

DR2004063

Weinberg Data Repository Item 1. Brief description of the computer codes used.

The two-dimensional code FLAC (Fast Lagrangian Analysis of Continua) is an explicit finite-difference code, which treats materials as continuous and can handle large strains, rotations and displacements. FLAC uses an explicit, time-stepping solution scheme for grids of arbitrary shapes. ELLIPSIS uses a hybrid approach—a particle-in-cell finite-element method that uses a standard Eulerian finite-element mesh (for fast, implicit solution) and a Lagrangian “particle” framework for carrying details of interfaces, the stress history etc.

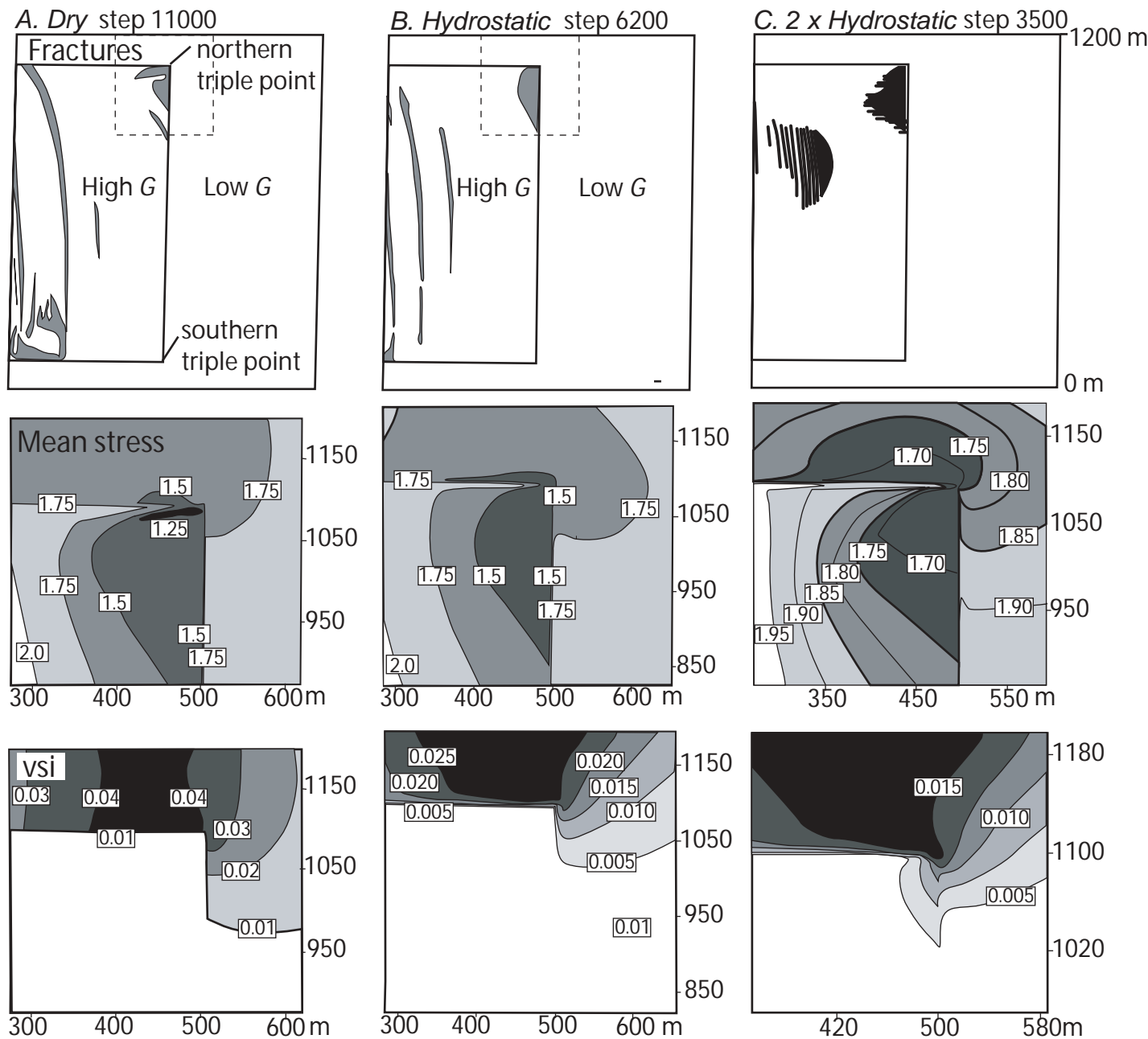


Fig. 1DR. Results of elasto-plastic model: A: Dry model. B: Hydrostatic pore pressure. C: Twice hydrostatic pore pressure. The ratio R between fluid flow time steps and deformation time steps was 3, implying rapid deformation compared to fluid flow. Models with higher $R=10$, equivalent to a decrease in deformation velocity compared to that of fluid flow, yielded similar results (not shown). Top row shows the deformation state of the entire model box (1 km wide, 1.2 km long). Regions in grey are fracturing in this time step, regions in white are undergoing elastic deformation. Notice how fractures are limited to the material with high shear modulus (left half of the models). The northern triple point yielded earlier than other parts. Number of steps (indicated in top-row images) is directly proportional to amount of shearing. Dashed box around northern triple points indicate the approximate position of close-up regions depicted in lower rows. Middle row shows the mean stress distribution around the northern triple point (numbers in 100 MPa units) and bottom row shows the volumetric strain increment (VSI) (positive values = dilation). Increased pore pressure leads to (1) earlier yielding, (2) decrease in mean pressure gradients, and (3) modest dilation (lower VSI). Numbers along the axes are distances in metres measured from the western and southern margins of the boxes.

Fig. DR2

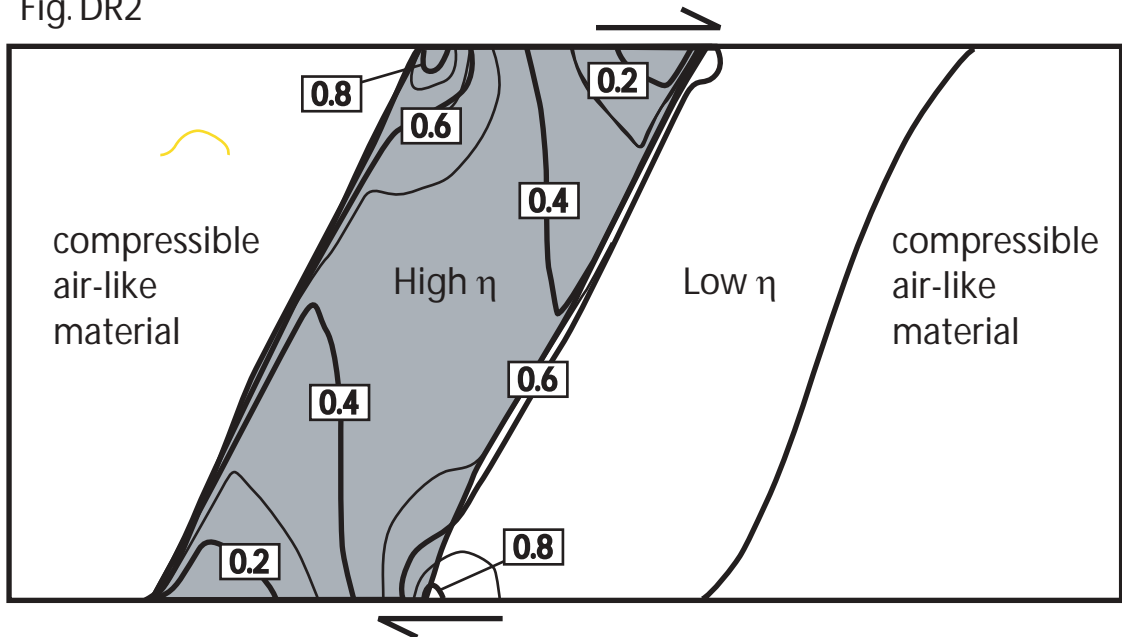


Fig. DR2. Results of dimensionless ELLIPSIS viscous models showing the distribution of normalized mean pressure showing changes of mean pressure of nearly one order of magnitude between high pressure and low pressure areas. In contrast to the FLAC models the northwest trending lateral walls are not rigid but are allowed to deform as they are in contact with the numerical analogue to air.