Geodynamic consequences of slab retreat: Implications for the orogenic development in the Circum-Pacific and Mediterranean-Carpathian regions

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Geodynamic reconstructions in both (south) western Pacific and the Mediterranean regions exemplify features of trench migration, back-arc extension, and transient pattern of surface subsidence-uplift those are characteristic for slab retreat/roll back tectonics. The development of these processes is usually followed by plate collision and tectonic displacements are mainly controlled by vertical forcings (e.g slab pull, mantle upwelling) rather than horizontal plate convergence. In this work, geodynamic modeling results of sub-crustal slab retreat (delamination) are used to infer the pattern and the amount of of surface uplift-subsidence, shortening-extension, trench migration. Model parameters are varied to test the influence lower crustal thickness/density, density of sinking slab, lithospheric thickness. Subsequently, a comparison between the model results are made against the; 1) last 12 Myrs tectonic evolution of the western North island in new Zealand, 2) Eocene-Oligocene evolution of New-Caledonia, Lord Howe regions 3) the last 10 Myrs post-orogenic lithospheric evolution of the Southeast Carpathians. Model results are in good agreement with the southward migration of the 1.2 km of uplift and 2 km of subsidence in the east of Taranaki basin in central island, 2 km of subsidence of the New Caledonia trough and 1-2 km of uplift of the Lord Howe rise, ~ 1 km of uplift in the southeast Carpathians-Transylvania and up to 6 km of subsidence in the Focsani basin. The retreating slab induces subsidence on the surface while pulling down the crust. The zone of slab removal results in the surface uplift and this is controlled by isostatic and dynamic response to the mantle uprising under the crust.

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