Tree rings, precipitation and lake level fluctuations, 261-year long history at Balaton, Hungary

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Balaton Highlands has a very special microclimate within the Carpathian Basin On the one hand the largest lake of Central Europe individualize the microclimate in the vicinity of it. On the other hand the runoff water is an important factor from the viewpoint of water balance of lake Balaton.

We collected 27 cores from 15 oak trees (13 *Quercus petrea*, 2 *Q. pubescens*) at 3 sites investigating if any evidence of this microclimatic effect is discernible in the trees of Balaton Highlands. Ringwidth series of these samples developed the Balaton Oak Chronology (BOC) which significantly differs both from oak chronology of Eastern Austria and the Central Hungarian Oak Chronology.

After twenty-one successfully dated timber samples (from four old buildings of Vöröstó and Vigántpetend villages) the BOC spans 1731-2003.

COFECHA program was applied to the ring width data set, to perform a statistical verification, the correlation analysis on intercalated subperiods, and to test the reliability of dating. The raw ringwidth series were detrended aiming to maximize the signal-to-noise ratio. The values were transformed to logarithms before standardization in order to stabilizing the variance. Individual indices were calculated as ratio and the stand average as biwieght robust mean. Finally, the index series covers the 1742-2003 period and we used this series during further investigations.

Monthly precipitation data were available from the two nearest meteorological station Nagyvázsony (1901-1987) and Mencshely (1960-1990). From monthly values

of precipitation we calculated percentages dividing the measured values by the mean monthly values of 1961-1990.

Response function analysis revealed positive correlation, exceeding the 95% significance, between ringwidth indices both May and June precipitation. Correlation coefficient between the averaged May-June precipitation index for the period of 1901-1990 and ringwidth index is 0.575.

The linear regression developed the $y = 0.0022x - 1.1628$ transfer function, explained variance by the linear regression is 33.15 %.

We have also compared the treering indices to fluctuation of mean lake level of Balaton. For the period of 1921-2003 we have found positive correlation (0.395). After we corrected the raw lake level series by the annual amount of water sluiced through the floodgate of Sió. The correlation coefficients have been significantly increased (0.484). As the water budget of this shallow lake strongly depends on climate we suggest that the oak ringwidth series will be a valuable proxy in reconstruction of natural lake level changes.