

Identification of temporal and small-scale spatial variations of phosphate concentration in the near-shore groundwater of an oligotrophic lake

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Lake Stechlin is one of the last oligotrophic lakes in the German North-Eastern Lake District. In recent years there was some worry over a small but continuous increase of phosphate concentrations in the open water body. The reasons remain unclear. Since the lake obtains its water only from groundwater and precipitation there is the assumption that the former can be a significant source of phosphate inputs into the lake. In the present study, three different groundwater sampling settings on different scales in time and space were used to investigate the phosphate concentration in the near-shore groundwater. A multi-level sampling grid of twelve samplers and 60 sampling ports was installed to study the temporal small-scale fluctuations of P concentration in the groundwater and the interstitial water. Furthermore, a one-time sampling campaign of shallow near-shore groundwater was conducted every 500 m along the lake shore. Additionally, nests of permanent groundwater wells were sampled monthly for one year to identify concentration patterns in the deeper aquifer. The results indicate a large spatial and small temporal heterogeneity of P concentrations. The range of P concentration is < 0.01 mg/l up to 0.2 mg/l. There was no significant increase of P concentrations downstream of the small near-shore village Neuglobsow. Since the groundwater catchment belongs since 1938 to a natural protected area other anthropogenic impacts are quite unlikely. Hence, the main source for phosphate is probably the decomposition of naturally present organic material under anaerobic and warm conditions.