Complex seismic activity and local stress perturbation of the Pyeongnam basin, northern Korean Peninsula

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The western region of the Pyeongnam Basin has relatively higher earthquake activity than the rest of the Korean Peninsula. We analyzed 48 earthquakes in the area, with a magnitude (M LAP) of 2.0 or more, from January 2009 to June 2019. The hypocentral parameters were re-determined using an iterative algorithm that repeats the calculation until the residual error between the observed and calculated arrival time of a seismic phase at each station is minimized. Using the hypocenters and the optimal 1-D velocity model derived from this process, the focal mechanisms were determined using the first-motion polarities of body waves. Many earthquakes are associated with left-lateral strike-slip faults, with a strike in the NW-SE direction and a normal faulting component. A stress inversion was performed using data of the pressure and tensional axes from the focal mechanisms. The maximum principal stress in the study area acts in the NW-SE direction with high angles of plunge and differs from the maximum horizontal principal stress in the rest of the Korean Peninsula. This stress perturbation is caused by the detachment of a small local stress from the regional stress field due to the presence of weak faults with low shear strength that develop in the sedimentation environment of the Pyeongnam Basin.