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Physical and chemical consequences of artificiall deepened thermocline in a small humic lake – a p whole-lake climate change experiment

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Abstract. Climate change with higher air temperatures and change cloud cover, radiation and wind speed alters the heat balance and stratification patterns of lakes. A paired whole-lake thermocline manipulation experiment of a small (0.047 km^2) shallow dystrophic (Halsjärvi) was carried out in southern Finland. A thermodynamic m (MyLake) was used for both predicting the impacts of climate chan scenarios and for determining the manipulation target of the exper The model simulations assuming several climate change scenarios indicated large increases in the whole-lake monthly mean tempera (+1.4–4.4 °C in April–October for the A2 scenario), and shortening length of the ice covered period by 56–89 days. The thermocline manipulation resulted in large changes in the thermodynamic prop the lake, and those were rather well consistent with the simulated increases in the heat content during the summer-autumn season. manipulation also resulted in changes in the oxygen stratification, expansion of the oxic water layer increased the spatial extent of tl sediment surface oxic-anoxic interfaces. In addition, the experimer affected several other chemical constituents; concentrations of org carbon, TotN, and NH_4 showed a statistically significant decrease, l due to both changes in hydrological conditions during the experim period and increased decomposition and sedimentation. In compar with the results of a similar whole-lake manipulation experiment in oligotrophic, clear-watered lake in Norway, it is evident that shallo dystrophic lakes, common in the boreal region, are more sensitive physical perturbations. This means that projected climate change r modify their physical and chemical conditions in the future.

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