Avalanche forecasting during heavy snowfall winter using SNOWPACK model

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In 2005/2006 winter, along the sea of Japan had record-breaking snowfall. One of the heavy snowfall area, Tunan, Niigata-prefecture, Japan had snow more than 4m in depth. A national road, route 405 was closed because of avalanche risk. In this study, avalanche forecasting was carried out around route 405 using SNOWPACK model. AMEDAS (Automated Meteorological Data Acquisition System operated by the Japan Meteorological Agency) data at Tunan was used as input data. Since Japanese snow was wet and heavy comparing to European and Canadian snow, empirical equations for the shear strength of Japanese snow (Yamanoi and Endo (2002), Abe et al. (2005)) were incorporated. 10m mesh Digital Elevation Model was used in order to take into account the topographic effect. SNOWPACK ran at each mesh considering the distribution of air temperature, wind speed and shortwave radiation, and stability index maps were made every day.

Calculated snow layer structures were compared with snow pit observations at the meteorological station from January to March. Calculations agreed roughly well with the observations.

Many avalanches occurred around route 405 this winter. One of the avalanche caused a disaster in which was that a car was push away from the road into valley on 24th, December. Snow depth had increased about 70cm within 24 hours, and it caused a large load before densification. Thus, the snow stability became unstable, and it was reproduced in SNOWPACK model as well, stability index maps showed that most of slopes were dangerous on that day.