

Orientation of the SHmax in accretionary prisms from real-scale numerical sandbox experiments

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The stress states in accretionary prisms are important for understanding the building and releasing of seismic energy. The in-situ stress states estimated from borehole data in IODP expeditions showed significant deviations in the maximum horizontal stress (SHmax) orientation from the plate convergence. These deviations reflect the 3D structure of the stress state rather than the 2D structure; however the 3D stress structures as well as their effects on the evolution of the accretionary prism are not clear. Analog sandbox experiments can be used to deduce such stress states. We performed real-scale and therefore large-scale numerical sandbox experiments using the discrete element method to understand the 3D stress state in the accretionary prism. The stress chain analyses demonstrate that the in-situ stress orientation from borehole data can be a signal of either the regional direction of plate convergence or the local stress orientation associated with the stress arch. The formation of stress arches is expected by the nonlinearities inherent in crustal deformation and micro-scale perturbations. I want to discuss the possibility of the long-term monitoring of the SHmax orientations in boreholes to support this hypothesis.

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