

## **The problematic identification of contacts between tectonic units: the example from the Mont Fort and Cimes Blanches nappes (Penninics, Western Swiss Alps)**

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The contacts between different tectonic units are commonly highlighted by the presence of distinctive markers such as well-developed mylonitic fabric or intercalation of corneule level or tectonized slices. In some cases, an abrupt change in the mineralogical assemblages, indicating contrasting tectono-metamorphic histories, may also help to identify such tectonic contacts. When such markers are absent, their recognition can be challenging, especially when two units of similar lithologies are tectonically juxtaposed. On the other hand, the presence within a single tectonic unit, of two levels showing a strong rheological contrast, can lead to local shearing which does not imply a contact between different tectonic units.

In the Penninics of the Alps of Western Switzerland, the location of the boundaries between the tectonic units now called the Mont Fort, Tsaté and Cimes Blanches nappes has been debated for decades. No well-developed mylonitic level are found between these units, while recurrent angular unconformities appear at their contacts. The study we have undertaken show that the upper contact of the Paleozoic levels of the Mont Fort nappe with the overlying Mesozoic sedimentary series, currently interpreted as a nappe boundary, rather correspond to a discordant contact formed by paleofaults during Jurassic extension and passively deformed during alpine orogeny. This Mesozoic series, currently attributed to the Cimes Blanches nappe, constitutes, according to our interpretation, the autochthonous sedimentary cover of the Mont Fort nappe.

This Mesozoic series is discontinuous and is characterised by significant levels of sedimentary breccias, probably Jurassic, ranging from thin turbiditic to coarse debris flows deposits. They are overlying discontinuous levels, attributed to the Triassic and the base of the Lower Jurassic, that consist of quartzites, dolomites and limestones. In few sections, the basal stratigraphic sequence of the Mesozoic series is entirely preserved and lies upon the uppermost formations of the Mont Fort basement with a concordant and non-sheared contact. In other sections where the Mesozoic breccias are found directly on top of the Mont Fort basement, the clasts of the breccia are at places almost entirely identical in composition to the adjacent basement. In addition, all the lithologies observed among the clasts of the Mesozoic breccia can be found in the Mont Fort basement or at the base of the series itself. These observations therefore strongly support the hypothesis of a stratigraphic contact of the Mesozoic series on the Mont Fort basement. This contact would have been cut by significant synsedimentary faults responsible for the sedimentary breccia deposits and recurring angular unconformities. The geological structures observed along this contact and highlighted by our mapping and cross-sections also support this hypothesis, as they are coherent with the passive folding of initial half-graben-type structures.

An intense orogenic deformation can reduce the initial angle of unconformities formed by paleofaults and the resulting discordant contacts may therefore be difficult to distinguish from alpine thrusts.