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Changes of water depth in Late Miocene Lake Pannon revisited: the end of an old legend

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The large Late Miocene Lake Pannon was a descendant of the Paratethys. The lake inherited a complicated collision- and rift-related bottom topography, which determined variations of subsidence rates and water depth of the individual subbasins. Lake water level was influenced by discharging rivers and precipitation, both controlled by climatic variations. Lake Pannon was surrounded by uplifting mountain chains providing abundant sedimentary influx both from Alpine and Carpathian source regions. This led to the progressive infill of the basin by fluvial-deltaic and turbiditic sediments dominantly from northwesterly (palaeo-Danube) and northeasterly directions (palaeo-Tisza). The variations in rate of progradation to aggradation of the delta-fed shelf-slope systems indicate that relative lake level also varied significantly both in space and time. The geometry of clinoforms can be used to determine the palaeo-water depth. Initial bottom topography and differential subsidence rates determined if "shallow-water" (200-400 m) or "deep-water" (700-900m) developed at certain parts of the basin. The high rate of subsidence coupled with the high rate of sediment input rates resulted in an excellent resolution of the startigraphic record, therefore former studies emphasized that both 3^{rd}, 4^{th} -order depositional sequences can be recognised. At the eastern part of the basin, where the most detailed studies were carried out so far, one of the most spectacular sequence boundaries at about 6.8 Ma was depicted by earlier authors who claimed that it separated the "deep-water" system from the overlying "shallow-water" one. In addition to the remarkable change in the height of the slope, onlaping slump deposits and turbidites at the former slope-toe were among the evidences to postulate a Messinian event.

In our study the same sections have been reinterpreted by using the advantages of the digital processing technology. Since the basin-fill succession was deformed by Late

Miocene, Pliocene to Quaternary tectonics it seemed to be neccesary to remove their effects. Therefore a series of snapshots were produced by flattening the seismic image to supposed palaeo-horizontals. The images clearly show, that when the shelf-slope system prograded above a half-graben, the virtual increase of the slope height and length occurred as a consequence of synsedimentary deformation at a basin margin listric fault. Afterwards aggradation and progradation continued at varying rates until a long wavelength synsedimentary folding of the whole area took place. The gradual uplift of the eastern and the ongoing subsidence of the western parts of the study area resulted in again a virtual growth of the slope height particularly along the limb of the fold. The water depth in this segment of Lake Pannon in reality did not changed significantly during these events, it remained in the range of about 4-500 m (un-decompacted thickness).

Based on the analyses of perpendicular sections it can be proved that the onlap surface dividing the virtually “deep-” and “shallow-water” settings, high and low slopes respectively, marks superposition of two distinct feeder systems having a 45^o degree difference in their direction of progradation.

These evidences indicate that there was no major lake level drop in the Late Miocene Lake Pannon at about 6.8? Ma, but synsedimentary deformation took place at various scale and duration. Retro-deformation of the basin fill succession is necessary to understand the interplay of sedimentation and tectonics.

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