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Present-day stress inversion from a single near-surface fault: A novel mathematical approach

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Keywords

Stress; Stress inversion; Active faults, Fault displacement

Abstract

A novel numerical approach enables determining contemporary stress states at a single fault near the ground surface using three dimensional fault displacement data, i.e. displacements that include movement component perpendicular to the fault surface. This approach is restricted to specific near-surface conditions and is based on three assumptions: (i) the near-surface faults contain apertures and the blocks can move in all directions at a sub-millimetric scale, so the movement is not restricted only to the fault plane; thus the stress vector (traction) acting on the fault surface has the same direction as the fault displacement vector, (ii) the isotropic component of the stress tensor near the ground surface is negligible, and (iii) one of the principal stress orientations must be vertical as being close to the ground surface. These generalizations enable distinct formula simplification and the reduced stress tensor calculation. Input data for the mathematical solution are the orientation of the fault surface