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Water balance changes across environmental gradients in Sweden.

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Climate change, land use change and an increasing use of water for irrigation, industry, hydro power and consumption alter the water balance of many catchments. Such changes affect the water availability for ecosystems and humans but also affect hydrological conditions in downstream lakes and coastal zones. In the Baltic Sea region, for example, an increase in precipitation in Northern Sweden may reduce sea water salinity, while increasing evapotranspiration in the South, which is dominated by agriculture, may reduce nutrient leaching. Both changes will affect the Baltic Sea ecosystem. It thus is important to identify, for each region in Sweden, the dominant drivers for change to understand and anticipate future hydrological conditions in the Baltic Sea.

In this study we have analyzed long term changes in the water balance for 250 catchments in Sweden. By quantifying the spatial correlation of these changes between catchments we were able to constrain measurement uncertainty in precipitation, discharge and catchment area. This allowed us to create reliable regional estimates of changes in precipitation, discharge and evapotranspiration for the period 1960-2010. The Bodyko framework was used to translate these water balance changes to water use efficiency trajectories across environmental gradients (latitude, elevation, agriculture and population). These trajectories in Bodyko-space help to identify the contributions of climate change and changes in water use efficiency to observed changes in the water balance. We show that within Sweden distinctly different trajectories of hydrological change occur and that these differences should be accounted for in climate change adaptation strategies.