

## RECCCE Excursion Day 2, Tuesday, April 28, 2009

### STOP 5 Cenomanian-Turonian at Rehkogelgraben/Hagenmühle (Upper Austria)

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Topic: hemipelagic sediments, black shales and the Cenomanian-Turonian transition, CORBs

Lithostratigraphic unit: "Buntmergelserie" (Upper Gosau Subgroup)

Age: upper part of *Gansserina gansseri* Zone, CC25b/ UC20a<sup>TP</sup>

Tectonic unit: Ultrahelvetic unit

Location: Outcrops in Rehkogelgraben creek

Coordinates: 013° 55' 30" E, 47° 56' 08" N

Specialities: black shales below water table (use rubber boots) and cyclicity including CORBs

References: Rögl in Kollmann & Summesberger (1982), Wagreich et al. (2008)

The Ultrahelvetic units of Austria are remnants of the European continental slope, lying between the Helvetic shelf in the north and the abyssal Rhenodanubian/Penninic Flysch basins, a part of the Alpine Tethys. The Rehkogelgraben section (Kollmann & Summesberger, 1982) belongs to an Ultrahelvetic slice within the Rhenodanubian Flysch Zone between Hagenmühle and Greisenbach, to the east of Gmunden (Upper Austria, Figure 10). The investigated Cenomanian-Turonian boundary section includes distinctive black shale horizons and a transition from black shales into marly limestones and red marls, which are typical for Ultrahelvetic sections in Upper Austria (Fig. 11). Strata within these tectonic windows have been traditionally attributed to the "Buntmergelserie", an informal lithostratigraphic unit comprising Aptian/Albian to Eocene pelagic and hemipelagic shales, marlstones, and marly limestones with rhythmic limestone and marl alterations. Upper to middle bathyal water depths have been inferred for the Ultrahelvetic units.

The section comprises a 5 m thick succession of Upper Cenomanian marl-limestone cycles overlain by a black shale interval composed of three black shale layers and carbonate-free claystones, followed by Lower Turonian white to light grey marly limestones with thin marl layers (Fig. 12). The main biostratigraphic events in the section are the last occurrence of *Rotalipora* and the first occurrences of the planktic foraminifer *Helvetoglobotruncana helvetica* and the nannofossil *Quadrum gartneri*. The thickest black shale horizon has a TOC content of about 5%, with predominantly marine organic matter of kerogen type II. Vitrinite reflectance and Rock-Eval parameter  $T_{\max}$  ( $< 424^{\circ}\text{C}$ ) indicate low maturity. HI values range from 261 to 362 mg HC/g TOC.  $\delta^{13}\text{C}$  values of bulk rock carbonates display the well documented positive shift around the black shale interval, allowing correlation of the Rehkogelgraben section with other sections such as the Global Boundary Stratotype Section and Point (GSSP) succession at Pueblo, USA. In the lower part of the section, values lie uniformly around 2.5 ‰ and show a slight decrease before the first small peak of 2.6 ‰, which is associated with the LO of the nannofossils *Lithraphidites acutus*. The first occurrence of the nannofossil *Eprolithus octopetalus*, above black shale 2, is associated with a second carbon isotope peak of up to 3.4 ‰, followed by a small peak below 3 ‰ immediately after last the increase in TOC, succeed by a final peak of 3 ‰. Towards the top of the section, values progressively decrease down to 2.7 ‰, but never reach values as low as in the Upper Cenomanian. Sedimentation rates at Rehkogelgraben (average 2.5 mm/ka) are significantly lower than those at Pueblo.

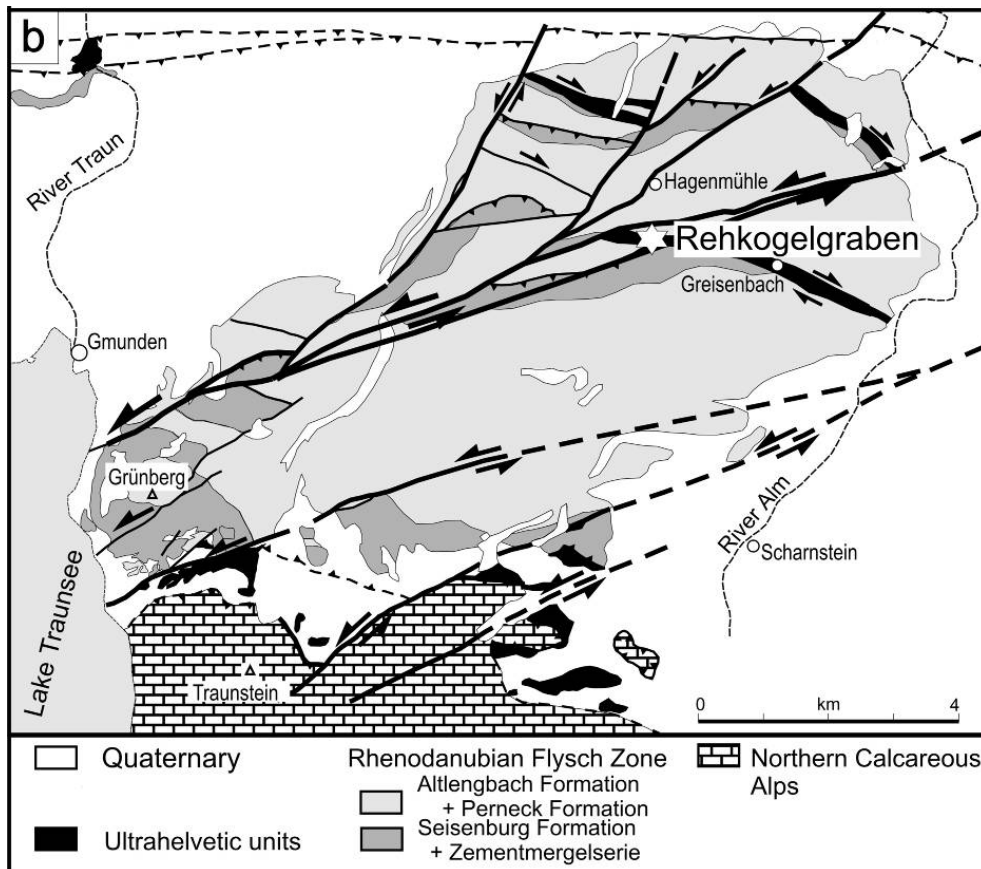


Fig. 10. Geological sketch map of the area east of Gmunden, including outcrop Rehkogelgraben.

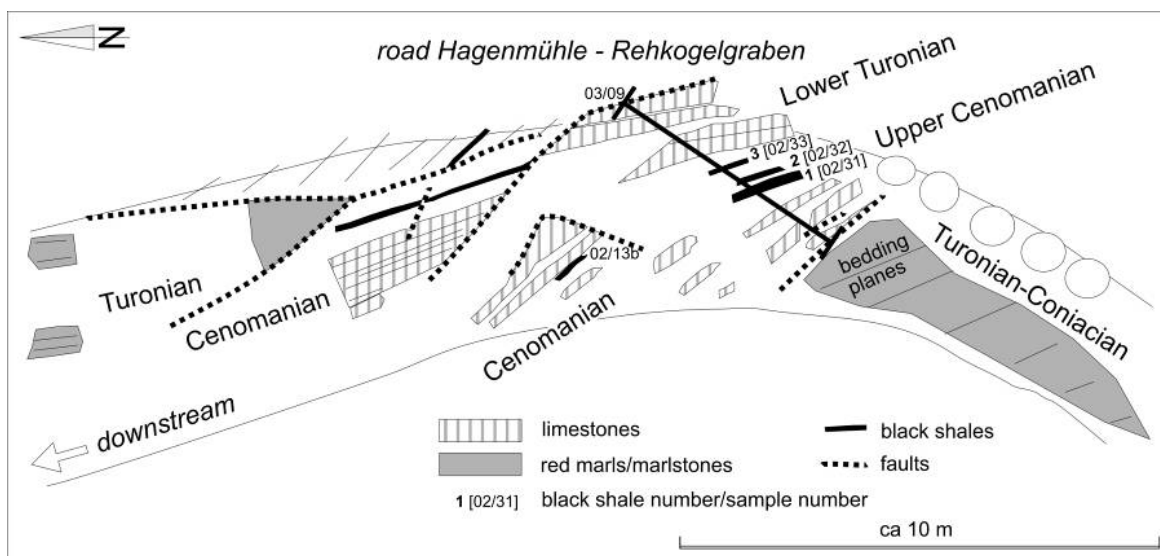


Fig. 11. Map view sketch of the Cenomanian-Turonian outcrop in the creek Rehkogelgraben.

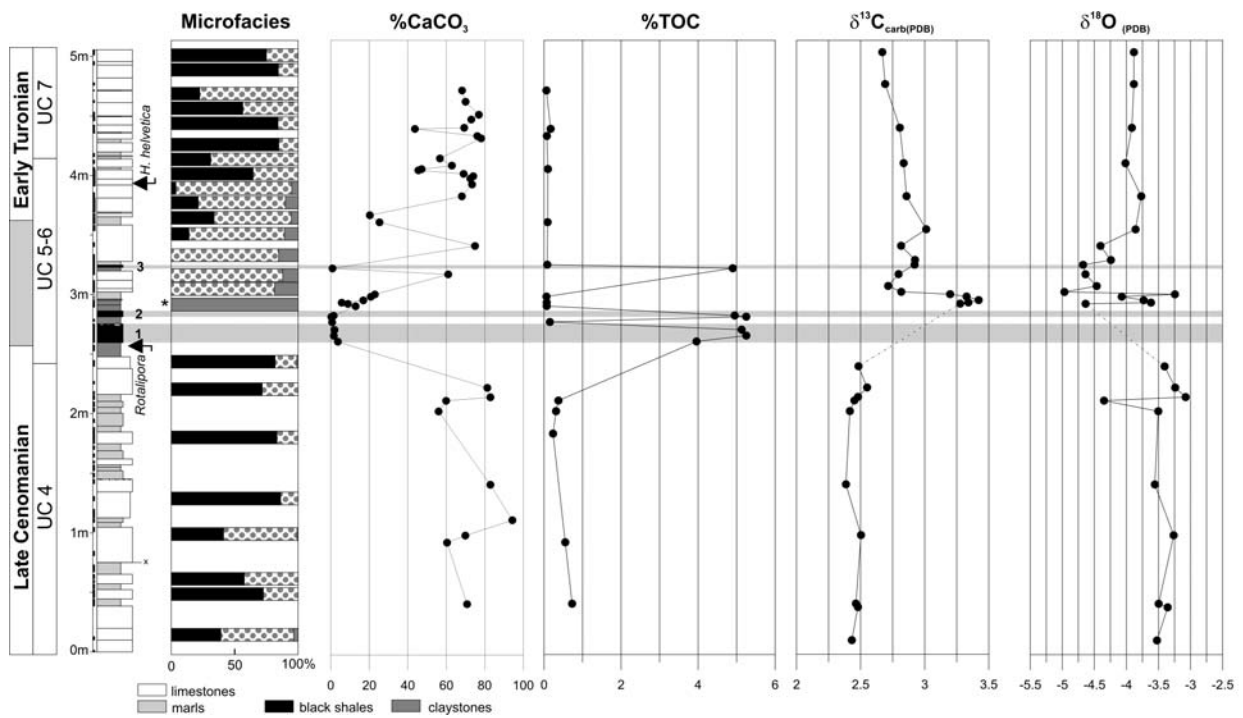


Fig. 12. Sedimentological log of the Rehkogelgraben Cenomanian-Turonian section, including microfacies data based on counts of planktonic foraminifera (black), calcispheres (stippled) and radiolaria (grey) in selected thin sections (except sample marked with \* which is a washed residue from a radiolaria-bearing claystone), carbonate and TOC contents, carbon and oxygen isotope values (Wagreich et al., 2008).