SWISS SED Meeting

Twenty-eighth Meeting of Swiss Sedimentologists

Saturday, 11 June 2022

Fribourg

Programme and Abstracts

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Stratigraphy, rocks and fossils of the Gemmi-Lämmerenalp area (VS), a poster for teaching and outreach

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The Gemmi-Lämmerenalp area gives easy access to excellent outcrops of a mildly deformed Upper Jurassic-Lower Cretaceous and Paleogene sedimentary sequence of the North-Helvetic Doldenhorn nappe. Traditionally, field camps are organized by the ETH and the University of Lausanne to train students in geological mapping, stratigraphical and structural observation. Also, numerous hikers frequent the area, potentially interested in knowing more about the geology. However, to our knowledge, no recent account on the stratigraphy, sedimentology and fossils of the area has been published, that would be easily accessible to students and an interested public.

Furrer (1962) briefly described the lithologic units of the Doldenhorn nappe in the explanatory booklet to the Gemmi geological map (Atlas sheet 1267). Herb in Masson et al. (1980, p. 142) gave an excellent description of the Jurassic to Eocene section of the Doldenhorn nappe in the area. More recently, Gansner (2000) presented a diploma work supervised by H. Funk and H. Weissert on the stratigraphy and sediment petrology of the sections indicated by Herb. Bonvallet et al. (2020) presented a highly fluctuating carbon isotope record of the Tierwis and Schattenkalk formations at Lämmerenplatten, that does not correlate with records from other Helvetic sections. According to the authors, it is affected by low grade metamorphism.

Here, we present a first working version of a poster that includes a revised stratigraphic column with a chronostratigraphic correlation of the Mesozoic part to the northern Helvetic realm in the space -time diagram by Föllmi (2007, fig. 2). A set of commented panoramas and outcrop images is provided for each formation, showing formational boundaries and typical facies and fossils. Typical fossil groups of each formation are illustrated for teaching purposes, with images from the area, but also with illustrations of well-preserved micro- and macrofossils from elsewhere, including the literature.

While Föllmi's chronology is calibrated by many published fossil occurrences (ammonites, calpionelids etc.) in central and eastern Switzerland, these ages are at present poorly confirmed by fossils in the Gemmi area. A general, lithostratigraphic correlation of the Lämmeren section with Helvetic sections in central and eastern Switzerland seems feasible at the level of formations. In particular, the main disconformities in the Berriasian-Barremian interval can be correlated well. However, the corelation of members is problematic and calls for a refined sedimentologic and sequence-stratigraphic analysis of the Gemmi area, as well as the definition of new members.

The lower part of the Quinten Formation is characterized by dm- to m-bedded light grey micritic limestones alternating with several thinner-bedded marly limestone intervals. Besides a supposed pelagic component, much of the micrite should represent peri-platform ooze. Belemnites are frequent in some beds. A more important marly limestone interval could represent the "Mergelband" recorded in other Helvetic sections. The upper part of the Quinten Formation, here informally termed "Lämmerendalu member" is characterized by

several intervals of 3-10 cm-bedded alternating light and dark grey, nodular dolomitic limestones and limestone breccias. Gansner (2000) reported sparse bioclasts, such as aptychy, *Saccocoma* and calcified sponge spicules, that must have resulted in the diagenetic formation of occasional chert nodules. We observed patches of encrusting corals and echinid spines, that could represent an offshore, lower photic zone paleo-environment. This new member clearly differs from the shallow platform Troos Member of central Switzerland.

The Zementstein Formation appears as soft slopes of thin-bedded, dank grey argillaceous limestones with marl joints. Some interbedded limestone beds can be followed over a few km. A set of several 3-4 dm thick limestone beds (equivalent of the Graspass Member?) mark the passage to the Öhrli Formation. It consists of at least 5 cycles, composed of a basal, thin-bedded marly limestone interval and thick-bedded white limestone top. These cycles are contiguous from Lämmerenboden to Rote Chumme but show important thickness variations that cannot be attributed to tectonics. Marly intervals may contain large slump masses indicated by rotated bedding. We need further observations to determine, if the thick-bedded tops correspond to platform growth.

The contact with the condensed Betlis Formation is sharp, shows sedimentary dykes filled with echinoderm-quartz sands. The top of the Betlis Formation is a paleo-karst infilled with echinoderm-rich sands (equivalent of *Pygurus* Beds?). The Helvetic Kieselkalk Formation is well developed with characteristic colour changes to be analysed. Its top is marked by a sharp contact with the grey Tierwis Formation (equivalent of the Altmann Member?).

Only a maximum of 20 m of the lower Schrattenkalk is preserved beneath the unconformity onlapped by the upper Eocene quartzose sandstones and lithothamnid limestones. We here include these beds with the Sanetsch Formation (Menkveld-Gfeller,1994), based on lithologic similarities with the Diablerets and the Tsanfleuron Members of this formation. Preliminary examination of outcrops and thin sections revealed small nummulites resembling the Priabonian *Nummulites retiatus* Roveda, 1959, already mentioned by Herb (1988, p.635) in the Priabonian of the Doldenhorn nappe of the Kiental. Herb in Masson et al. (1980) mentions a level with *Cerithium* in the lower part of the Eocene beds at Rote Chumme. Thus, we favour the working hypothesis that only the lower members of the Sanetsch Formation are preserved beneath the overthrust of the Gellihorn nappe, between Lämmerensee and Rote Chumme. The Siderolithic Group is present in the underlying formations in paleo-karst pockets, which may present an internal stratigraphy (including *Microcodium*) to be investigated.

References

Bonvallet, L., Arnaud-Vanneau, A., Arnaud, H., Adatte, T., Spangenberg, J. E., Stein, M., Godet, A., Föllmi, K. B. (2019) Evolution of the Urgonian shallow-water carbonate platform on the Helvetic shelf during the late Early Cretaceous. Sedimentary Geology 387, 18–56.

Föllmi, K.B., Bodin, S., Godet, A., Linder, P., van de Schootbrugge, B. (2007) Unlocking paleoenvironmental information from Early Cretaceous shelf sediments in the Helvetic Alps: stratigraphy is the key! Swiss Journal of Geosciences 100, 349–369.

Furrer, H. (1962) Erläuterungen zum geologischen Atlas der Schweiz, Blatt: Gemmi, 1 :25'000. Schweizerische geologische Kommission.

Gansner, C. (2000) Geologische Untersuchungen im Gebiet Gemmipass-Lömmerenboden-LämmerenalpäKummen, Leukerbad Kanton Wallis. Diplomarbeit, Geologisches Institut ETH.

Herb, R. (1988) Eozäne Paläogeographie und Paläotektonik des Helvetikums. Eclogae geol. Helv. 81/3, 611-657.

Masson, H., Herb, R., Steck, A. (1980) Helvetic Alps of Western Switzerland. In: (Ed) R. Trümpy, Geology of Switzerland. part B. Basel. Wepf & Co. 109-135.

Menkveld-Gfeller, U. (1994) Die Wildstrubel-, die Hohgant- und die Sanetsch-Formation: Drei neue lithostratigraphische Einheiten des Eocaens der helvetischen Decken. *Eclogae Geol. Helv.*, 87: 789–809.

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Upper Jurassic - Eocene, Doldenhorn nappe, North-Helvetic

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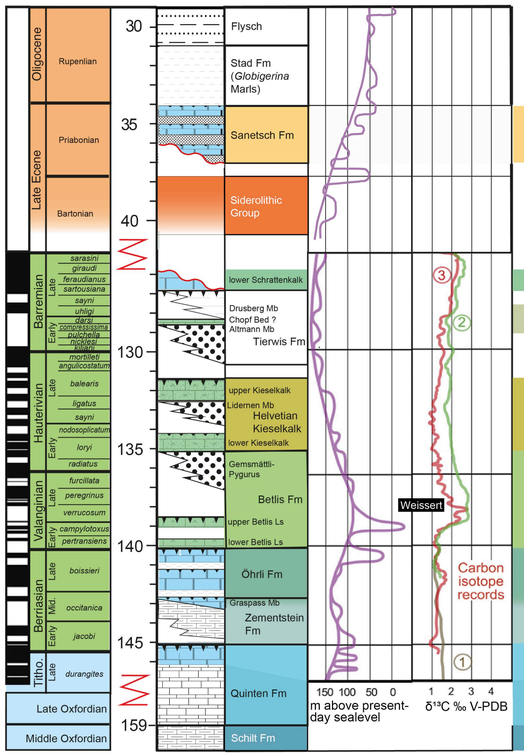

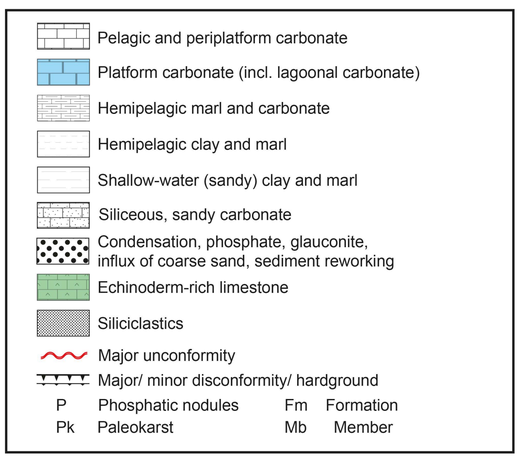

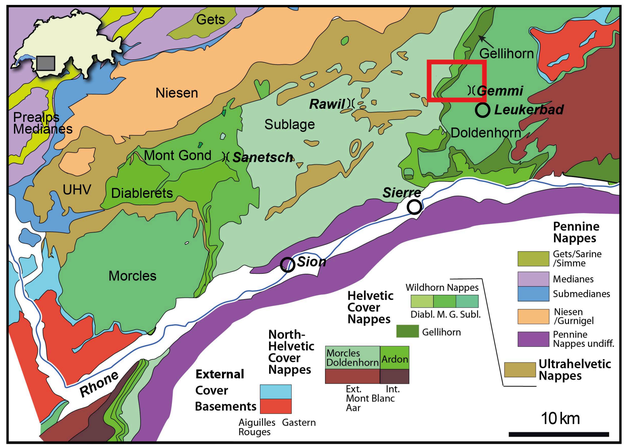

Mesozoic chronostratigraphy of the North-Helvetic realm modified after Föllmi et al. (2007), based on the biostratigraphy of the Helvetic nappes of central and eastern Switzerland. Stable isotopes by Föllmi (2012) based on 1) Weissert and Channell (1989), 2) Sprovieri et al. (2006); 3) Emmanuel and Renard (1993), Hennig et al. (1999), Van de Schootbrugge et al. (2000), Herrle et al. (2004), Godet et al. (2006) and Föllmi et al. (2006). Sealevel changes (m above present-day sea level) according to Haq et al. (1987).
Lithostratigraphy: Thicknesses of formations modified after Gansner (ETH Diploma 2000).
Lithologies: POB et al., Images: POB, CBM, JLE,SMS, and WWW. Texts POB et al.
Notes: The age of the formations is based on biostratigraphy mainly published form localities in central and eastern Switzerland with more fossils than those illustrated here, in particular ammonites characteristic of the ammonite zones (3rd column on the left). Each group is illustrated once, while it may exist in several formations, including different taxa.