

Location of automatic measuring stations for estimating the snow pack

Enterprise

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Reference

An article on kriging is available on the problems page and can be downloaded.

Abstract

The water equivalent of snow represents around 30% of the Hydro-Québec network hydraulicity, and actually in northern basins its contribution is higher than 30%. It is vital to obtain an accurate measure of this water equivalent because good water management enhances the security of the infrastructure and that of citizens, and provides the company with substantial benefits. In order to optimize the management of its catchment areas, Hydro-Québec measures the snow on the ground at 76 locations once a month between January and March and twice a month in the snowmelt season. The data it collects, however, is patchy, and does not provide an accurate picture for all periods and all areas. A probabilistic approach based on kriging is used to estimate the snow distribution on the whole Québec territory.

Although the kriging method yields good results, it requires that sufficient data be obtained within a relatively short period of time. In practice, the conditions required for estimating the distribution of snow are not always met. For instance, the collection of data within the catchment area of the La Grande river takes place over a period of two weeks. For logistics and security reasons, one cannot measure the snow at all the sites during the chosen periods; because of this, the snow pack estimate is not as precise as it should be. The installation of automatic measuring stations would enable Hydro-Québec to collect data on the snow pack and minimize the loss of precision when estimating the extent of the snow fields.

In a pilot project, automatic measuring stations will be installed in the La Grande river catchment area. This area was chosen on account of its size and lack of accessibility. Choosing the station sites appropriately is of the utmost importance for Hydro-Québec, since it will allow the company to minimize the error when estimating the extent of the snow fields within the La Grande river territory. Several constraints must be taken into account

when choosing the sites: a station cannot be located on a lake, a river, a rough mountainous area, or an area of dense vegetation. The location of power lines, roads, and existing snowlines must also be considered.