Facies of Paleogene deep-water deposits of the Upper Gosau Subgroup at Gams (Styria, Austria)

Veronika Koukal, Michael Wagreich

University of Vienna, Department of Geodynamics and Sedimentology, Vienna, Austria; e-mail: veronika.koukal@univie.ac.at

The Gosau Group of Gams comprises deposits of late Turonian to Ypresian age, which rest unconformably upon Permian–Jurassic strata of Tirolian nappes (Northern Calcareous Alps, NCA). Several outcrops of the Nierental Formation (Upper Campanian–Selandian) and the Zwieselalm Formation (Maastrichtian–Ypresian) are exposed along Gamsbach creek and its tributary creeks in the eastern Gams basin.

Detailed sedimentological studies within the Upper Gosau Subgroup above the K/Pg were made, including bed-by bed measurements of sections. Additionally, heavy mineral, microprobe, thin-section and biostratigraphic nannoplankton analyses were conducted. Based on biostratigraphic data, a composite section was created for the investigated area. The four correlated facies assemblages are: 1) gray and red marls with thin turbidites; 2) carbonate-poor turbidites; 3) carbonate-rich turbidites; and 4) marl bearing turbidites.

The Danian section of the Nierental Formation (NP1–NP4) consists of hemipelagic to pelagic red and gray marls and marly limestones, intercalated with minor thin, normally graded, sandy and silty turbidite beds as well as slump beds and submarine debris flow deposits. Turbiditic sandstones are rich in carbonate and include redeposited material from NCA, bioclasts (foraminifera, corallinacea) are common. Debris flow deposits include also Paleocene limestones. Variable geometries (channel-fill, lenses) and textures (matrix- to clast-supported) of these mass transport complexes are present.

The basal part of the Zwieselalm Formation (NP5–NP12) is indicated by the first thick (>1 m) turbiditic sandstone bed. An interval (NP5–NP9) of carbonate-rich sandy and silty turbidites (*i.e.*, "classical turbidites"), gray marls and marly claystones changes into a carbonate-poor succession (NP9–NP10) of sandy and silty turbidites and claystones. Turbiditic shales are dark gray, only a few centimeters thick and mostly free from carbonate. The Paleocene/Eocene boundary interval is characterized by thin-bedded turbidites with russet to brown claystones, deposited below the calcite compensation depth (CCD). An interval (NP10–NP11) of turbiditic sandstones with higher carbonate contents follows, intercalated with gray, reddish and greenish marls. Towards the top of the Zwieselalm Formation (NP12), the thickness of fine-grained sandstone beds decreases.

Breccia layers at the base of turbidites and several slump beds are characteristics of the Zwieselalm Formation. Thicker sandstones show Bouma Ta-e sequences, more frequent thinner beds often only show Tcd sequences. Water escape structures, bioturbation and amalgamation of turbiditic sandstones are visible in all sections. Thinning- and fining-up cycles indicate small turbidite fans prograding into a confined slope basin.

Heavy mineral- and thin section analysis suggest a mixed siliciclastic-carbonate source from the rising metamorphic hinterland, the NCA and small contemporaneous carbonate platform areas. Material delivered from the south filled up a (partly) confined slope basin along the active margin of the Austroalpine microplate. Sedimentation rates for the Zwieselalm Formation are high, approximately 20 cm/kyr are estimated.