Detailed snow-pack modelling and its application to snow-cover monitoring, hydrology, road meteorology and climate

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Snow as a medium experiences unique physical properties which can change very rapidly, often over a range larger than one order of magnitude. Its relatively low thermal conductivity and heat capacity involve very rapid changes of its surface temperature, which affect the surface energy balance and hence the atmospheric boundary layer.
Ice crystals metamorphism is a key process controlling snow albedo. It is a main source of positive feed-back in the climate system.
Physically-based detailed numerical snow models, like Crocus, have been developed since a few decades. The main features of Crocus will be presented. Its performance made possible its use for a wide range of applications which will be presented: snowcover monitoring for operational avalanche forecast, assessment of the impact of climate change on snow climatology and hydrological resources, study on snow deposition over roads.

Snow parameterizations in meteorological and climate models are still relatively simple. Increasing their complexity is a very challenging open issue, especially over forest areas. An ongoing IPY project on the assimilation of IASI observations over the Antarctic plateau will be invoked to demonstrate potential improvements of the simulation of snow surface temperature in NWP models.