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The effect of climate change on future discharges and flow characteristics on a sub-arctic river in Northern Norway

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Climate change is expected to have a major impact on hydrology at global and regional scales. Due to the changes in precipitation, snow cover and evaporation, river discharges may experience significant seasonal and annual alterations in sub-arctic environments. Earlier spring floods and more frequent autumn floods may alter the power of flow in streams and thus also fluvial erosion processes. We attempt to estimate the changes in river flow characteristics on a sub-arctic river Tana in northern Norway on a century time-scale.

It has been argued that it is not necessarily the rare great floods, but frequent and dominant flood events, which have the most modifying effect on river channels. Therefore, in addition to the simulation of differences between various future flood scenarios, also differences in erosion power between frequent (occurring statistically once in 2 years) and infrequent floods (occurring statistically once in 250 years) will be examined. Our hydrological model is based on selected regional and global climate models and different emission scenarios. The simulated future discharges are used as input data in 2D hydraulic modelling, which produces spatial variability of velocity, bed shear stress and stream power per unit area.

Preliminary results indicate that in the future, the annual discharge pattern may lack single (spring) flood peaks, replaced by multiple episodes of high discharge during winter period as a response to increased temperature. Hence, the magnitude of both great floods and typical annual floods is likely to be reduced on the studied river. The future challenge is to estimate the implications of reduced peak stream power to the spatio-temporal erosion-sedimentation pattern and channel dynamics, which may eventually be reverberated to flood behaviour.