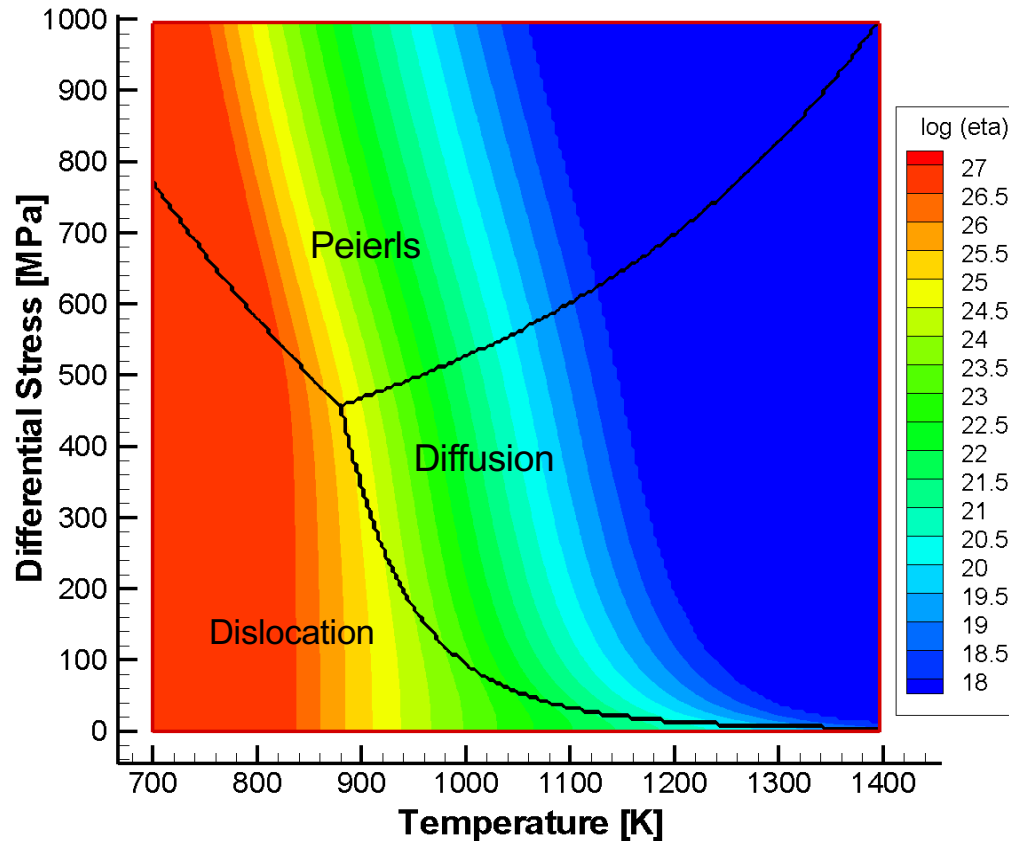
- Iso-viscous
- Arrhenius (T dep.)
- Diffusion creep (PT dep.)
- Dislocation creep (PT dep.)

How to set?

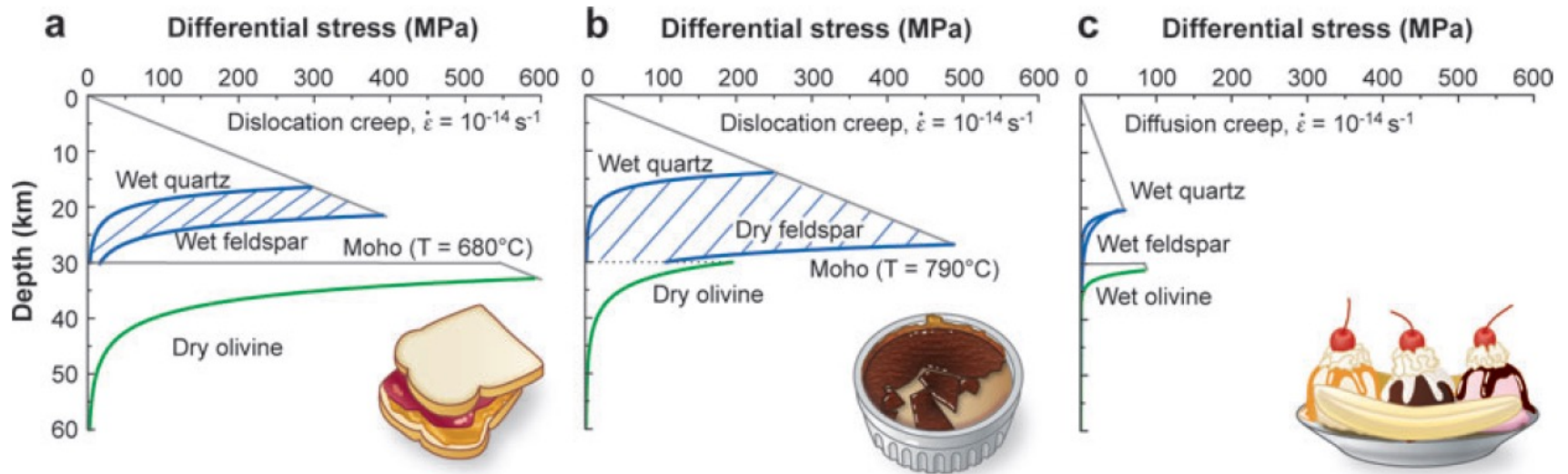
- Elastic bulk modulus
(of the order $1e10$ Pa)

- “Brittle” behavior
using Drucker-Prager
(cohesion + frictional angle)

Relationships between creep laws

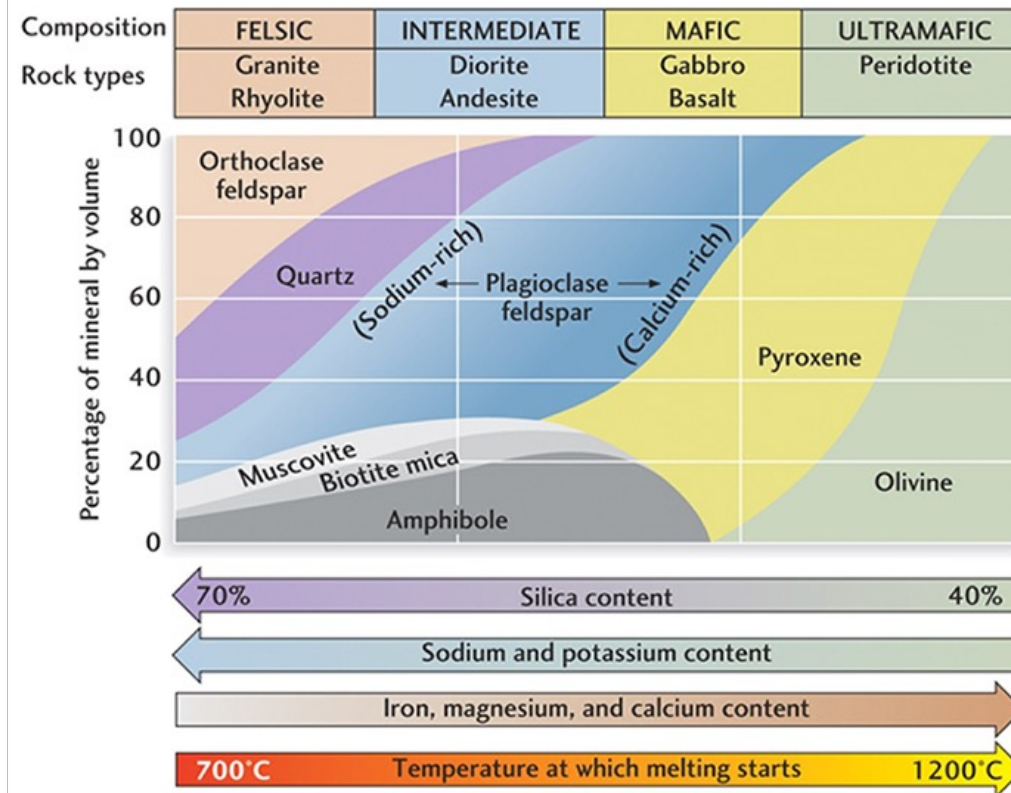


Flow laws



Burgmann & Dresen, 2008

How to link rheology to rock type?



- Find the dominant mineral of your rock
- Choose flow law of this mineral

Available creep laws of LaMEM

List given in “tools_and_tips.txt” and on the Github repository

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# LaMEM creep laws list:

Diffusion creep:
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[Hirth, G. & Kohlstedt (2003), D. Rheology of the upper mantle and the mantle wedge:
  → "Dry_Olivine_diff_creep-Hirth_Kohlstedt_2003"
  → "Wet_Olivine_diff_creep-Hirth_Kohlstedt_2003_constant_C_OH"
  → "Wet_Olivine_diff_creep-Hirth_Kohlstedt_2003"
[Rybacki and Dresen, 2000, JGR]
  → "Dry_Plagioclase_RybackiDresen_2000"
  → "Wet_Plagioclase_RybackiDresen_2000"
  →

Dislocation creep:
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[Ranalli 1995]
  → "Dry_Olivine-Ranalli_1995"
  → "Wet_Olivine-Ranalli_1995"
  → "Wet_Quartzite-Ranalli_1995"
  → "Quartzite-Ranalli_1995"
  → "Mafic_Granulite-Ranalli_1995"
  → "Plagioclase_An75-Ranalli_1995"
[Carter and Tsenn (1986). Flow properties of continental lithosphere. - page 18]
  → "Quartz_Diorite-Hansen_Carter_1982"
[J. de Bremond d'Ars et al./Tectonophysics (1999). Hydrothermalism and Diapirism in t
  → "Diabase-Caristan_1982"
  → "Tumut Pond Serpentinite-Raleigh Paterson_1965"
[Mackwell, Zimmerman & Kohlstedt (1998). High-temperature deformation]
  → "Maryland_strong_diabase-Mackwell_et_al_1998"
[Ueda et al. (PEPI 2008)]
  → "Wet_Quartzite-Ueda_et_al_2008"
[Huismans et al. 2001]
  → "Diabase-Huismans_et_al_2001"
  → "Granite-Huismans_et_al_2001"
[Burg And Podladchikov (1999)]
  → "Dry_Upper_Crust-Schmalholz_Kaus_Burg_2009"
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