Experimental investigation of evaporation and condensation in sandy soils under simulated arid conditions

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Abstract The diurnal cyclic process of evaporation and condensation in bare soils in arid and semi-arid areas was explored experimentally in laboratory sand columns under controlled meteorological conditions of periodic step-wise variation of humidity and solar radiation to simulate daytime and night-time conditions. The materials used were a dune sand and a silica sand; for the former an initially dry condition was set and for the latter a fixed water table with NaCl solution at high concentration was set. During the experiments measurements of water vapour density in pore volumes and column weights were used to determine the behaviour of the evaporation–condensation front in the drying stage (daytime) and wetting stage (night-time). Vapour movement caused by phase changes and development of solute accumulation in the sand column are discussed.

Key words arid area; evaporation-condensation; sand column experiment; simulated periodically varying atmospheric condition; salinisation