STOP 4 Mid-Maastrichtian ammonite site E of Haid

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Topic: Sedimentology and integrated stratigraphy in mid-Maastrichtian deposits
Lithostratigraphic unit: Nierental Formation (Upper Gosau Subgroup)
Age: upper part of *Gansserina gansseri* Zone, CC25b/ UC20a^{TP}
Tectonic unit: Untersberg nappe / Göller nappe (Tirolicum), NCA
Location: Outcrops along a forest road and creek northeast of Haid
Coordinates: 14° 51’ 35’’ E, 47° 40’ 00’’ N
Specialities: high-frequency turbidites through the Paleocene-Eocene boundary interval
References: Summesberger et al. (2009)

The investigated outcrop within the Nierental Formation exposes about 5 metres of thin and evenly bedded sandy/silty grey shales and marls with a few intercalations of coarse sandstones below 10 cm thickness. The beds are a few centimetres thick, the bedding planes are more or less even. Some bedding planes are coated by a rusty cover. Bioturbation is common, especially in the lower part of the outcrop. *Chondrites* is a typical trace fossil present at topmost parts of graded sandstone/ siltstone turbidite beds. Some bedding planes also show grazing traces by echinoids. Pelitic beds can be subdivided into soft sandy turbiditic shales and more indurated marls, which are interpreted as hemipelagic. The stratigraphic position of the cephalopod-bearing grey marl bed is below a 16 cm thick graded sandstone layer and thus is also interpreted as a hemipelagic, non-turbiditic layer.

Nannoplankton
The most important marker species recognized in the six samples is *Lithraphidites quadratus.* This species is rare to very rare (1 specimen in around 100 fields of view). The presence of *L. quadratus* in all the samples and the absence of *Micula murus* and *Nephrolithus frequens* allow the recognition of standard nannplankton zones CC25b (according to Sissingh, 1977; Perch-Nielsen, 1985) and UC20a^{TP} (Burnett, 1998). The presence of *Corollithion completum* further corroborates this assignement according to Burnett (1998). An early Late Maastrichtian age is interpreted in correlation to belemnite zonations (*tegulatus /junior* Subzone or younger; Burnett, 1998). Very rarely, Campanian to Lower Maastrichtian taxa such as *Broinsonia* and *Quadrum* are found, which are interpreted as reworked from older strata.

Planktonic Foraminifer
All 3 samples contain a similar foraminifera assemblage, mainly characterized by high amounts (>90 %) of planktic foraminifera. The most characteristic and stratigraphically important taxa present are: *Globotruncanita stuarti; Rosita contusa, Abathomphalus intermedius, Racemiguembelina intermedia.*
Globotruncanita stuarti and *Rosita contusa* are typical Maastrichtian species. *Abathomphalus intermedius* and *Racemiguembelina intermedia* both have a first occurrence higher up in the Maastrichtian, within the *Gansserina gansseri* Zone (Robaszynski & Caron, 1995). According to Robaszynski & Caron (1995) *Racemiguembelina fructicosa* occurs below the *Abathomphalus mayaroensis* Zone.
Thus, the samples can be attributed to the upper part of the *Gansserina gansseri* Zone, the *Contusotruncana contusa* (Sub-) Zone, within the upper part of the of the *Gansserina gansseri* Zone, just below the first occurrence of *Abathomphalus mayaroensis*. According to LI et al. (1999, 2000), based on data from El Kef/Tunisia, the assemblage with *Racemiguembelina* (*Pseudotextularia*) *intermedia and Rosita contusa* defines planktic zone CF5 (*Pseudotextularia intermedia* Zone).

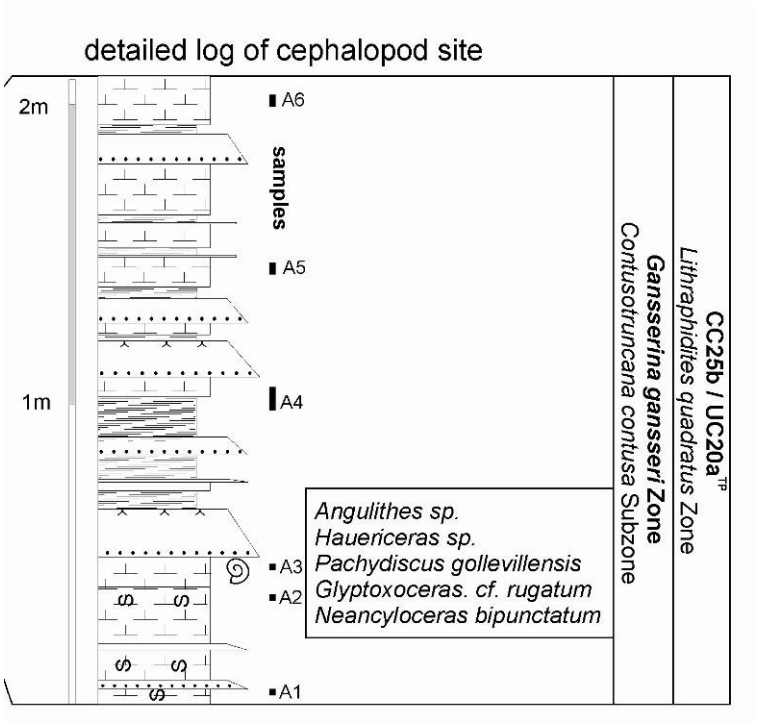

Fig. 9. Section of Stop 4 east of Haid (Summesberger et al., 2009).

Cephalopods and chronostratigraphic correlation

The most indicative ammonite taxon present is *Pachydiscus* (*P.*) *gollevillensis* (D'ORBIGNY, 1850), which ranges at Zumaya (Spain) from the upper part of the *Gansseri* Zone to the middle *Mayaroensis* Zone (Ward & Kennedy, 1993). In terms of ammonite zones this corresponds to the *Anapachydiscus fresvillensis* Zone, which is upper Lower Maastrichtian to lower Upper Maastrichtian. The L.O. level of *P.* (*P.*) *gollevillensis* at Zumaya is within the Upper Maastrichtian zones of *Anapachydiscus fresvillensis* and *Abathophalus mayaroensis* (Ward & Kennedy, 1993: fig. 5), and above the F.O. of *Lithraphidites quadratus* in the Biscay region (Burnett, et al. 1992), within nannofossil zone UC20 (Burnett, 1998). At Sopelana I (Spain) *P. gollevillensis* occurs about 50 m below the K/P boundary near the base of the *Mayaroensis* Zone (Ward & Kennedy, 1993), at Sopelana II (Spain; Ward & Kennedy 1993) it occurs about 50 m below K/P in the *Gansseri* Zone, at Hendaye (France, loc.cit., fig. 8) it ranges within the topmost Maastrichtian Zone of *Anapachydiscus terminus*. Its extinction level is about 10 m below K/P. At Bidart II (France, loc.cit., fig. 11) it occurs in the *Mayaroensis* Zone. Taken together all informations from the Bay of Biscay *P. gollevillensis* is mainly an Upper Maastrichtian species, appearing at the top of the upper Lower Maastrichtian *Gansseri* Zone.

Combining nannofossil (CC25b/UC20a^{TP}) and planktic foraminiferal data (upper part of *Gansserina gansseri* Zone, *Contusotruncana contusa* (Sub-) Zone, CF5 of Li et al., 1999; below the first occurrence of *Abathomphalus mayaroensis*) gives a more precise stratigraphic frame for the cephalopod fauna and allows correlation to other zonations, e.g. the boreal belemnite zonation of northern Europe. The first occurrence of *Lithraphidites quadratus* was recognized within the *Belemnitella junior* Zone of NW Germany, i.e. within the *tegulatus/junior* Subzone, the lowermost subzone of the Upper Maastrichtian. According to the absence of the nannofossil *Micula murus* in our samples, the age cannot be younger than the top of the *Belemnitella junior* Zone. Integrating foraminiferal data, especially the lack of *Abathomphalus mayaroensis*, leads to a correlation of the investigated cephalopod horizon with the interval from the base of the *Spyridoceramus tegulatus /Belemnitella junior* Subzone to the lower part of the *Tenuipteria argentea /Belemnitella junior* Subzone (Burnett, 1998 and TSCreator, www.stratigraphy.org).