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Ground heat transfer: A numerical simulation of a full-scale experiment

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Abstract

A numerical simulation of ground-heat transfer adjacent to an experimental earthâ€“contact structure is presented. In particular, a two-dimensional time-dependent simulation is compared directly to data measured from an experimental site over a one year period. Determination of representative thermal properties for the materials involved is explored in some detail. Indirect methods of estimating thermal conductivity and volumetric heat capacity have been described and employed. The results show good correlation between the simulated and measured thermal response. The work is viewed as a useful contribution to the overall drive to validate earthâ€“contact simulation. However, difficulties in determining realistic initial conditions when attempting to model field conditions still remain a challenge. Further exploration of material property variations throughout the full range of climatic conditions is also needed.

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Keywords

Heat transfer; Ground; Energy efficiency; Buildings; Simulation; Field measurement

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