NaCl Salt Crust Dynamics Diagram

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Résumé

The impact of salt crust formation on water evaporation from a porous medium is an important issue in relation with the water cycle, agriculture, building sciences and more. Salt crusts have been found to have great impact on the evaporation rates of porous media as well as to show big morphological changes. These changes can be seen in nature and in laboratory experiments. One here can mention doming (1), impressive recurring patterns as seen in salt deserts (Uyuni in Bolivia) while usually in laboratory experiments, they are split in uniform or cauliflower type crusts. This type of uniform and cauliflower crusts have been previously related to the initial pore size of the supporting porous media. The study shows that this support porous media is not needed in order to obtain the changes in its structure. Here it can be seen that salt crusts are not a simple accumulation of salt crystals at the porous medium surface, in the form of efflorescence, but undergo complex dynamics. These types of dynamics present a point of interest in the scientific community as they are still not fully understood. The work shows that by manipulating the saturation of a salt crust the topology of the crust can change dramatically. We report on the experiments from (2)–(4) in the form of a study that allows the identification of various crust evolution regimes depending on the competition between evaporation and vapor condensation. All the preformed experiments are done in Hele-Shaw cells. This technique allows for observations to be made directly on suspended salt crusts that have been previously detached from a porous media. The full spectrum of the various regimes is summarized in a NaCl salt crust dynamics diagram. These findings provide in-depth insights into the salt crust dynamics while showing how one can change between different morphologies by modifying key factors. This new data paves the way for the better understanding of the efflorescent salt crusts impact on evaporation and the factors leading to its final forms.

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