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The structure and evolution of the Becca d'Aver continental sliver in the Western Alps (Valtournenche, Italy): A first ascent

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The Becca d'Aver continental sliver (BACS) is a fragment of continental crust within the ocean-derived Combin Zone in the western Valtournenche of Italy. The lithologically heterogeneous fragment consists mainly of metasedimentary sequences (e.g. quartzites, micaschists, paragneisses). It is floored by a sole of serpentinite and has been folded into a N-facing synform. Short-term mapping and sampling along a N-S trending, 2 km long traverse revealed the potential of the BACS to provide further information on the tectonic evolution of the Combin Zone in particular and the Western Alps in general.

Two main tectonic units can be distinguished: 1) The BACS with its sole of serpentinite and 2) the underlying Combin Zone. In the study area, the Combin Zone can be further subdivided into two units: a structurally lower ophiolitic nappe consisting of greenschists and serpentinite and a structurally higher nappe consisting mainly of calcschists with minor serpentinite and greenschist lenses and, in its basal part, a Mesozoic succession of quartzites and cellular dolomite. Stretching lineations in all units strike uniformly NW-SE; foliations mostly dip to the S. The BACS shows a higher metamorphic grade than surrounding greenschist-facies rocks of the Combin Zone as evident from the occurrence of garnet-bearing assemblages. However, the age of this imprint is unknown so that it could be either Variscan or related to Alpine accretion.

The BACS displays diverse deformation structures: folding of a pre-Alpine metamorphic layering shows that the whole fragment has been folded into a N-facing synform with a steeply-dipping upper limb and a shallowly-dipping lower limb. Preferably in fold hinge zones, L-tectonites can be found which is in contrast to the S>L-tectonites of the surrounding Combin Zone. Since the orientation of stretching lineations in the L-tectonites is the same as in the Combin Zone they are interpreted to have formed during the same deformational event. The formation of these L-tectonites can be explained by two mechanisms which may have both contributed: 1) The localization of the constrictional strain component into rheologically strong continental rocks of the BACS whereas flattening strain was preferentially partitioned into rheologically weak calcschists and serpentinites of the Combin Zone (Lister & Williams, 1983) and 2) the rotation of one of the long axes of L-S-tectonites into the field of maximum shortening due to progressive folding (Sullivan, 2012). Steeply-dipping, SW-NE-striking conjugate sets of shear bands overprinting the Alpine foliation indicate a pure shear extensional regime probably related to late-stage orogen-perpendicular extension.

The close association of continental rocks and serpentinites suggests that the BACS represents a piece of the rifted Adriatic continental margin that was incorporated into the accretionary wedge during Late Cretaceous - Early Tertiary subduction and accretion. The observed deformation structures within the BACS and the surrounding Combin Zone suggest that they shared a common Alpine tectonic evolution but behaved differently due to strong contrasts in competence and rheology. The small and inconspicuous BACS may thus hold crucial information on the deformation history of the Western Alps.

References

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