



## **Continental Collisions (Stephan Mueller Medal Lecture)**

Leigh Royden

Department of Earth, Atmospheric and Planetary Sciences, MIT, Cambridge, MA 01890, USA (lhroyden@mit.edu)

The Mediterranean and Tibetan-Himalayan regions represent two different stages, or types, of continental collision. The former represents an incomplete collisional stage where areas of oceanic and thinned continental crust remain between the two colliding continents. Here, deformation is dominated by the rapid movement of regional scale subduction systems in a direction that is commonly oblique to that of large scale continental convergence. These systems are driven by slab pull and the rate of subduction is exquisitely sensitive to the buoyancy of the subducting lithosphere. Subduction in these systems ends quickly when negatively buoyant foreland lithosphere has been consumed. The geological signature of such subduction systems typically consists of low mountains with little erosion, few high-grade metamorphic rocks, anomalously deep foredeep basins containing deep water sedimentary deposits and regional extension of the upper plate. In contrast, the more advanced Tibetan-Himalayan region has no deep water regions remaining between the colliding plates and a broad zone of convergent deformation has developed greatly thickened crust everywhere. The dominant modes of deformation are crustal shortening and lateral extrusion of material eastward away from the zone of immediate convergence. The mode of eastward extrusion has changed with time, probably responding to changes in the tectonic boundary conditions to the southeast. The geological signature of such subduction systems typically consists of high mountains with significant erosion, common occurrences of high-grade metamorphic rocks, and foredeep basins containing shallow water and non marine sedimentary deposits.