

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

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Abstract

We investigate whether the recently observed trends over the Baltic Sea region are consistent with regional climate model (CORDEX; ENSEMBLES) simulation in response to greenhouse gas (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 found that the climate in the Baltic Sea Basin has undergone a change in the past decades, which 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 GHGs. We find that changes in near-surface temperature and surface specific humidity support our hypothesis that the effect of GHG is needed to reconstruct the observed changes. However, in summer and autumn none of the 19 regional climate models, used in this study, reproduce the observed warming amplification. Those changes in precipitation and surface solar radiation are also 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.