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Effective heat conductivity of snow and snow microstructure

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A model for the effective heat conductivity of an anisotropic porous medium that includes solid–gas phase transitions is presented. The model satisfactorily reproduces the experimentally observed temporal change of the effective heat conductivity of snow caused by snow recrystallization (metamorphism). The input parameters for the model are snow porosity, temperature and internal geometry of snow, which is revealed by computed microtomography. The internal geometry is parameterized by Structure Model Index, Mean Intersept Length anisotropy and the Specific Surface Area. The model suggests that 15–30% of the effective heat conductivity is due to the latent heat released and absorbed during phase changes, and that there is a sensitive dependence of the effective heat conductivity on snow microstructure.