Geophysical Research Abstracts
Vol. 17, EGU2015-3332-1, 2015
EGU General Assembly 2015


# Earthquakes, geodesy, and the structure of mountain belts

Mark Allen (1), Richard Walters (2), and Ed Nissen (3)

(1) Durham, Earth Sciences, Durham, United Kingdom (m.b.allen@durham.ac.uk), (2) Institute of Geophysics and Tectonics, School of Earth and Environment, Leeds University, UK., (3) Department of Geophysics, Colorado School of Mines, Colorado, USA

Most terrestrial mountain belts are the topographic expression of thrust faulting and folding, which are how the continents deform in compression. Fold-and-thrust belts are therefore a global phenomenon, in existence since at least the onset of plate tectonics. They are typically described as wedge-shaped zones of deformation, overlying a basal low-angle thrust fault ($\leq$10o dip). Here we use earthquake focal mechanisms and geodetic data from active continental fold-and-thrust belts worldwide, to test these concepts. We find that widespread, seismogenic, low-angle thrusting at the base of a wedge occurs only in the Himalayas, New Guinea, Talesh and far-eastern Zagros, which are plausibly underthrust by strong plates. In other ranges there is no focal mechanism evidence for a basal low-angle thrust, and well-constrained hypocentre depths are typically <20 km. Available geodetic data show that active deformation is focussed on a single, low-angle thrust in the Himalayas and New Guinea, but distributed in other ranges for which there are sufficient observations. We suggest that the more common style of deformation approximates to pure shear, with a brittle lid overlying the rest of the plate, where ductile or plastic deformation predominates. Interpretations of both active and ancient mountain belts will need re-evaluation in the light of these results.