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MODELLING OF FREEZING AND THAWING EXPERIMENTS OF SATURATED SAND COLUMN

Thursday, 2 June 2022 10:10 (1h 10m)

Freezing and thawing experiments were carried out in the laboratory on fully saturated sand sample (15 cm in diameter and 20 cm in height). The column sand, packed into the PVC container, was well insulated by foam materials at the bottom and on sides, whereas the top of the sample was covered by a stainless steel plate to allow the heat flux between the sand and the ambient environment in the climatic chamber. The freezing-thawing cycle started by equilibrating the sample temperature at $+10^{\circ}\text{C}$ then the temperature inside the climatic chamber was changed -10°C . The freezing-thawing cycle was repeated 4 times. The inner temperature of sand sample was monitored in three depths by thin temperature sensors horizontally inserted into the sample at three depths.

The experiment aims to provide information on freezing dynamics and thermal changes during the freezing and thawing cycles. Temperatures inside the sample achieved 9.6°C before freezing and were stabilized around 0°C after 12 hours. The same behavior was monitored within thawing cycle. The data were compared with simulations obtained by a numerical model. The model is based on the heat balance within the sample assembly and a modified heat equation for the porous medium temperature allowing for the phase transition below the freezing point depression. The comparisons of the thermal behavior show good agreements both in quantitative and qualitative sense.

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Czech Republic

References

Time Block Preference

Time Block B (14:00-17:00 CET)

Participation

In person

Primary authors: SOBOTKOVA, Martina; Dr ZAK , Alexandr; Dr SNEHOTA, Michal; Prof. BENES, Michal

Presenter: SOBOTKOVA, Martina

Session Classification: Poster

Track Classification: (MS17) Thermal Processes, Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales