Raso, Gabriel¹; Tropper, Peter¹; Rammlmair, Dieter²

Diabases are petrologists best friends: quantitative P-T constraints on the Eoalpine metamorphic gradient in the Ötztal nappe using diabase dikes

¹Universität Innsbruck; ²Leibniz Universität Hannover; gabriel.raso@student.uibk.ac.at

The Ötztal nappe (austroalpine domain, Eastern alps) is a polymetamorphic unit that consists of metapelites with various intercalations of orthogneisses, amphibolites and rare metacarbonates. These rocks have been cut by numerous diabase dikes of basaltic to andesitic composition. Field- and textural investigations revealed a post-Variscan emplacement, since these dikes only show Eoalpine metamorphism and deformation. The aim of this study is to extend the P-T constraints for the Eoalpine metamorphic gradient in the Ötztal nappe further to the NW by using diabase dikes. Therefore multi-equilibrium geothermobarometry paired with classical geothermobarometry was performed on 19 diabase samples from the Ötztal nappe, the Texel Unit and the Silvretta nappe. The diabase dikes contain the mineral assemblage plagioclase + amphibole + biotite + quartz + epidote + muscovite + titanite \pm garnet. The anorthite content (X_{An}) in plagioclase and the edenite component in Ca-amphibole shows increasing P-T conditions from the NW to the SE of the Ötztal nappe. The thermobarometric calculations with multi-equilibrium geothermobarometry (THERMOCALC v.3.21) yield P-T conditions of 250-300°C and 2-4 kbar for the northwestern Ötztal nappe, reaching 550-600°C and 8-10 kbar in the southeastern Ötztal nappe, near to the Schneeberg unit. The diabase sample from the Texel unit yields P-T conditions of 540 ± 41°C and 8.9 ± 1.6 kbar. Thermobarometric calculations with THERMOCALC v.3.33 and v.3.45 yield similar results, but tend to overestimate the P-T conditions, especially for the lower greenschist-facies. Our thermobarometric results are representing the first quantitative P-T estimates for the Eoalpine metamorphic gradient in the Ötztal nappe above the chloritoid isograde.

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