MSc projects in Hydrology

Landscape analysis of variation in stream discharge

It is known that different landscape elements contribute differently to streamflow. These spatial patterns has also been observed to have complex temporal variations, for example changing with seasons and climatic conditions. Detailed knowledge of the contributions from various landscapes, their controls and quantification, however, is still limited. This is especially true for the boreal region, where the different landscapes such as wetlands, lakes and forests, form a complex pattern.

In this project observed timeseries of discharge from the Strömsjöliden area in Northern Sweden will be investigated, and the landscape controls spatial and temporal variation quantified. Automatic water-level measurements are available from 12 discharge stations. GIS datasets includes LiDAR digital elevation model, geology and vegetation.

Project work involves

- Assembling and quality controlling discharge timeseries from the 12 stations in Strömsjöliden
- Gap filling of discharge timeseries using the HBV model
- Delineating catchments using LiDAR elevation data
- GIS work collecting information on catchment characteristics, such as geology and landuse
- Analysis of streamflow variability and the connection to the landscape

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Stream network dynamics – where do the streams begin?

As catchments wets up and dries out, the stream network extends and contracts in response to changing wetness and storage conditions. Despite this phenomenon being well known, field observations, quantification of stream dynamics and understanding of the mechanisms controlling the dynamic behaviour is rarely explored and poorly known.

This thesis projects seeks to evaluate the landscape controls on where streams begin during different wetness conditions, using samples of stream head locations collected during wet spring flood periods and dry summer conditions in the Krycklan catchment in Northern Sweden. Key research questions include how different soil types, topography and man-made ditches influence the dynamics of stream networks between dry and wet states.

Processing and analysis of spatial data using GIS is central in this work. This includes preprocessing of the GPS data that has been collected, and performing landscape analysis on these data and interpreting the results. There is also the opportunity to explore time series analysis of distributed stream temperature measurements, which can be used to investigate the temporal dynamic of stream expansion/contraction in more detail.

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