Lithosphere Geodynamics

Problems specific to lithosphere geodynamics:

- Prediction of structure (Lagrangian Frame)
- Large deformation
- Very heterogenous materials
- Very non-linear materials
- Free surface - true topography - stress gradients moving boundary
- Open Boundaries
- Isolation of lithosphere - requires assumptions of deeper mantle

Classes of Mechanical Models

Method	Reference Frame	Rheology	Advantages	Disadvantages
EVP – "solid" mechanics based. Finite Element/Finite Difference Methods.	Lagrangian	• Elastic-viscoplastic • Elastic-plastic • Visco-elastic (Maxwell)	• Elastic stress predictor • Associative or non-associative plasticity • Discrete faults can be described by contact elements	• Mesh distortion • Remeshing required • Complex and numerous formulations for finite strain
EVP –Explicit (**FLAC**)		•	• Fast	• Restrictive stability condition

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Thin Sheets – 2D viscous sheet, solved with FEM	Eulerian or Lagrangian	• Viscous, non-linear	• Reduced Dimensionality by vertical integration of stress and strain • Faults can be included as contact boundaries	• No vertical partitioning or resolution of strain – neglect of components of strain rate

Note: Nothing on numerical methods here