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# Mio-Pliocene paleostress fields in the inner western Alps

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Examination of faults and fault patterns along the inner western Alps reveals a predominance of extensional deformation. About 75% of all the measured faults carry steep, downdip striations in a normal faulting sense, while 25% of the remaining faults indicate strike-slip motions. This extensional deformation regime of Neogene age is synchronous with compressional tectonics recorded in external parts of the alpine orogen, such as the Subalpine Chains and the Jura fold-and-thrust-belt. We have collected fault data from 200 stations, where systematic fault measurements have been used to calculate paleostress tensors. Incorporating previous data from the Simplon area and the Briançon area, our paleostress data-base now covers most of the inner Western Alps in a continuous and quite homogenous way. The most salient features of this data base are as follows: - A dominant extension direction is oriented in a strike parallel orientation, gradually changing from East to Southwest: from ENE-WSW near Simplon pass and in the southern Valais to NNE-SSW in the Aosta valley, to N-S in the Vanoise massif to NNW-SSE in the Briançonnais area. This extension is materialized in the form of a set of faults with an orientation in a fan like pattern, radial to the Alps. - A minor part of faults indicate an orogen-perpendicular extension, materialized in the form of longitudinal faults. This faulting style is best developed in the southern, Briançonnais area and diminishes progressively in importance northeastward. - Transcurrent, dextral strike-slip is observed all along the belt from the Simplon down to the Briançonnais. Strike slip movement is younger than extension in the southern (Vanoise and Briançonnais) areas whereas it is older than orogen-perpendicular extension in the northern (southern Valais). Tensional paleo-stress axes of the transcurrent tensors are close to those of the extensional tensors. We interpret these observations as

evidence for at least two stages in the Neogene evolution of the Western Alps: (i) During the latest stages of collision with a general NW-ward advance and anticlockwise rotation of the Apulian microplate, pushing further into the European foreland and squeezing the already formed stack of alpine nappes, the core parts of the central Alps are reacting by lateral extrusion to the South (Ligurian sea), accomodated by orogen-parallel extension and dextral strike slip along orogen-parallel fault lines. Locally, vertical pinching of uplifted bodies (External and Internal Crystalline Massifs), with normal relative motion could have induced orogen-perpendicular extension. (ii) The present day situation of the Alps is characterized by the absence of convergence between Apulia and Europe, and seismotectonics document a general extensional regime all along the inner Western Alps. The present day extensional directions are systematically oriented at a high angle to the strike of the Alpine chain, in agreement with a minor portion of the faults of our faulting data-base. The transition between these two regimes is probably of Pliocene age, related to the diminution of the convergence and the erosion rate increasing in the Alps. The Pliocene to current tectonics of the Alps are best explained in terms of gravitational equilibration and collapse.