

An attempt to reconstruct the observed climate trends in the Baltic Sea Basin

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Abstract

In the past decades, the climate in the Baltic Sea Basin has undergone a change with a magnitude that is beyond the estimated range of natural variability. We test the hypothesis that this change may be understood as a manifestation of global warming due to increasing concentrations of greenhouse gases (GHGs). Our approach is based on verifying whether observed trends in climate parameters over the Baltic Sea region during the last decades are consistent with regional climate model simulation in response to GHG forcing. For research we use several datasets: 1) multi-decadal trends derived from different observational data sets, 2) an estimate of natural (internal + external) variability provided by a 2,000-year paleoclimatic model simulation, and 3) GHG-signals derived from downscaled A1B and RCP4.5 scenarios (from ENSEMBLES and CORDEX).

We find that changes in temperature support our hypothesis that the effect of GHG is needed to reconstruct the observed warming. However, those changes in precipitation and surface solar radiation are partially inconsistent with the hypothesis. We conclude that beyond the regional manifestation of global warming; more human-made drivers are present. Regional emission of industrial aerosols has been reduced strongly in this region, and we suggest that this reduction may constitute the missing driver.