

The Basal Amphibolite in the central Tauern Window: new chemical data and implications for Early Palaeozoic paleogeography

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The Basal Amphibolite is an Early Palaeozoic sequence of metabasites and meta-ultramafic rocks in the central Tauern Window; it is mainly exposed around the Granatspitz dome underlying the magmatic series of the Habach Complex. The palaeo-tectonic setting, its pre-Alpine palaeogeographic position and the emplacement age of the Basal Amphibolite are strongly debated. This study presents new high-quality bulk rock chemical data of several lithologies within the Basal Amphibolite in order to constrain its geotectonic setting. Additionally, a palaeogeographic model is presented.

Three types of metabasites can be distinguished: amphibolites, hornblende-biotite schists and hornblende-biotite gneiss. The amphibolites are coarse-grained, massive to banded with the assemblage hornblende + plagioclase with minor biotite, epidote, chlorite and rutile. It shows slight enrichment of LILE and LREE compared to MORB. Especially Th is elevated and scatters strongly indicating varying degrees of crustal contamination. More massive types may represent metagabbros.

Hornblende-biotite schist is fine to medium-grained and well foliated. It consists of hornblende, biotite, plagioclase, quartz, with varying amounts of garnet and titanite. Formerly this schistose rock was interpreted as a stronger deformed variety of amphibolite (Frisch and Raab, 1987). However, the new geochemical data indicate that there are significant chemical differences; i.e. it is higher in LILE and HFSE and has about 10 times higher (La/Yb)_{cn} values. The hornblende-biotite schist is interpreted as a higher fractionated melt from the same parental magma.

Hornblende-biotite gneiss forms so far unrecognised m-wide, discordant, late-magmatic intrusive stocks and dykes. It is mesocratic due to higher modal contents of quartz + feldspar and absence of garnet. It has a dioritic composition and represents the highest fractionated rock in the Basal Amphibolite. The very similar trace element composition indicates a common magma source of all metabasites, which was enriched relative to N-MORB. An origin in a back-arc setting is envisaged possibly influenced by continental (?) arc magmatism.

An updated palaeogeographic model includes: 1.) Subduction and formation of an Andean-type continental arc at the northern Gondwana margin in the Late Neoproterozoic/Early Cambrian. 2.) Formation of a back-arc basin behind the active continental margin. This might represent an unsuccessful and aborted attempt to open the "Proto Rheic Ocean" in the Cambrian. 3.) As part of the Avalonia Terrane, the Rheic Ocean finally opened in the Ordovician. Subsequent spreading of the Rheic ocean moved Avalonia to the north where it finally collided with Laurentia in the Silurian (Caledonian orogeny). The Habach Complex might represent the corresponding arc to the Proto Rheic Ocean back arc basin where the Basal Amphibolite unit formed. The following Variscan and Alpine orogenies obscured most of the primary features making interpretation of Early Paleozoic features difficult.

Reference:

Frisch, W. and Raab, D. (1987): Early Paleozoic back-arc and island-arc settings in greenstone sequences of the central Tauern Window (Eastern Alps). *Jahrbuch der Geologischen Bundesanstalt* 129, 545-566.