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Active crustal deformation and earthquakes in China and neighboring regions: from kinematics to dynamics

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The broadly diffuse crustal deformation in China and neighboring regions has been well delineated by space geodesy and neotectonics studies. Here we summarize the results of kinematics, and use them as constraints to explore the geodynamic controls of crustal deformation and earthquakes in eastern Asian continent in a large-scale 3D geodynamic model. We show that the effects of the collisional plate boundary force are limited to western China, whereas gravitational spreading of the Tibetan Plateau has a broad impact on crustal deformation in much of Asia. We found that the intense seismicity in the Norh China block (NCB), and the lack of seismicity in the South China block (SCB), resulted primarily from differential motion of crustal blocks that produces high deviatoric stresses within the NCB but allow the SCB to move coherently as a rigid block. Within the NCB, seismicity is largely controlled by the heterogeneous lithospheric structures. We calculated the change of Coulomb stress, strain energy, and seismic moments. The results provide useful insight of historic seismicity and present seismic hazard in China and surrounding regions.