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The model of evolution of mantle viscous shear stresses in the process of convergence and collision of two floating continents different by dimensions

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We consider a simple 2D model of convergence and collision of two undeformable continents whose horizontal dimensions are significantly differ one from another (collision of Indian plate and Eurasia). In numerical experiment the computations are fulfilled of viscous stresses in the mantle far off and near the edges of moving continents, taking into account simultaneously evolving field of mantle flows. The numerical experiment demonstrates that in studied case the velocity of motion of smaller continent approximately is three times as much as the velocity of larger continent. The result qualitatively has general character, as large continent is usually influenced by more than one convective mantle cells which pull it in reciprocally opposite directions. In the collision area we find that under the bottom of a larger (i.e., less mobile) continent, almost horizontal layer appears of could mantle material, what doubles the thickness of this edge of continent (through horizontal distance of about 1500 km). The appearance of this layer is caused by the existence of horizontally elongated mantle circulation which transfers could mantle material under the edge of almost immobile continent. As the numerical experiment demonstrates, maximum shear stresses in this layer are oriented approximately sub-horizontally. The case essentially differs from the stress orientation in the mantle descending flows in the oceanic area (far from continents); these flows drop nearly vertically, and maximum shear stresses are oriented at 45 degrees angle to the horizontal in the upper part of the flows (what agrees with the sub-vertical orientation of the principal normal stresses). It should be noted that in given statement the studied area is regarded not as a local model with prescribed (perhaps artificially) boundary conditions (for example, with non-time-dependent conditions) but as a sub-area of global self-organizing model.
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