

Geotectonic evolution of the Apennine chains bordering the Ligurian Sea

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Resumé: Les structures et la distribution des terrains allochthons de l'Apennin septentrional peuvent être expliquées comme l'effet d'un charriage d'un prisme accrétaire de sédiments eugéosynclinaux d'origine penninico-ligure sur le bord occidentale de la microplaque Adriatique au cours d'une subduction partielle sous la plaque supérieure européenne. Cependant, selon nouvelles dates fournies par la sismique à explosions, la croûte continentale de la Corse plonge sous la croûte d'Elbe qui fait part de la plaque Adriatique. Cette disposition doit être attribuée ou à une subduction du fond eugéosynclinal sous le bord de la plaque Adriatique antithétique à l'emplacement des nappes ou à un changement de la direction de la subduction (flip) après le paroxysme orogénétique.

The pile of nappes of the Northern Apennines can be explained by the obduction of oceanic sediments and ophiolites from the Penninic-Ligurian eugeosyncline onto the western border of the continental Adria microplate during Oligocene and Miocene times. Thus consumption of oceanic crust and mantle by subduction and continental collision is invoked for the Northern Apenninic orogeny.

Structures and distribution of the allochthonous materials and of the synorogenic sediments can be considered to have originated in a similar way as shown by some recent examples of subduction in areas of great sedimentary thicknesses, i.g. at the coast of Oregon, in the Java trench and at the Ionian coast of Calabria. During the Apenninic orogeny a subduction zone dipping to the SW (a probable rotation of Italy is neglected) must have been active along which the eugeosynclinal floor and partially the border of the Adria microplate were subducted. Thus this plate was marginally invaded by an accretionary prism of eugeosynclinal sediments which was formed at the leading edge of the European plate and its Corso-Sardian fragment. This implies, however, that during the preceding orogeny of the Western Alps and its prolongation to Corsica during the Upper Eocene starting from that point where the Apennines are juxtaposed to the Western Alps

the continental collision between the European plate and the Adria plate was not yet accomplished and a part of the Penninic-Ligurian eugeosyncline was left. As the orogeny of the Western Alps is supposed to have been caused by total or partial subduction of the eugeosynclinal floor along an east dipping subduction zone, the double orogene Western Alps/Northern Apennines with its divergent and not coeval structures should be explained by a reorganization and flip of subduction during the Oligocene.

However, recent geophysical interpretations of explosion seismic profiles through Corsica and the Northern Apennines show that the continental crust of Corsica, instead of forming the leading and overriding edge of the European plate, is dipping beneath the crust of Elba, which belongs to the Adria plate. There are two possibilities to explain this configuration:

- 1) The models adopted for the Northern Apenninic orogeny are not correct, and the obduction of eugeosynclinal materials must have been provoked by some kind of "flake tectonics" with a subduction plane dipping to the NE beneath the Adria plate and hence antithetic to the direction of nappe emplacement.
- 2) The models are correct, but after the first flip of subduction in the Oligocene after the paroxysm of the Western Alpidic orogeny, a second flip occurred in the Lower Pliocene after the paroxysm of the Apenninic orogeny. In this case only by the second flip the continental collision was completed, and the Penninic-Ligurian root zones were overridden by this retrocharriage. This view is supported by some geological evidence.