GRAIN GROWTH IN SNOW WITH A TEMPERATURE GRADIENT

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When a temperature gradient is imposed on a snow cover, a vapor pressure gradient arises as well. The resulting vapor flow among particles causes grain growth. The vapor flow and grain growth are described in a multiparticle system using a statistical description of the snow.

The calculation of grain growth for a given temperature gradient does not, in itself, adequately describe snow metamorphism. At large temperature gradients when supersaturations exceed the critical supersaturation for the onset of dislocation-aided crystal growth, depth hoar crystals grow. At lesser temperature gradients where lower supersaturations arise, the equilibrium forms of snow crystals evolve (at higher temperatures these are well rounded). A series of experiments on the growth of single crystals in the laboratory has identified the critical supersaturation at which dislocation-aided growth begins. Thus the growth of both rounded and faceted crystals in snow can be quantified and explained.