MAVEPROS EVEREST

(Earth Visco-Elastic anisotropic properties Simulator)

a new open source software to predict mantle visco-elastic properties and build realistic tomographic models

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Supported by ERC StG #758199 NEWTON
• **EVEREST** builds on D-REX (Kaminski et al., 2004), written in FORTRAN, run in parallel with shared-memory architecture.

• Computes the strain-induced fabrics of mantle aggregates with abundant anisotropic phases (Ol, Opx, Wd, Brd) taking into account the strain history.

• **Input**: velocity, temperature, pressure fields of your 2D/3D geodynamic model.

• **Output**: elastic tensors of mantle aggregates scaled by local P-T conditions and their Finite Strain Ellipsoid (FSE).

• **Visual output** for inspection of FSE and elastic properties with Paraview:
  • FSE as a 3D ellipsoid or directions of its min/max axes.
  • $V_{p_{\text{max}}} / dV_{s_{\text{max}}} / \text{Trans. Isotropy symmetry axis}$ directions.
  • $V_p, V_s, dV_p, dV_s$ isotropic or as seen by incoming waves.
  • Radial/Azimuthal anisotropy, SKS splitting.
  • P-P or P-S Energy Reflected/Transmitted at discontinuities (useful for receiver functions studies).
In addition, the package:

• includes routines from **FSTRACK** (Becker et al., 2006) to estimate **SKS splitting**.

• generates tomographic grids for **SPECFEM3D** with the 21 elastic moduli on each node (see in this session EGU2020-14886, VanderBeek and Faccenda).

• estimates **extrinsic elastic and viscous anisotropy** due to grain-/rock-scale layering or fluid filled cracks.

• single aggregate LPO evolution + MTEX/MatLab files for visualization of the output. Useful to test the LPOs as a function of the D-Rex parameter.
Examples:

- Analytical convective patterns in 2D annulus (this slide)
- 3D half-slab subduction in spherical coordinates (next slide)
- 3D symmetric plume upwelling in spherical coordinates (2nd next slide)
Azimuthal anisotropy at 50 and 150 km depth

Radial anisotropy + SKS splitting

Purple surface: +2% dVp

Isotropic Vp

1 sec

Radial Anisotropy

Purple surface: +2% dVp
Upwelling thermal plume

Isotropic Vs

Radial anis.

Isotropic dVs

Isotropic dVp
**EVEREST road map**

- **Summer 2020**: release of the beta version with the manual and intrinsic/extrinsic elastic anisotropy simulator.

- **Fall 2020**: add extrinsic viscous anisotropy simulator (see in this session EGU2020-13325, Navarro and Faccenda).

- **Winter 2020-2021**: add a new tool to automatically perform synthetic teleseismic Vp-Vs tomographies on the domains modelled with D-Rex (see in this session EGU2020-14886, VanderBeek and Faccenda).