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A multiple algorithm for earthquake modeling

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We develop a multigrid-multiple timestepping scheme to reduce computational efforts for calculating complex stress interactions in a strike-slip fault for the simulation of seismicity. The key elements of the multilevel solver are separation of length scale, grid-coarsening, and hierarchy. In this study the complex stress interactions are split into two parts: the first with a small contribution is computed on a coarse level, and the rest for strong interactions is on a fine level. This partition leads to a significant reduction of the number of computation. The reduction of complexity is even enhanced by combining the multigrid with multiple timestepping. Computational efficiency is enhanced by a factor of 10 while retaining a reasonable accuracy. The accuracy of solution and computational efficiency depend on a given cut-off radius that splits multiplications into the two parts. The multigrid scheme is constructed in such way that it conserves stress in the entire half-space.