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Floating covers for evaporation suppression from small reservoirs - global survey of feasibility and water saving potential

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The practice of water storage in arid regions dates back to the dawn of civilization and is likely to expand with projected climate variability and increasing demand for irrigation water. The main challenge for surface storage is evaporation losses, we seek to provide a socio-economical and feasibility context for evaporation suppression potential using floating covers focusing on small size reservoirs (often $<$1000 m^2). Available global databases ignore on-farm reservoirs ($<$0.1 km^3), we thus analysed high-resolution imagery to quantify size-number of reservoirs in regions that are arid and receive at least 300 mm of rain annually. We selected 9 areas in arid regions with different socio economical levels and employed stratified sampling of 10% of the region using 10x10 km quadrants to identify water bodies (with area 100 to 100,000 m^2). We use normalized water index from surface reflectance of multispectral Sentinel-2 satellite imagery (10 m pixel size) acquired shortly after the wet season. We identified reservoir densities in range of 5 and 250 reservoirs per 100 km^2 with power-law density distributions similar to natural inland lakes. We estimate a total 14x10^{6}reservoirs globally within these climatic regions with seasonal storage equivalence of a few mm. We use climatic information and evaporation suppression efficiency from our lab and field studies to estimate seasonal storage and evaporation losses. The mean evaporation suppression efficiency of a full floating cover is about 0.75 (i.e., losses are 25% of values from uncovered reservoirs). We will present regional analyses to delineate economic feasibility and water saving potential that consider availability of alternate water sources (desalination).