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Evaporation suppression from water reservoirs using floating covers – preliminary results from field experiments

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The increase in fresh water storage needs to mitigate seasonal water shortages induced by precipitation variability, drier climate and expansion of irrigated land requires measures to reduce evaporative losses from reservoirs. A cost-effective and scalable method uses self-assembling floating covers to reduce evaporating surface and alter surface energy balance. Theoretical estimates and small scale lab experiments suggest that 70-90 % of open water surface evaporation could be suppressed by such floating covers. Yet, experimental verification of suppression efficiency under natural conditions remains limited. In the fall of 2017 we launched a field experiments using 2 banks of 4 ponds each 14 m2 and 1.5 m deep (at EAWAG facility neat Zurich, Switzerland) to systematically study evaporation suppression by comparing evaporation rates and energy balance for covered and uncovered (control) ponds. We have used 200 mm disks of 15 mm thick PEVA foam in black and white (to evaluate radiative properties of the cover). Three ponds were covered with black and three with white disks all with maximum cover fraction of 90% (two control ponds remained uncovered). The ponds were instrumented with water level pressure transducers (to monitor evaporation rates), six temperature sensors, heat flux plates at the bottom, and ambient radiation, air temperature, wind and rainfall at the site were monitored. Preliminary results show different thermal regimes and evaporation rates from covered and uncovered ponds, but very similar responses for the “black” and “white” ponds. For the low evaporation rates at the late fall, evaporation suppression efficiency was smaller than the expected 70-90% obtained in the lab; in some conditions we observed higher evaporation rates for black covers than from uncovered ponds (for evaporation rates below 1 mm/day). These surprising findings suggest complex interactions with cover surface energy balance under cool temperatures and require verification for summer conditions (more representative of periods where water storage is often needed).