OROGENIC MIGRATION AND GEOTECTONIC EVOLUTION FROM FORELAND TO BACK-ARC CONDITIONS IN TUSCANY: IMPLICATIONS FOR LITHOSPHERIC SUBDUCTION

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Résumé: Afin de combiner la migration de l'orogénèse vers l'externe des Apennins septentrionaux et de l'évolution tectonique de la Toscane avec la conception de la convergence de plaques on propose un modèle de séparation intra-lithosphérique. Pendant que la partie inférieure de la lithosphère continue de descendre, la partie supérieure, consistante essentiellement de la croûte continentale, ascend et est deformée (fig. 1).

The present geological situation in the northern part of the Apennic peninsula permits recognition of a configuration which resembles that of an island arc system with its back arc (Tuscany), arc (frontal Apennines) and trench (Po Plain) elements (BOCCALETTI & GUAZZONE 1975). However, no suture between two convergent plates can be recognized along the Apennines: The arc configuration exists within the crust of the Adriatic plate (ELTER et al. 1975).

This situation represents the final stage of a migrating orogeny which started in the oceanic Penninic-Ligurian eugeosyncline in the Lower Oligocene and then gradually moved to the NE into the Adriatic plate. In its course Tuscany underwent all the different geotectonic stages from a foreland involving a period of compressional tectonics to the tensional tectonics of a hinterland.

The combination of the theory of plate convergence as a cause of orogeny with the evident migration of crustal deformation and the establishment of a trench/arc/back arc configuration in a coherent crust allows following model to be proposed: During the Oligocene the last part of the oceanic Penninic-Ligurian eugeosyncline was subducted along SW-dipping plane as may be deduced from the opposite sense of obduction. Liguride sediments and ophiolites which were forming an accretionary wedge at the front of the upper Corso-Sardian plate invaded the Adriatic plate when its border was downwarped with the

approaching subduction (fig. 1 A). But before this continental crust could be underthrust beneath the upper plate itself, it re-emerged causing its allochthonous overburden to slide to the NE.

With the assumption that lithospheric subduction was continued in the same direction even after the consumption of the oceanic lithosphere and the continental collision between Corsica and the Adriatic plate, the reappearance of its crust at the surface implies an intralithospheric splitting probably near the crust/mantle boundary. The advancement of such a process from the border towards the interior of the Adriatic plate explains the migration of a frontal trough followed by a zone of crustal uplift. The wedge-shaped opening between the upper and the lower lithosphere must have been filled with hot asthenospheric material from the upper plate. Its influx exerted the tangential stresses in the compressional belt as well as in the back-arc region and supplied the heat for the magmatism (fig. 1 B).

The underthrusting of the Corsican continental crust beneath that of western Tuscany (LETZ et al. 1978) and the decreasing ages of magmatism from W to E in Tuscany are consistent with the model.

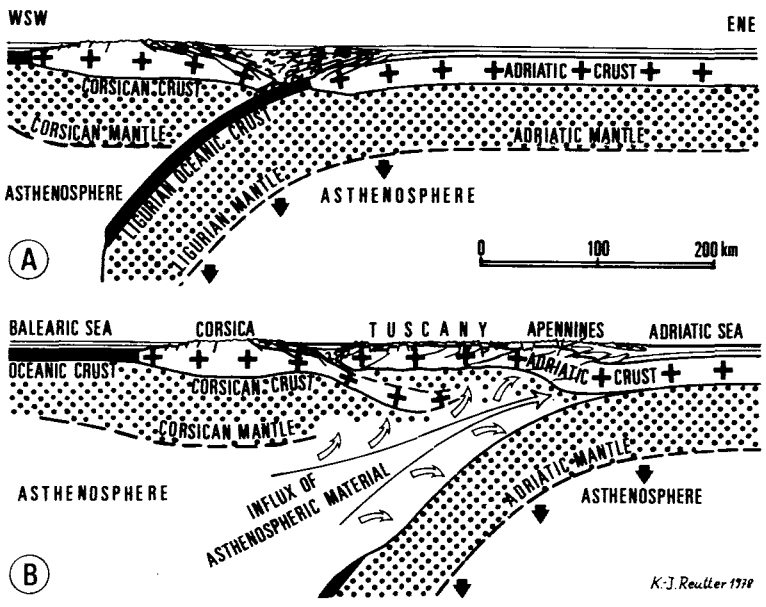

Fig. 1: see text for explanation.

References:
BOCCALETTI & GUAZZONE: in Squyres (ed.) "Geol. of Italy", 143-163, Tripoli 1975.
ELTER, GIGLIA, TONGIORGI & TREVISAN: Bol. geofis. teor. appl., 17(65),3-18, 1975.
LETZ, REICHERT, WIGGERT & GIESE: in Closs, Roeder, Schmidt (ed.)"Alps, Apennines, Hellen." 215-220, Stuttgart 1978.