

COMBINED HEAT TRANSFER IN A SNOWPACK HEATED BY SOLAR RADIATION

Leonid A. Dombrovsky^{1*}, Alexander A. Kokhanovsky², and Jaona H. Randrianalisoa³

¹ Joint Institute for High Temperatures, 17A Krasnokazarmennaya St., Moscow, 111116, Russia

²VITROCISSET Belgium SPRL, Bratustrasse 7, Darmstadt, D-64293, Germany

³ GRESPI Lab., the University of Reims, Champagne–Ardenne, 51687 Reims Cedex 2, France

ABSTRACT A complete computational model for radiative-conductive heat transfer in a semi-transparent snowpack is developed. The model includes the geometrical optics approximation for ice grains of snow, the two-flux model for radiative transfer, and solution to transient energy equation including possible snow melting. Time variation of irradiation conditions from the Sun and clear sky during several days is taken into account. The effects of both the convective heat transfer and mid-infrared radiative cooling at the snowpack surface are considered. It is shown that thermal processes are not located near the snow surface only. The calculations show an accumulation of heat and possible snow melting in rather deep layers of a snowpack.