Geophysical Research Abstracts
Vol. 20, EGU2018-4219, 2018
EGU General Assembly 2018

Reconstruction of northeast Asian deformation integrated with western Pacific plate subduction since 200 Ma

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The configuration and kinematics of continental deformation and its marginal plate tectonics on the Earth's surface are intrinsic manifestations of plate-mantle coupling. The complex interactions of plate boundary forces result in plate motions that are dominated by slab pull and ridge push forces and the effects of mantle drag; these interactions also result in continental deformation with a complex basin-mountain architecture and evolution. The kinematics and evolution of the western Pacific subduction and northeast Asian continental-margin deformation represent a first-order tectonic process whose nature and chronology remains controversial. This paper implements a "deep-time" reconstruction of the western Pacific subduction, continental accretion or collision and basin-mountain deformation in northeast Asia since 200 Ma based on a newly revised global plate model. We use GPlates software to examine strain recovery, geological and seismic tomography constraints for the western Pacific plate subduction, and sequentially backward rotations of deforming features. The results indicate a NW–SE-oriented shortening from 200 to 137 Ma, a NWW–SEE-oriented extension from 136 to 101 Ma, a nearly N–S-oriented extension and uplift with a short-term NWW–SEE-oriented compressional inversion in northeast China from 100 to 67 Ma, and a NW–SE- and nearly N–S-oriented extension from 66 Ma to the present day. The western Pacific oceanic plate subducted forward under East Asia along Mudanjiang-Honshu Island during the Jurassic, and the trenches retreated to the Sikhote-Alin, North Shimanto, and South Shimanto zones from ca. 137–128 Ma, ca. 130–90 Ma, and in ca. 60 Ma, respectively. Our time-dependent analysis of plate motion and continental deformation coupling suggests that the multi-plate convergent motion and ocean-continent convergent orogeny were induced by advance subduction during the Jurassic and earliest Cretaceous. Our analysis also indicates that intra-continent rifting and back-arc extension were triggered by trench retreat during the Cretaceous and that the subduction of the oceanic ridge and arc were triggered by trench retreat during the Cenozoic. Therefore, reconstructing the history of plate motion and subduction and tracing the geological and deformation records in continents play a significant role in revealing the effects of complex plate motions and the interactions of plate boundary forces on plate-mantle coupling and plate motion-intracontinental deformation coupling.