



Nappes, STEPs and the depth-dependence of orogenic arc formation

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In spite of the classical nature of the subject, our understanding of nappe emplacement and the role of nappes in orogenic arc formation is still far from complete. We propose this stems from a lack of attention for the deeper, sub-crustal levels of the arc formation process. In this study we place the subject into a lithospheric scale perspective. Recent results concerning the present-day deformation of the Calabrian accretionary wedge and the underlying basement in the central Mediterranean (Polonia et al., *Tectonophysics*, 2016) provide an excellent starting point for exploring the role of lithospheric-scale tear faults near edges of subducting slabs (STEPs, Govers and Wortel, *EPSL*, 2005) in nappe emplacement and orogenic arc formation. Analysis of the Calabria-Sicily region leads us to propose a depth-dependent model for arc formation which distinguishes the near-surface nappes in the upper crustal depth range from the plate boundary evolution - through STEP activity - at the lithospheric scale, which dominates the deeper part. This new perspective accounts for several hitherto puzzling features of arc formation, in the Alpine-Mediterranean region (Alps, Apennines, Carpathians, Anatolia) and elsewhere, such as strongly variable nappe emplacement directions and the formation of very tightly curved arcs and series of juxtaposed arc-shaped thrust fronts. A likely setting of the proposed process is that of a region in a terminal stage of convergence, with (nearby) imminent continental or arc-continent collision.