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ICLO Subduction; modelling differences in styles of continental extension between the Hellenic - W.Anatolian, the Pannonian - Carpathian, and the W. Mediterranean convergent margins

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ICLO (intra-collisional landlocked ocean) subduction (proposed by Edwards and Grasemann 2009) provides a mantle dynamics mechanism by which to explain key differences in the nature of continental extension at convergent margin settings. We present a new model that identifies why salient differences are present in the three greater Africa-Eurasia collision components of (1) The Hellenic - Western Anatolian subduction collisional system, (2) the Pannonian - Carpathian subduction collisional system and (3) the Western Mediterranean system. Key differences between these three systems are found in the presence or absence of:

(A) core complexes: major in (1), i.e. Rhodope, Aegean, Menderes, Lycian; rare in (2), i.e. portions of Corsica, Calabria and Tuscany are present as scraps ripped off the Alps during the rotation and retreat of Italy.

(B) sedimentary basins: major in (2), i.e. the Pannonian Basin; minor in (1), i.e. small trough areas in the Aegean; minor in (3), i.e. remnant shelf areas of the Ligurian-Provençal Basin before total failure of continental crust and oceanization due to extreme crustal stretching.

(C) melt generation: significant I- and S-type plutonism in (1), mainly mantle melting in (2).

Whereas the Hellenic - Western Anatolian system represents true "post-orogenic" collapse of continental collision (in that multiple continental crust elements collided over time to generate the present day, now massively extended back arc continental crust), the Pannonian - Carpathian and the W. Mediterranean systems were almost exclusively accretionary orogenesis convergent margins. This accretionary orogenesis however differs fundamentally from (e.g.) Andean type accretionary orogenesis (where hot crust with extensional collapse also exists) in that subducting slab geometries for this study's Mediterranean examples are extremely narrow and steep; mantle dynamics in Mediterranean type land-locked collision settings (thereby comprising limited subductable lithosphere) do not encourage widespread buoyed up subducted lithosphere (i.e. Farallon type flat slab subduction) and accordingly, the back arc is relatively heat-starved (at least until oceanization a la the Western Mediterranean). For the Hellenic - Western Anatolian system, the residual heat from the "true" continental collision alone is sufficient to obtain the observed extension-related phenomena in the presence of narrow and steep subducting slab geometry. Nevertheless, different slab geometry (dip angle) may have provided some heat over the past; this is especially likely during brief periods before or after discrete terrane collisions in order to elegantly generate the now-notorious spatio-temporally restricted pulses in Hellenic - Western Anatolian melting and / or extensional periods. This obviates the need to explain these pulses through changes in slab retreat velocity, albeit that ICLO subduction as a whole predicts accelerating subduction retreat velocity as a product of steadily narrowing subducting slab width. A linearly increasing retreat velocity, however, does elegantly obtain the observed rates of back arc extension (oceanization) in the Western Mediterranean as well as the migration of sedimentation depocentre loci in the Pannonian stretched continental crust. The model also predicts key features common to all three systems such as prolonged absence of high topography (in comparison to lofty examples of core complex and extension such as Southern Tibet or the Central Andes) and a climate parameter (e.g. precipitation) is not needed for the observed landscape evolution.