

Submitted Abstract

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Abstract

The seasonal snow cover in high-mountain Asia is an important source of melt water for domestic use, irrigation and hydropower production, especially in the long dryer season after the 3-4 month long monsoon rain period has passed. At the same time, snow cover can also be a cause of disasters, such as avalanches and slush flows. Thus, there is a great demand for up-to-date information on the snow conditions and water discharge in the rivers in the remote Himalayan environment.

In our study we combine a snow mapping model (seNorge) and a hydrological model for two pilot study catchments remotely located in the Nepal Himalayas in the Langtang and Mustang regions. We set-up and couple snow mapping and streamflow forecasting systems, which together can give estimates of the current status as well as medium- and long-range prognosis on expected snow conditions and water discharge in these two catchments. This type of information may benefit the local water managers. It may also provide useful information on snow conditions and for producing avalanche danger bulletins for local citizens, tourist operators and tourists.

Our model setup utilizes and compares meteorological forcing data from (1) robust and almost maintenance-free in-situ weather and snow measurement stations located between 4000-5000 m elevation with real time satellite data transmission, as well as (2) meteorological forecasts from a global weather forecast model (ECMWF IFS). The single-layer snow model features an extended degree-day melt algorithm where estimation of snow melt model parameters is based on local meteorological and snow observations. Melt water refreezing, which may be a significant factor in hampering melt water runoff from the snow pack, is also simulated taking into account the depth of the refreezing front and insulation effect of the overlying snowpack.

Finally, a web- and mobile phone-based solution is planned to enhance communication between the scientists and the local citizens. This application (regObs) aims to enable easy registration of local snow, weather, geohazard, etc. observations (data sharing and exchange by crowd-sourcing).