EGU21-12509
https://doi.org/10.5194/egusphere-egu21-12509
EGU General Assembly 2021

Investigating the effectiveness of bubble-plume destratification systems in a temperate, shallow, drinking water reservoir

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Thermal destratification of lakes and reservoirs is a primary control on dissolved-oxygen levels below the thermocline. In such waterbodies, internal biogeochemical processes are often controlled by a complex set of oxygen-controlled forcing mechanisms. Therefore, preventing stratification by artificial processes has long been an important tool in maintaining dissolved oxygen concentrations and corresponding water quality and ecosystem health in drinking water reservoirs. Blagdon Lake in Somerset, SW England is a medium-size (1.8km^2), shallow depth (max: 13.1m) drinking water reservoir. An extensive 6-month field campaign was undertaken in the summer of 2019 at the reservoir, measuring depth profiles of dissolved oxygen, turbidity, conductivity, temperature and pH using an EXO3 multiparameter sonde and a CastAway® CTD. In addition, two thermistor chains were permanently installed measuring temperature and dissolved oxygen concentrations using Onset TidbiT v2 loggers (1m depth intervals) through the water column at 30-minute temporal resolution and a miniDOT oxygen logger at the sediment-water interface respectively. These thermistor chains collected data from summer 2019 – autumn 2020. The data from this field campaign were analysed to investigate the effectiveness of the installed bubble-plume destratification system present at Blagdon Lake, SW England. Similar systems are used in 66% of UK reservoirs employing artificial mixing infrastructure, though very little has been published evaluating their effectiveness in such temperate, shallow, drinking water reservoirs. Initial analysis of the results indicates that the bubble-plume system, nor wind shear is effectively preventing spring/summer destratification for long periods, and that neither are the main factor controlling thermal stratification in Blagdon Lake. The data provides a unique opportunity to directly assess the impact of bubble-plume aerators and their effectiveness at thermal destratification to control dissolved oxygen and water quality in temperate, shallow water bodies.