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A New Baltic Sea Environmental Index

Background

- The Baltic Sea (BS) is a dilution basin characterized by strong salinity gradient and closed circulation.
- Correlation between North Atlantic Oscillation (NAO) and biological variables fails since 2000/2001
- Large scale sea level pressure fields underwent substantial change on the northern hemisphere indicating a global climate regime shift (Swanson & Tsonis, 2009)
- Large scale climate indices perform insufficiently as predictors for most zooplankton species

Baltic Sea Environmental (BSE) Index

consists of 4 time series:
- Arctic Oscillation (AO)
- Salinity between 120-200 m in the Gotland Sea
- integrated runoff of all rivers draining into the BS
- relative vorticity of geostrophic wind over the BS area (Chen, 2000)

Conclusions

- combination of large scale and regional scale indices in a multivariate index has better performance than single large scale indices
- BSE index is versatile for studying ecosystem response to climate signal

Statistical Downscaling Experiment

Predictors:
AMO, AO, NAO, BSI, Chen, BSE, COADS-SST

Predictands:
SST of the Gotland Sea (GS), Landsort gauge (LG), ice extent (IE) and abundance and biomass for the period 1969-2002 of Acartia spp., Pseudocalanus sp. and T. longicornis, and total biomass for 1960-1997 of B. longispina, E. nordmanni, Syncheata spp. and measured in ICES sub-division 28 by the Latvian Inst. of Food Safety, Animal Health and Environment

Downscaling Results

Fig.5: BSE index. The red line is the time series filtered with a cut off of 25 months

Fig.2: Climate regimes in SLP (hPa) over the North Atlantic (Hurrell & Deser, 2010)

Fig.3: SLP Composite (Dec-Mar) (Dippner et al., 2010)

Fig.4: Components of the BSE index. The red line is the time series filtered with a cut off of 25 months

Fig.1: Baltic Sea bathymetry. Also shown is the location of the Landsort gauge (red asterix), Gotland Sea (GS) and the ICES sub-division 28 (SD28)

References


