

Abb. 1: Megabreccien in den Untersten Allgäu Schichten bei den Schönpleisspitzen in den Lechtaler Alpen. Als Komponenten treten Oberer Hauptdolomit, Kössen Fm., und Oberrhätalk auf.

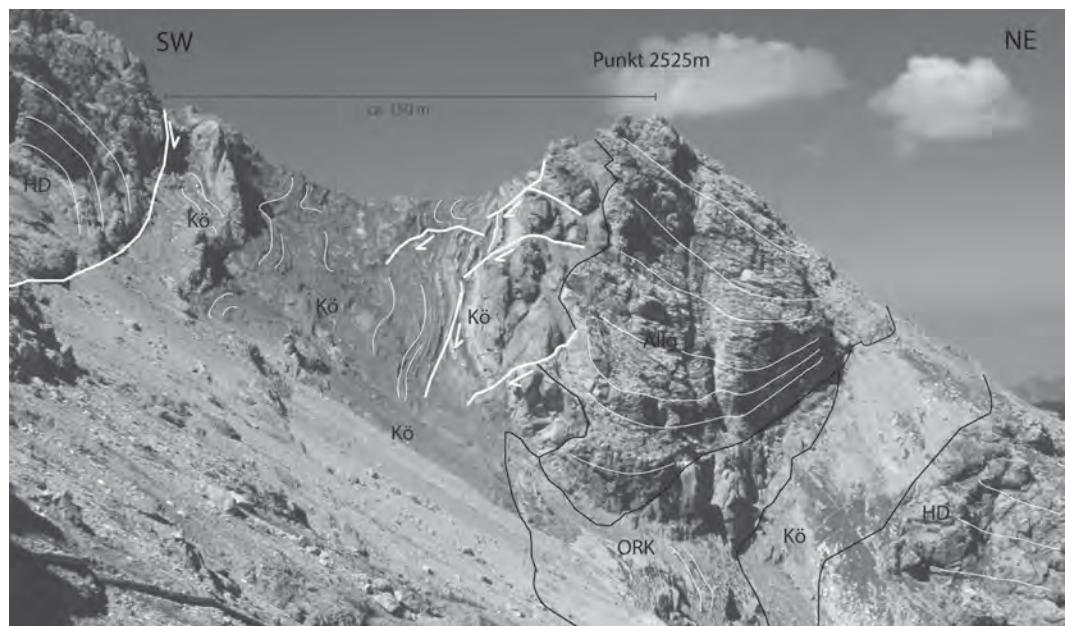


Abb. 2: Eine jurasische Abschiebung im Rätikon (NW Mannheimer Hütte) am Kontakt Hauptdolomit (HD) - Kössener Schichten (Kö). Rutschfalten und Brekzien in den Kössener Schichten werden von der Allgäu-Fm. (Allg.) plombiert.

**Geochronology of the Alpe-Morello-Unit in the upper Ivrea-Verbano Zone (N. Italy)**

BLAHA, S., CERNOK, A. & KLÖTZLI, U.

University of Vienna, Department of Lithospheric Research, Althanstrasse 14, 1090, Vienna, Austria

The Ivrea-VerbanoZone (IVZ) is interpreted as one of the most spectacular cross sections through an attenuated continental lower crust. The regional lithology has been subdivided into three major units: supracrustal rocks of the Kinzigite Formation; mantle peridotites and a underplated igneous mafic complex. The assembly of the rocks in their relative stacking order close to what can be

seen today dates from Carbo-Permian time. The amphibolite facies rocks of the Kinzigite Formation consist of metapelites and metapsammites and subordinate metacarbonates and metabasites. Metapelites and metapsammites, also known as kinzigites, form a uniform 3-4 km wide tract. They are interpreted as a Palaeozoic accretionary complex. The lowest grade rocks, in upper amphibolite facies, appear along the southeastern margin of the IVZ. The metamorphic grade increases towards the NW to granulite facies. In this amphibolite facies part of the northeastern IVZ close to the tectonic border to the Strona Ceneri Zone a tectonically emplaced slice (1 x 0.2 km) of granulite facies lower crust comprising metaperidotite, mafic and inter-

mediate granulites and metagabbros (Alpe-Morello-Unit) is found. From field evidence this section can easily be interpreted as part of the lower granulite facies IVZ.

To understand the chronology of the area we dated leucocratic dykes. Two types can be distinguished: The younger type consists of dykes that are found discordant in the peridotite body and the metagabbro. It is dated at  $\pm 280$  Ma. This age corresponds directly with the main intrusive phase of the Mafic Complex dated at  $288 \pm 4$  Ma in the Val Sesia section. The other group is dated at  $\pm 450$  Ma which is interpreted as an intrusive age, but wasn't found in the IVZ before. Hence two possibilities arise. The host rocks of the older group are part of the Strona Ceneri Zone directly in contact with the Alpe Morello Unit or it is a new age group for the IVZ that is astonishingly similar to Rb/Sr whole-rock dates from kinzigites of  $478 \pm 20$  Ma. If it is a new age group it is required to find a new interpretation for the formation of the IVZ instead of the single formation event as a Palaeozoic accretionary complex.

### Sedimentological and geochemical examination of the Bellerophon and Werfen Formation at Laurinwand section (western Dolomites, Italy)

BOSCHETTI, F. & METTE, W.

Institut für Geologie und Paläontologie, Universität Innsbruck, Innrain 52, Austria

This work details a sedimentological and geochemical examination of a Permian-Triassic section near to the Laurinwand (Rosengarten). This section is a still unexplored area of the numerous Permo-Triassic outcrops in the western Dolomites, aiming new evidence for the end-Permian mass extinction. The Bulla Member (uppermost Bellerophon Formation, late Changsingian) is a nearly 2 m-thick unit of fossiliferous carbonates, with cm-thick intercalations of marls. It is the last lithostratigraphical unit bearing Permian fossil taxa before the end-Permian catastrophe with extinction rates of marine species close to 98 %. Carbonates in the Bulla Member are composed of two characteristic microfacies types; one shows favourable conditions (MF Type 5) in an open marine environment with a diverse assemblage of foraminifera and algae; the other represents unfavourable conditions (salinity, oxygenation) with low diverse fauna and abundant opportunistic taxa that can tolerate bad conditions in a restricted lagoonal setting (MF Type 6). In the Bulla Member of the Laurinwand section two periods are evident showing open marine water circulation which interfinger with carbonates of restricted environment. The Tesero Horizon (basal Werfen Formation, latest Changsingian) shows a lithostratigraphical unit of grainstones characterizing the TST following the Bulla Member. A still not documented microfacies type, composed of superficial ooids with a thin crystalline cortex around a large nucleus is denominated as „Bellerophon-Oolite“ (MF Type 7). This MF type demonstrates a passage from intraclastic packstones of the Bulla Member to typical

normal ooids of the Tesero Horizon and marks an increase in current energy („current event“, BRANDNER 1988). Geochemical evaluation of entire-rock composition constitutes a drop from 3.5 to 2 ‰  $\delta^{13}\text{C}$  at the beginning of oolitic sedimentation. Independent from the accumulation rate, this negative-shift is traceable in different environments of western Tethys, placed in the *Clarkina meishanensis* / *Hindeodus preparvus*-zone, and gives therefore a geochronological marker (HORACEK et al. 2010). Geochemical examination of a brachiopod shell from the first bed with „Bellerophon-Oolite“ displays a 2 ‰ variation of  $\delta^{18}\text{O}$  values. The depletion in  $\delta^{18}\text{O}$  isotopes in young shell layers shows a short-term (seasonal?) change of ecologic conditions at the beginning of oolitic accumulation.

The storm-dominated Werfen Formation is characterized by 4th and 5th order cycles generated by 0.1-0.2 Ma variation of astronomical parameters. In this work the lithostratigraphical unit „Gastropode-Oolite Member“, located between the Seis and Campill Members (FARABEGOLI & PERRI 1998, POSENATO 2008) has been eliminated. The reason for this new classification is the occurrence of the characteristic Gastropode-Oolite MF type, abundant in gastropod shells with oolitic encrustation of iron-dolomite, at different stratigraphical levels in the Seis and Campill Member (BRANDNER et al. 2009). The lithostratigraphical boundary between these two members is therefore placed in the section with a strong increase of mica. Another geochemical marker is situated on yellowish silty dolomites of the Campill Member, where  $\delta^{13}\text{C}$  values come to on a maxima with 5-6 ‰ in the Griesbachian isotope excursion. In correlation with the Induan /Olenekian GSSP-section (Mud/Spiti, India; KRYSSTYN et al. 2007) and the Olenekian GSSP-section (Chaohu, Southchina; PAYNE et al. 2004), the Induan/Olenekian boundary could be placed at this marker-horizon.

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