Geophysical Research Abstracts
Vol. 18, EGU2016-7633, 2016
EGU General Assembly 2016

How the structure of a continental margin affects the development of a fold and thrust belt. 1: A case study in south-central Taiwan

Dennis Brown (1), Joaquina Alvarez-Marron (1), Cristina Biete (1), Giovanni Camanni (2), Hao Kuo-Chen (3), and Chun-Wei Ho (4)

(1) ICTJA, CSIC, Earth Structure and Dynamics, Barcelona, Spain (jalvarez@ictja.csic.es), (2) University College, Dublin, (3) Department of Geosciences, National Central University, Jongli, Taiwan., (4) Central Weather Bureau, Taipei 100, Taiwan

Studies of mountain belts worldwide have shown that the structural, mechanical, and kinematic evolution of their foreland fold and thrust belts are strongly influenced by the structure of the continental margins that are involved in the deformation. The area on and around the island of Taiwan provides an unparalleled opportunity to investigate this because the entire profile of the Eurasian margin, from the shelf in the north to the slope and continent-ocean transition in the south and the offshore, is currently involved in the collision. Taiwan, then, can provide key insights into how such features as rift basins on the shelf, the extensional faults that form the shelf-slope break in the basement, or the structure of the extended crust and morphology of the sedimentary carapace of the slope can be directly reflected in the location and pattern of its seismicity, in its topography, and in its structural architecture, among other things. The continental margin of the Eurasian Plate that is currently involved in the Taiwan orogeny is thought to have evolved from a sub-continental subduction system in the Late Cretaceous to a rifting margin by the Early Eocene and, during the late Early Oligocene, to sea-floor spreading and the formation of the South China Sea, followed by localized extension in the Middle Miocene and, finally, collision with the Luzon Arc by the Early Miocene. Imaging features of the margin's structure in the Taiwan orogen is possible with seismic tomography, which shows, for example, that there are notable changes in velocity that can be directly attributed to structures in the basement. For example, there is a marked increase in Vp beneath the Hsuehshan Range which can be interpreted to be related to the uplift of higher velocity basement rocks by basin inversion. This is accompanied by significant seismicity that reaches a depth of more than 30 km's, and by surface uplift to form the highest topography in Taiwan. Furthermore, beginning at 8 km depth, but becoming especially prominent at 12 km and 16 km depth, there is an embayment of relatively high Vp that can be interpreted as the onshore projection of a basement high that occurs between the Mesozoic basement shelf break and the Taihsi Basin. Southward, there is a notable northeast-southwest-oriented increase in seismicity across the on land projection of the Mesozoic basement shelf break, with seismicity predominantly located beneath the Alishan Ranges, the highest topography in this part of the mountain belt. The topography also shows a pronounced re-entrant that coincides with the orientation and onshore projection of the Mesozoic basement shelf break that extends northeastward across the Western Foothills and into the Hsuehshan Range. The shallow structure of south-central Taiwan contains a number of features, such as changes in structural grain, or basement involvement in the deformation, that can be attributed to the presence of pre-existing structures in the Eurasian continental margin as it enters into the deformation of the Taiwan fold and thrust belt.