Geophysical Research Abstracts
Vol. 20, EGU2018-7531, 2018
EGU General Assembly 2018
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Indentation tectonics at plate corner in northern Taiwan: insights from field observations and sandbox models

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In northern Taiwan, contraction, extension, transcurrent shearing, and block rotation are four major tectonic deformation mechanisms involved in the progressive deformation of this arcuate collision belt. The recent tectonic evolution of the mountain belt is controlled not only by the oblique convergence between the Eurasian plate and the Philippine Sea plate but also by indentation process due to the corner shape of the plate boundary. Based on field observations, morphostructural analysis, taking into account geophysical data (mostly GPS) and results of experimental modelling, we interpret the curved belt of northern Taiwan as a result of contractional deformation (involving compression, thrust sheet stacking & folding, back thrust duplex & back folding) that induced horizontal and vertical extrusion. This deformation partitioning combined with increasing transcurrent & rotational deformation (involving transcurrent faulting, bookshelf-type strike-slip faulting and block rotation) induced transcurrent/rotational extrusion and extension deformation which in turn induced extensional extrusion. As a consequence, a special type of extrusional folds was formed in association with contractional, transcurrent & rotational and extensional extrusions subsequently. The extrusion tectonics in northern Taiwan reflects a single, albeit complicated, regional pattern of deformation. The crescent-shaped mountain belt of Northeastern Taiwan develops in response to oblique indentation by an asymmetric wedge indenter, retreat of Ryukyu trench and opening of the Okinawa trough. We performed three types of analog sandbox models to study the impact of deformation partitioning on the kinematics of tectonic structures. In addition, structural and thermal evolutions are summarized with age evaluations.