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Evaporation out of a 2D model soil BERTRAND SELVA, REMI DREYFUS, Complex Assemblies of Soft Matter, CNRS-Rhodia-UPenn UMI 3254, Bristol, Pennsylvania 19007, USA — Our goal is to improve our understanding of water transport in the soil-plant-atmosphere continuum. For this purpose, we focus on water losses due to evaporation at the soil surface. Such losses are known to be important at places where plants do not entirely cover the surface. Our model soil is a 2D porous medium with controlled wettability and humidity. It has been reported that evaporation is characterized by three stages: a first stage with a strong and constant evaporation flux, a second stage where mass transfer is dominated by diffusion mechanisms, and a third stage that occurs when the medium is almost empty. Here we focus on the first two stages and the transition between them which occurs when an intermediate unsaturated zone has reached its maximum width. This width strongly depends on the wettability distribution of the porous medium. In our experiments, we have explored a regime where gravity effects and capillary forces have similar contributions. In this particular regime we found that the first stage is characterized by a continuously decreasing evaporation flux and the second stage by usual diffusion transfer mechanisms. In order to understand this behavior, we have developed a model which allows us to predict the transition between the two stages and which is in agreement with the decreasing values of the first stage evaporation flux.

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