TEMPERATURE-GRADIENT METAMORPHISM

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Cylindrical snow samples (2.5 X 10^5 mm^3) were collected at a study plot in the Sunshine Ski Area (elev. 2200 m), Banff National Park, and transported in snow-fuled insulated boxes to a refrigerated laboratory in Canmore, Alberta. Each sample was weighed to determine its density, and then split into three smaller cylindrical disks (25 mm thick X 50 mm diameter). One snow disk was immersed in super cooled dimethyl phthalate and frozen solid. A plane section through the solid disk was microtomed, dyed, polished, and photographed using incident reflected light. The second snow disk was disaggregated into grains which were photographed using transmitted polarized light. The third snow disk was sealed in a small plexiglass container and then subjected to temperature-gradients up to 2000°*Clm* across the disk thickness (25 mm). After 100 hours the snow disk was removed from the container and the metamorphosed snow was photographed as a polished section and as a collection of disaggregated grains.

Our results matched Akitaya's classification of temperature gradient morphologies. Snow of high porosity metamorphosed toward a loosely connected skeleton of "stepped" and "cup-like" grains, whereas low porosity snow metamorphosed toward a strong, crusty texture of interconnected fibers without the expected stepped and cup-like morphology. In all cases, the temperature-gradient boundary conditions altered drastically the initial crystal morphology by redistributing the ice throughout the pore space.