



Changing salinity gradients in the Baltic Sea as a consequence of altered precipitation patterns in Northern Europe

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Climate change is expected to increase precipitation in northern latitudes. Indeed, global observational data sets show statistically significant trends in precipitation averaged over land between 30°N and 60°N for the period 1901-2008. These changes would cause reduced salinity in the Baltic Sea, a semi-enclosed marginal sea with a large catchment area located in northern Europe. With the help of ocean simulations forced by historical atmospheric and hydrological reconstructions and local observations, we analyze the variability of sea surface salinity (SSS) of the Baltic Sea during 1850-2008. In line with other variables of the Baltic Sea water cycle, also the time series in SSS show low-frequency oscillations with a period of about 30 years. Hence, trends in absolute SSS are not significant on centennial scales. However, we found a statistically significant positive trend in the North-South gradient during 1900-2008 enhancing the sharp horizontal salinity gradient. With the help of sensitivity simulations, this change is attributed to local changes in the river runoff; the total annual river runoff to the Baltic Sea did not change. A detailed analysis of the individual rivers reveal increasing freshwater supply from the northernmost catchment indicating a footprint of the anthropogenic impact on salinity with consequences for the marine ecosystem and species distributions.