Arbeitstitel	Trend of Degree-Day Factors in Response to the Hydro-Climatological and Physiographic Parameters
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Abstract

Snow and ice are the significant components of the hydrological cycle. Seasonal snow accumulation may act as a huge reservoir where water storage may last over the period of several months and then as the snowmelt season progresses this water reservoir will start supplying the water to cater the anthropogenic needs. Rapid snowmelt in combination with rainfall can also be a cause of sudden floods. The downstream regions which are depending upon the seasonal snow and ice melt are highly vulnerable with regard to the presence and absence of snow and ice in the upstream waters. While on the other hand, global climate change is a major cause which will modify the snow and ice conditions and thus lead to changing water availabilities. The consequences of reduced snow duration and an increasing share of rainfall on precipitation will completely change the hydrology of a region and lead to severe water problems. The spatial and temporal heterogeneity of snow accumulation and melt in complex terrain is initiated by multiple factors and the reliable modelling of snowmelt governed processes remains a challenge.

The snowmelt runoff can be modelled by two types of techniques. One is the energy balance and other is the temperature-index (TI). This proposal is primarily focused on the latter, which is very popular because of its less data requirement and only dependence on air temperature which is a good indicator of snowmelt depths and is widely available.

The key parameter in TI models which is controlling the snowmelt is the so-called Degree-Day Factor (DDF), which transforms one degree-day ($^{\circ}C.day^{-1}$) into the melt depths ($cm.day^{-1}$). DDFs are generally obtained by model calibration on observed discharges while other method could be the measurements of the snowmelt parameters. In this context a snow measurement station has been installed in the German Alps which is working since November 2016. So far, the measurements showed that the DDFs are not constant but changing with the progress of the snowmelt season. The important questions which need to be answered are related to the changing snow properties during the snowmelt season at its effect on the DDFs, as well as the variability of the DDFs with the change of geodetic elevation.

It is always a challenge to estimate the appropriate values of the DDFs, Because of the scarcity of data measuring points in the mountainous terrain. This becomes more challenging when it comes to snow or glacial melt forecasting in operational phase using the TI models. Because in the forecasting phase, the variation of the DDFs should be known in advance. Thus, the influence of the factors (e.g. climatic, physiographic) on the DDFs have to be better understood in order to devise a proper relationship for the development of the DDFs. Improvement in the estimation of the DDFs will lead towards the improvement of seasonal water availability forecast, which will ultimately play a positive role in the socio-economic development of the region.