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A kinematic model for the Central Ligurian Alps

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The present structure of the Ligurian Alps chain is particularly complicated and difficult to unravel. More than 20 tectonic units or nappes have been mapped and analysed over an area of about 2500 km^2. They are either composed of basement and cover, locally still stratigraphically continuous, or by detached cover, or by basement only, respectively.

Following a widely accepted reconstruction, it may be assumed that tectonic units originally belonged to three adjacent paleogeographical domains: Briançonnais, part of the European continent; Prepiedmont, representing the margin of this continent; and Piedmont-Ligurian, corresponding to the adjacent oceanic domain.

After the SSW-wards directed stacking (D1 phase), the whole pile of units underwent an almost co-axial backfolding event (D2 phase), whose intensity decreases towards the outer sectors, where it is no longer present. Later, the development of the Ligurian sphenocasm induced the principal orogenic event in the Northern Apennines and, in the Ligurian Alps, superposed open folds, trending NNW (D3 phase), on the previous (D1+ D2) structures, thus generating asymmetric dome-and-basin interference patterns. At the same time, the whole Ligurian Alps segment was rotated (Vanossi et al. 1994) up to 40 degrees along a nearly flat surface, located at a depth of about 10–15 km. For the sake of clarity, we will discuss the original directions of tectonic transport within the present-day geographical framework.

Units were displaced from their original domains and transported outwards during the principal (Eocene) Alpine tectogenetic event. Presently, disregarding the collisional zone (eastern boundary of the Voltri Group), the Piedmont–Ligurian units rest on the Prepiedmont nappes, in turn thrust onto the Briançonnais sector. This ensemble, forming the Penninic realm, has been transferred onto the outermost Dauphinois domain.

The top of the pile is formed by the Helminthoid Flysch nappes, representing the detached original cover of the oceanic units. Having bypassed the Penninic realm, they rest on the Briançonnais-Dauphinois contact.

At this scale, the overall structure appears to fit in the general orogenetic model which, starting from the inner sectors, progressively superposes nappes onto the adjacent, outer sectors. The Helminthoid Flysch units can be seen as weakly involved in the contractional mechanism and mainly transported by gravity. But, when looking at a more detailed scale at contacts amongst units and, within each unit, at its stratigraphy and inherited Mesozoic framework, as well as at its present structure and metamorphic parageneses, many problems must be faced in order to elaborate a kinematic model.

We now intend to present a general kinematic model, firstly taking into consideration the relationships within both the Prepiedmont and a part of the Piedmont-Ligurian units, and then linking (chronologically and mechanically) events that have involved all the examined units (internal Briançonnais included).