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Effects of large macropores on soil evaporation in salt marshes

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The occurrence of macropores in salt marsh sediments is a natural and ubiquitous phenomenon. Although they are widely assumed to significantly affect water flow in salt marshes, the effects are not well understood. We conducted physical laboratory experiments and numerical simulations to examine the impact of macropores on soil evaporation. Soil columns packed with either sand or clay and with or without macropores were set up with water tables in the columns set at different levels. A high potential evaporation rate was induced by infrared light and a fan. The results showed that in the soil with a low saturated hydraulic conductivity (and thus a low transport capacity), macropores behaved as preferential flow paths, delivering water from the groundwater towards the soil surface and maintaining a high evaporation rate in comparison with the soil without macropores. This effect was more pronounced for sediments with lower hydraulic conductivities and shallower groundwater tables. These results not only improve our understanding of water flow and soil conditions in salt marshes but also shed light on soil evaporation in other hydrological systems.