

Evidence of Jurassic rifting in the Dent Blanche nappe (near Cignana, Italy)

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The Roisan Zone is considered to be the Mesozoic metasedimentary cover of the Dent Blanche nappe (Austroalpine domain, Western Italian Alps; Diehl et al., 1952). It is dismembered into metric to hectometric bands and pods of marbles, dolomitic breccias with a phyllitic matrix, calcschist, micaschist, chlorite schist, impure and manganoan quartzites.

In the Roisan Zone we found the Alpine record to be heterogeneous; the metamorphic imprint indicates low temperature and intermediate pressure, locally this is associated with superimposed mylonitic foliations. Four evolutionary stages have been reconstructed by meso- and microstructural analysis. Pre-stage 1 is a pre-Alpine event recognised only at the microscale. During stage 1 a well differentiated millimetric foliation develops, whereas D2 structures consist of isoclinal folds, transposing the S1 foliation into a new, pervasive S2. D3 structures mainly consist of isoclinal folds: this stage is not always associated with the development of a new foliation.

Within the Roisan Zone, particularly near Cignana, we investigated cross-cutting relationships between metamorphic and deformational signatures. In Mn-quartzite and marble a relative temporal sequence was deduced. Titanite and allanite were singled out for U-Th-Pb dating. Allanite from Mn-quartzites occurs as subhedral crystals and displays irregular zoning in LREE, Ca, Fe, and Mg. SHRIMP analyses did not yield the metamorphic Alpine age expected on the basis of petrographic and structural observations. Two generations of allanite grains were analyzed; the first one shows Permian (~280 Ma), the second one Jurassic ages (ca. 160-190 Ma).

Titanite in marble occurs as abundant subhedral to anhedral crystals (mostly fractured and/or deformed), locally sub-parallel to the foliation. BSE images, qualitative X-ray elemental maps, and EMP spot analysis show weak regular to irregular zoning in Al, Ti and Ca. SHRIMP U-Pb analysis of titanite domains with various Al contents yield apparent spot $^{206}\text{Pb}/^{238}\text{U}$ ages scattering between 284 and 160 Ma.

The younger ages of titanite and the ages of allanite are tentatively interpreted as reflecting an extensional regime that preceded the Alpine collision. Further work is underway now to clarify whether zoning of LREE, Ca, Fe and Mg in allanite and variations of Al, Ti and Ca in titanite grains may partly reflect changes in fluid compositions in a metasomatic-hydrothermal system associated with extension, possibly in an oceanic environment.

References:

Diehl E.A., Masson R., Stutz A.H. (1952). Contributo alla conoscenza del ricoprimento della Dent Blanche. Memorie degli Istituti di Geologia e Mineralogia dell'Università di Padova 17, 1-52.