



## **Estimation of the maximum Holocene water level of the Lake Balaton (Hungary) based on geomorphic maps and geodetic uplift rate indicators**

**G. Timár, B. Székely and G. Molnár**

Space Research Group, Institute of Geography and Earth Sciences, Eötvös University of Budapest, Hungary

(spacerg@sas.elte.hu / Fax: +36 1 3722927 / Phone: +36 1 2090555 6651)

The maximum extents of the Lake Balaton, the greatest lake in Central Europe, has been estimated by Lajos Lóczy, the famous researcher of the lake in the early 1900s. The lake today has an elongated, dominantly SW-NE directed shape determined by the typical strike of the main geological structures of the central part of the Pannonian Basin. Its present extent is thought to be considerably smaller than the Late Pleistocene/Holocene maximum. Lóczy mapped numerous coastal features at elevated position; these observations served later as data base for outlining the original extents of the lake. As the GIS technologies and the usage of digital elevation models became available, there were modern attempts to reconstruct the paleo-coastlines with this technology as well.

However, this way of reconstruction does not take into consideration the recent vertical crustal movements. The present elevation of the coastal features are not the same. We found evidence that the differential vertical uplift can be correlated with this difference. Consequently, we suggest that this discrepancy is mainly due to variations in the present uplift pattern.

Present geodetical measurements, namely repeated precise levellings, indicate that the northern coast of the lake has larger uplift rate than the southern one; the difference is as high as 0.5 mm/a, which, projecting to the past, results half meter elevation difference per thousand years between the two coasts. The maximum extent of the lake is thought to have happened 6000 years B.P., in the Atlantic period. Thus, 3-4 m

difference could be accounted for this reason.

To have a robust model, first the tilting angle is deduced from the present elevation of the former coastal points, so that this angle should reproject the present vertical position of the former coast to the same horizontal plane within the range of the estimation error. In the second step, either the recent differential uplift difference dataset, or the estimated age of the maximum extents phase of the lake can be used to deduce another vertical position to check the estimation of the other data.

The research was supported by the Ministry of Informatics and Communication and the Hungarian Space Office project TP277, and also by the National Research Fund, projects OTKA TS44765, T47104 and T43666.