

WHAT CAN DIATOMS TELL US ABOUT WETLANDS AND RIVER DYNAMICS?

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Can diatoms archived in sediments provide insight into past flood variability? Rivers do not accumulate sediments useful for paleolimnological analysis, but sediments from floodplain lakes (cut-off meanders) might allow inferences of river dynamic. Sediments from upstream get deposited on the floodplain during seasonal recurring inundations. This deposition of sediments has the consequence that the older cut-off meanders are at a higher elevation and have less contact with the river compared to the younger lower elevated lakes, are less frequently inundated and differ in their diatom communities.

This talk presents results of a NSF funded project following the 2008 100-year flood of the lower White River, a tributary to the lower Mississippi in SE Arkansas in the Arkansas Delta. Within the Lower White River National Wildlife Refuge, the annual duration of inundation of the around 400 floodplain lakes ranges from several weeks to several months. In order to develop a quantitative diatom-inference model for river connectivity, surface sediment and water samples were collected from 30 lakes along a gradient from 0 to 6 m height above the Lower White River in spring and summer 2008. Subfossil diatoms were analyzed from the top centimeter of the 30 surface sediments and one of the cores (Adams Bayou). Multivariate statistics revealed that lake height above river bank explained most of the spatial distribution of diatoms and was not correlated to nutrients. Diatoms might have responded to lake level change or might have been transported from the river into the lake. This species-environment relationship allows the development of a diatom-inference model to reconstruct past floods from diatoms archived in floodplain lake sediments. The weighted averaging partial least square (WA-PLS) diatom inference model with two components for height difference between lake and river had a root mean square error of estimation (RMSE) of 51 cm and the jack-knifed root mean square error of prediction (RMSEP) was 108 cm. This high ratio between RMSE to RMSEP shows the need to increase the number of samples in order to increase the robustness of the diatom inference model.

Next to recurring inundation, groundwater depletion and the use of fertilizer seems to be a major factor influencing the floodplain lakes, as the Arkansas Delta is the main rice producing area in the United States. In order to study water quality changes over time, the sub fossil diatoms archived in a sediment core from Adams Bayou central to the hardwood bottom forest at the lower White River were analyzed and compared to recorded groundwater levels. A shift from the epiphytic diatom *Gomphonema parvum* indicating macrophytes to planktonic *Aulacoseira species* was statistically related to the decline of the groundwater level, suggesting that decreased groundwater recharge of the lake might have led to eutrophication and resulted in accelerated sediment infill of these floodplain lakes valued for their ecosystem services.

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