Rise and demise of the Paleo-Danube delta during the late Miocene (Vienna Basin, Austria)

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We present a detailed description of the depositional architecture of the Paleo-Danube delta in the Austrian part of the central Vienna Basin based on the integration of 3D seismic surveys and well-log data. The Paleo-Danube delta formed between c. 11.5–11.3 Ma as part of a 3rd order lowstand of Lake Pannon. The delta deposits are framed within two 4th order flooding surfaces, used as correlation horizons in the seismic interpretations. Morphologically, the delta is divided into a western part with a braided river delta plain and an eastern and southeastern part consisting of five distinct delta lobes, which are defined as Großengersdorf, Aderklaa, Markgrafneusiedl, Matzen and Zistersdorf lobes. Seismic architecture reveals consecutive onlaps of theses lobes, documenting that the lobes developed successively through time. The initial delta progradation was oriented in southern direction, roughly coinciding with the Aderklaa fault system. Subsequent lobes switched into eastern and northeastern directions and finally switched back into southern direction. Simultaneously, the point of origination of the lobes switched towards the northeast with the most prominent shift of 15 km occurring between the Markgrafneusiedl and the Matzen lobes. This channel migration was probably governed by a stepwise activity of the Pirawarth-Steinberg fault system. In total, the delta complex spreads over about 850 km^2. The geometry of the lobes, the steeply inclined clinoforms and the development of large beach ridge fields classify the delta as a river-dominated delta with strong influence of wave reworking, comparable to the modern Danube delta. The switch in geometry, from narrowly elongate of the initial lobe to broad lobate of subsequent lobes, suggests increasing influence of wave activity and a decrease in accommodation space. In-seismic measurements of clinoforms illustrate a drop of the relative lake level of about 80 m during deposition of the lobes. The size of the Paleo-Danube delta was about six times smaller than the Holocene to recent Danube delta in the Black Sea. The pace of delta progradation was distinctly slower and the rate of sediment accumulation was about 70 times smaller, indicating a considerably lower sediment load compared to that of the modern Danube. This observation is in line with the distinctly shorter and substantially smaller drainage system of the Paleo-Danube as compared to the extent of the modern Danube river drainage basin. After about 200 kyr, the Paleo-Danube delta was pushed back into the North Alpine Foreland Basin at around 11.3 Ma due to the strong 3rd order lake level rise of Lake Pannon, which culminated in the maximum extent of Lake Pannon during the middle Pannonian. The results are published in Borzi et al. (2022): Late Miocene Evolution of the Paleo-Danube Delta (Vienna Basin, Austria). – Global and Planetary Change, 103769. https://doi.org/10.1016/j.gloplacha.2022.103769