A CRITICAL COMPARISON BETWEEN THE APENNINES – TYRRHENIAN AND THE BETIC-RIF – ALBORAN OROGENIC SYSTEMS: AGES, STRUCTURES AND GEOPHYSISCAL DATA

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The Apennine-Tyrrhenian and the Betic-Rif-Alboran orogenic systems developed along the southern margin of the Alpine collision and show striking similarities, such as the strong curvature and the coexistence of extension and contraction during their formation. However, while the Apennines-Tyrrhenian system is almost unanimously considered as resulting from eastward retreat of NW dipping subduction below the Alpine chain, in a context of reduced or no plate convergence, for the Betic-Rif-Alboran system several differing geodynamic models have been proposed.
Recent seismic tomographies permit discarding some of these hypotheses in the Betic-Rif and provide increased details for the Apennines-Tyrrhenian system. We have compared the distribution, the timing and relative chronology of tectonic structures along the two orogenic systems (i.e. thrust faults, low-angle normal faults, strike-slip faults, tectonic rotations), and tried to link these to the hypothesized dynamics of subducting lithospheric plates that may be inferred from the latest tomographies.
In both orogenic systems an analogous relative chronology of structures may be discerned. Foreland-wards migrating thrust fronts are followed in time/space by coaxial and later non-coaxial low-angle normal faults, which are then dissected by strike-slip faults that accompany tectonic rotations and the acquisition of curvature. In the inner portions of both chains, extensional contacts bound the top of exhumed HP-LT metamorphic rocks, which in most cases correspond to continental crust units previously subducted to several tens of kilometers. Their buoyancy-driven ascent along the convex part of the subducting plate represents a fundamental aspect of the roll-back process in both orogenic systems. The two compared orogenic systems may be regarded as expressions of the same geodynamic process – i.e. subduction trench retreat of attenuated continental/oceanic lithosphere along 'oceanized' corridors running trough continental plates – however under different boundary conditions.