

Mechanics of Orogenic Zones

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The fabric and tectonic/structure evolution of orogens is dependant upon a complex mix of factors in the seven basic types; continent-continent collision, continent-arc collision, contraction of para-rifts, Andean style progeny, New Zealand style progeny, progeny at locking bends of transforms, and looping orocline collision just prior to terminal oceanic closure. These factors include:

- The petrographic layering, crustal thickness; and thermal age of the colliding/contracting margins, which together determine the vertical rheological zonation which, in turn, determines the flexural wavelength at lithospheric and upper crustal scales and the thermo-mechanical behaviour of the orogenic lithosphere. Foreland flexural strength is critical in determining the slope up which thrust sheets are pushed, the integrated compressive strength and potential decollement horizons of the orogenic lithosphere depends upon crustal thickness, petrography and geothermal gradient. In the India/Eurasia collision zone, India has an old thick strong lithosphere except at its northern edge because of Triassic rifting, whereas Tibet, especially in the north, is made up of arcs and accretionary prism assemblages; hence Tibet and the Himalayas take up the shortening. Thermally young lithospheric colliding and shortening edges take up more shortening than thermally old ones and also have more potential decollement horizons. The collision of intra oceanic arcs

generates short-lived progeny (~10 My) and nappe piles rapidly heated by the shallow asthenosphere of the arc.

- The amount and rate of plate convergence determine, respectively, the width of an orogenic belt and its style. Fast convergence causes high strain rates and more brittle behaviour to greater depths.
- The obliquity of plate convergence determines whether orthogonal shortening, oblique shortening or partitioned transpression occurs.
- Climate may be an important factor in determining orogenic style. The New Zealand Alps are an intracontinental dextral transpression steady-state orogen with denudation equaling rock uplift at about 100 mm.a⁻¹. If precipitation rates were lower, rock uplift would exceed denudation, vertical stresses would be greater and both deep and shallow gravity-driven tectonics would be more important.
- Late orogenic extensional collapse causes rapid exhumation of core complexes with massively-strained retrograded high pressure rocks with horizontal fabrics. Whether or not collapse occurs is largely dependant upon the petrography and water content of the lower crust. Lower crustal convection and bulk lateral flow may be important in determining tectonic style and fabric.

Polyphase deformation may be generated in at least ten ways.

Plio-Pleistocene sedimentary facies and tectonics of the central-east Sicily

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In the Plio-Pleistocene age the Sicilian area has been characterised by the presence of two emerged areas: the Madonie–Nebrodi–Peloritani sector and the Hyblean plateau. The former corresponds to the orogenic Miocene front of the Apenine–Maghrebien thrust belt; the latter is the correlative term of the northern part of the pelagian foreland (Lentini et al. 1990). Around the Messinian Caltanissetta basin, between the aforementioned sectors, the marine sedimenta-

tion has always had foredeep characteristic with more terrigenous facies in the central area opposed to the carbonatic deposit found in the East and Southeast areas.

The correspondent litostratigraphical sequences generally show a lower part formed by clays, silt and muds that pass up into either coastal carbonate sands or silicoclastics. Upon their age and some slight unconformity, these sequences were referred to different sedimentary events. The age