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New constraints for the late Oligocene to Early Miocene development of the eastern North Alpine Foreland Basin

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In this study, we discuss new stratigraphic constraints for the Upper Oligocene to Lower Miocene Zupfing, Puchkirchen and Hall Formations from three drill-sites in the North Alpine Foreland Basin (NAFB) of Upper Austria. Particular focus is given to the timing and extent of the Northern Slope Unconformity, a basin-wide erosional surface of unclear origin, and the Base Hall Unconformity, marking the top of the Puchkirchen Formation.

During the late Oligocene to Early Miocene, the Upper Austrian NAFB formed a deep-marine basin with water depths of 500 – 1500 m. The basin was confined by the Bohemian Massif in the North and the Alpine thrust front to the South, creating a steep and tectonically active southern basin slope and incorporating southern parts of the basin as “Imbricated Molasse” into the thrust belt. Sedimentation was strongly controlled by a sinuous, eastward-directed, basin-axial submarine channel, of 3-5 km width and >100 km length, that acted as a funnel for turbidity currents and debris flows.

The aim of this study is the improvement of the biostratigraphic and chemostratigraphic correlation of the upper Oligocene to Lower Miocene deposits of the Upper Austrian NAFB in order to constrain basin-wide erosional events more precisely. Furthermore, we attempt to correlate overbank sediments from the northern and southern slope. This correlation is hampered even using 3D seismic-reflection data, as the erosional surfaces bounding the submarine channel margins prevent north-to-south stratigraphic correlations.

We use multiple data sets, including a 3D seismic-reflection cube for stratigraphic correlations and unconformity determination, bulk δ13C-analysis, and biostratigraphic data from nannofossils as well as foraminifera on drill cuttings of three wells. One well is located on the northern basin slope and two on the southern basin slope in the overbank sediments of the Puchkirchen submarine channel belt.

Our results will enhance correlation of past erosion events and sedimentation patterns to Alpine tectonic events and relative sea-level change. The new data will allow the calculation of sedimentary budgets and sequence-stratigraphic analyses. Ultimately, the results will improve our understanding of the mechanisms driving the evolution of the eastern NAFB.