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MARBLES AS PETROGENETIC INDICATORS OF INCREASING EO-ALPINE METAMORPHIC GRADE IN THE ORTLER CRYSTALLINE

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The Ortler crystalline represents a polymetamorphic Austroalpine crystalline basement which occurs southwest of the Ötztal crystalline between the Vinschgau- and the Ulten Valley. During the Eo-Alpine orogeny, the Ötztal Crystalline was juxtaposed onto the northern part of the Ortler Crystalline and its sedimentary cover [4]. Tectonically, the Ortler crystalline represents a stack of three distinct units which can be distinguished by their polymetamorphic P-T evolution: A): The Laaser Series: It is the lowermost unit and is characterized by intensely deformed, mylonitic amphibolites, micaschists, paragneisses and almost pure marbles (Laas Marble). B): The Martell Micaschists: It is on top of the Laas Series and is comprised of a more or less homogeneous stack of micaschists (Grt-Sta-Bt-bearing schists) with intercalations of amphibolites, orthogneisses and rarely marbles. C): The Zebru Schuppenzone: This unit consists mainly of quartzphyllites with small intercalations of greenschists, quartzites and impure marbles. This unit is tectonically emplaced onto the Marteller Micaschists and occurs at the base of the overlying sedimentary cover (Ortler Trias).

In the course of this study, we collected a suite of marble samples from all three units along a profile from the southernmost, highest, unite (Zebru Schuppenzone) to the northernmost, lowest, unit (Laas Series) in order to provide additional informations about the increasing Eo-Alpine metamorphic grade. The sample from the Zebru Schuppenzone contains the following mineral assemblage: epidote + muscovite + titanite + calcite. Since we up today have no datations on these rocks it is not clear if this mineral assemblage is of variscan or of eoalpine age. However, the structural features of the marbles are perfectly concordant to that of the surrounding quartzphyllites which are dated and yield ages of around 87 Ma. Therefore the perfectly reequilibrated postdeformative mineral assemblage of the marbles may be Eo-alpine in age.
The samples from the Martell Micaschists were collected from the basal area of this unit close to a contact area between marbles and the pegmatitic dikes from the Martell Granite. This Variscan contactmetamorphic overprint led to the formation of a complex mineral assemblage: garnet + idocrase + zoisite + titanite + diopside + calcite + quartz. The Eo-Alpine metamorphic overprint leads to the replacement of diopside by tremolite. In contrast to the samples from the Zebru Schuppenzone and the Martell Micaschist units, Eo-Alpine metamorphism was pervasive in the Laas unit. The marbles from this unit only contain an Eo-Alpine mineral assemblage such as: tremolite + clinozoisite + titanite + calcite + quartz.

The chemical composition of the tremolites shows a slight increase in Na and Al (edenite vector) towards the North, thus indicating possibly a slightly higher Eo-Alpine metamorphic grade in the Laas Series. We also investigated titanites from all three units to possibly correlate titanite zoning with the metamorphic evolution of these rocks. Titanites in all samples except for the samples from the southern Zebru Schuppenzone, show distinct chemical zoning with respect to Ti, Al and F thus showing an increase in Al + F in the rims indicating a chemical substitution such as: Al + F $\Leftrightarrow$ Ti + O. The highest Al and F contents are from titanites from the Martell Micaschist unit with up to 9 wt.% Al_2O_3 and 2 wt.% F.

Although the Laas Series and the Martell Micaschists clearly show a polymetamorphic evolution with an earlier Variscan and a later Eo-Alpine metamorphic overprint, it is not clear yet if titanite zoning corresponds to these distinct metamorphic events. The Eo-Alpine metamorphic conditions in the Martell Micaschists and the Lass Series range from 6.7–8.5 kbar and 480–500°C. These data are in accordance with current investigations in the Ortler Crystalline which clearly show that the Eo-Alpine metamorphic overprint was very strong and pervasive and thus led in the Laas Unit to a complete recrystallization during the Alpine orogeny in contrast to previous ideas ([1], [2], [3].

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