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Investigating and simulating the impact of surface water retention potential in Western Siberia

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The Western Siberian lowland is characterised through an extreme climate with a yearly temperature difference of more than 60°C. An intensive growth period of five months follows the most important hydrological event of the year, the snowmelt, which defines more than 90% of the yearly runoff. The geophysical setting is mainly influenced through low hydraulic gradients, clayey soils, retention basins, landscape depressions and embankments that lead to a high water rentention potential on the surface and the soil. During snowmelt, this leads to a runoff delay. In hand with high evaporation, the described characteristics cause low runoff generation during the rest of the year, even after intense rainfall events.

Within the scope of the project "Sustainable land management and adaptation stategies to climate change for the Western Siberian corn-belt" (SASCHA) the hydrological processes are simulated in three catchments, in a gradient from the pre-taiga to the forest steppe. The three catchments are Pyschma (16.762 km^2), Vagai (2.851 km^2) and Loktinka (334 km^2).

The special challenges in the simulations are: (1) the correct simulation of the half-year long snow cover and its melting, (2) the scarce historical flow data, which could only be extended in 2013 through own measurement campaings and (3) to quantify and simulate the impact of the water retention potential on the catchment hydrology using raw and filled digital elevation models and landscape characteristics.

Against the background of these challenges, we present the hydrological simulations with the Soil and Water Assessment Tool (SWAT).