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Autor: Dietrich, V.

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Investigation of Ophiolitic Occurrences and Ophiolitic Detritus in the Eastern Alps

Report by *V. Dietrich**)

Ophiolitic occurrences and ophiolitic detritus in flysch-type sediments from the Penninic-Austroalpine boundary in Grisons and from the Rheno-Danubic flysch north of the Eastern Alps have been investigated in order to evaluate a plate-tectonics model for the Eastern Alps. The main processes were formation of a few hundred kilometres of ridge-type oceanic crust in the Penninic ocean during Late Jurassic to Early Cretaceous time, the rapid and episodic destruction of oceanic crust in a subduction zone, during Late Cretaceous to Eocene time, and the collision of two continental plates followed by vertical uplift during Late Eocene to Late Miocene time (DIETRICH 1976a, b; 1977).

Ophiolites crop out in the ophiolite zone of Grisons, that includes Arosa, Platta, and Malenco, in a few tectonic windows of the Northern Calcareous Alps, in the Engadin and Tauern windows. Metamorphic studies within the Platta and Avers Bündnerschiefer units should proof the existence of an early-alpine subduction phase. However within these areas the high-pressure metamorphic event is only weakly pronounced and overprinted by the «central alpine» regional metamorphism (DIETRICH et al, 1974; DIETRICH und OBERHÄNSLI, 1976; OBERHÄNSLI, 1977). Geochemical investigation on metamorphic ophiolitic pillow-lavas, lava flows, sills and dikes have been carried out to compare major and trace element concentrations with those of oceanic crust from mid-oceanic ridges, marginal sea floor, oceanic islands and island arcs. The aim is to study chemical exchange processes in basaltic rocks during alteration and increasing metamorphism and to use any «chemically stable» element for discrimination of the original basaltic composition. The majority of about 300 analyses from the above mentioned areas revealed a tholeiitic composition similar to that of oceanic ridge basalts (DIETRICH and OBERHÄNSLI, 1975; OBERHÄNSLI and DIETRICH, 1975; DIETRICH et al, 1977). This supports the idea of the existence of a Penninic oceanic basin.

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*) Institut für Kristallographie und Petrographie, ETH-Zentrum, CH-8092 Zürich (Switzerland)

Ophiolitic detritus occurs in the Upper Cretaceous Rheno-Danubic flysch, Eocene wildflysch and in the Upper Cretaceous Gosau deposits (Northern Calcareous Alps). The characteristics of the clastic Gosau sedimentary rocks suggest that the fine-grained ophiolitic detritus experienced long-distance transport into the Gosau basins by mass flow and turbidity activity (DIETRICH and FRANZ, 1976). In contrast, coarse-grained carbonate clasts must have been derived from a nearby continental slope or platform of the Calcareous Alps. Therefore, the Gosau basins or troughs are regarded as locally limited offshore basins within the accretionary prism between the continental shelf and a tilted flysch wedge that formed the highest part of the subduction zone. Ophiolitic detritus was shed from downgoing slices and sediments of the Penninic oceanic crust. «Southward-directed» subduction thrust the Penninic oceanic lithosphere under the Austroalpine-Southalpine sialic crust and caused the internal thrust sheets of the Northern Calcareous Alps as well as the uplift of the Northalpine flysch deposits (DIETRICH and FRANZ, 1978). This evidence, as well as palinspastic reconstructions place the Northern Calcareous Alps north of the Tauern window without large horizontal nappe displacements.

Literature

DIETRICH, V., VUAGNAT, M. and BERTRAND, J. (1974): Alpine Metamorphism of Mafic Rocks. Schweiz. Min. Petr. Mitt. 54, 2/3, 291–332.

DIETRICH, V. und OBERHÄNSLI, R. (1975): Die Pillow-Laven des Vispertales. Schweiz. Min. Petr. Mitt. 55, 79–87.

DIETRICH, V. (1976a): Plattentektonik in den Ostalpen. Eine Arbeitshypothese. Geotekt. Forsch. 50, 1–84.

DIETRICH, V. (1976b): Evolution of the Eastern Alps. A plate tectonics working hypothesis. Geology, 147–152, March 1976.

DIETRICH, V. und FRANZ, U. (1976): Ophiolith-Detritus in den santonen Gosau-Schichten (Nördliche Kalkalpen). Geotekt. Forsch. 50. 85–109.

DIETRICH, V. und FRANZ, U. (1976): Alpidische Gebirgsbildung in den Ostalpen: Ein plattentektonisches Modell (Kurzfassung). Geol. Rundschau 65, 361–374.

DIETRICH, V. und OBERHÄNSLI, R. (1976): Der Gabbro der Jufer Horen (Avers, Graubünden). Schweiz. Mineral. Petrogr. Mitt., 56/3.

DIETRICH, V., NISBET, E. und OBERHÄNSLI, R. (1977): Chemismus metabasaltischer Gesteine aus alpinen Ophiolithen. Schweiz. Mineral. Petrogr. Mitt., 57/3, 464–466.

DIETRICH, V. (1977): Plate Tectonics in the Eastern Alps. Geotectonica 6 (USSR, in Russisch), 61–68.

DIETRICH, V. und FRANZ, U. (1978): The Gosau Formation (Northern Calcareous Alps) and Example of an Alpine Trench-Slope-Continental Margin. In «Alps, Apennines, Hellenides» (editors: Closs, Roeder, Schmidt), E. Schweizerbart'sche Verlagsbuchhandlung.

OBERHÄNSLI, R. (1977): Natriumamphibolführende metamorphe basische Gesteine aus den Bündnerschiefern Graubündens. Dissertation ETH Zürich.

OBERHÄNSLI, R. und DIETRICH, V. (1975): Geochemische Untersuchungen an Metabasalten der alpinen Ophiolithe. Schweiz. Min. Petr. Mitt. 55/3, 574–576.

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