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The stress field model of the South China Sea calculated by sea level data from satellites

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The South China Sea (SCS) is situated at the junction of Eurasian, Indo-Australian, and Philippine sea plates. Its stress state provides significant information about the regional tectonic structure associated with interaction among the three plates. The stress field of the SCS is composed of horizontal and vertical stress fields. We calculate the vertically averaged deviatoric stress field using horizontal gradients of gravitational potential energy obtained by high-resolution sea-surface height data (SSH) from satellite Haiyang-2A. The vertical tectonic stress field is computed based on the Bouguer gravity anomaly derived from SSH and topographic data.

The vertically averaged deviatoric stress field is consistent with the GPS velocity field, the focal mechanism, and the mantle flow stress field of the South China Sea. Moreover, it also indicates the Red River-Ailaoshan Fault zone on the west of the SCS and the Manila subduction on the east. The vertical tectonic stress field removing the influence of sediment indicates upward stress of the lithosphere in the SCS ocean basin. The stress field model therefore provides a powerful tool for understanding regional tectonic activities around the SCS.