



Mechanisms of pre-shortening thinning, burial and exhumation of hot Andean Type orogens exemplified by European Variscan belt

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The European Variscan orogenic root system is a subduction driven hot orogen which originated as a result of deformation, thickening and thermal-magmatic reworking of an upper continental plate. Three major events are recognized: 1) Back-arc thinning of continental crust (Moho at 20 km) associated with Devonian tholeiitic volcanism, development of juvenile magmatic arc and massive thermal weakening of back-arc/arc lithosphere, 2) Carboniferous migration and enlargement of magmatic arc associated with progressive flattening of subduction zone and pure shear dominated thickening (depth to Moho at 70 km) of previously thinned hot back-arc crust, 3) subsequent vertical material transfers (exchanges of upper-middle orogenic crust with orogenic lower crust along steep channels) associated with indentation of strong foreland lithosphere. Vertical material transfers are terminated by horizontal spreading (subsurface channel flow at 12 - 20 km depths) of weak and hot orogenic lower crust underneath rigid lid. This orogenic suprastructure becomes progressively dismembered along normal shear zones in areas where orogenic lower crust reaches the surface. This 40 My evolution is documented by finite strain pattern of orogenic lower, middle and upper crust outcrops, seismic and gravity imagery, thermodynamic modelling of burial and exhumation PT vectors and isotopic dating of all tectonic events.