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The alpine paleo-arcs in the Adriatic plate margin (Eastern Alps)

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The North-eastern Italy (Adriatic paleo-margin) is a laboratory to study past orogenetic processes. The paleo-margin was involved in the subduction of the Mesozoic Tethys lithosphere with development of (a) an early magmatic belt, (b) a typical fore-arc crust, (c) a back-arc crust and (d) a collisional paleo-arc.

Early alpine magmatic belt. This is represented by the Re di Castello, Central Adamello, Mt. Marser and Corno Alto plutons of ultrabasic to intermediate composition, the Mt. Ospedale diorite dykes, and other ultrabasic to andesitic dykes distributed in the Southern Alps basement and cover. The ages of these magmatic rocks span between Upper Cretaceous (Northern Calcareous Alps and Dolomites), Paleocene (Val Camonica and Valtellina) and Middle Eocene (Adamello). Volcanics of Middle Eocene age are widespread in the Western Trentino and in the Southern Lombardy sedimentary sequences. In Trentino they crop out in a very restricted zone because of the transpressive deformation and shortening of the Giudicarie fault zone.

Adriatic fore-arc crust. This is represented by the high-grade Austroalpine Tonale nappe and the Lombardian Edolo/Morbegno basements which show evidence of a pervasive crustal deformation. These basements show swarms of pseudotachylytes often associated to mylonites, testifying crustal deformation at a critical depth in the Adriatic paleo-margin during the alpine subduction/collision.

Adriatic back-arc crust. This is testified by Paleocene to Oligocene ultrabasic to basic dykes and volcanics in the Venetian region. These volcanic rocks show HIMU-DM-OIB geochemical features, ascribed to deep mantle upwelling after a possible failure of the slab.

Collisional paleo-arc. Subduction was followed by a collisional to post-collisional magmatism at Oligocene, characterized by intrusion of large tonalite to quartz-diorite plutons (e.g., Western Adamello, Presanella, Ries, Rensen), apophyses, dykes and volcanics, very common in the Southern Alps and in the Austroalpine basements mostly along the Periadriatic Lineament. This magmatism continued up to Miocene in the Southern Alps. A relevant seismotectonic activity of Oligocene age developed across the tonalite plutons of the Adamello.

The above mentioned magmatic, volcanic and seismotectonic data, evidences of the pre-collisional (subduction) and collisional stages, clearly indicate the position of the related paleo-arcs.