

Baltic Sea -Backyard, testbed or challenge for physical oceanography ?

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Baltic Sea is one of ice covered marginal seas



DRIVER OF THE BALTIC SEA RESEARCH UNDERSTAND VARIABILITY AND CHANGE – PAST, PRESENT AND FUTURE

What is the link between the global scale change and local characteristics ?

1. Global to North-Atlantic / Eurasian scale

controlled by the global climate system very strong feedback between scales

2. Baltic Sea scale

- climate variability very much controlled by the atmospheric circulation

- some feedback to large scale

3. Basin scale

- atmospheric forcing is modified by the local characteristics : shape of the basin, interaction between the sub basins, river runoff etc.

4. Response of the ecosystem

- depends very much on the basin scale characteristics, even smaller sub-basin scale changes could be important.

- dowscaling from global to the basin scale has been actively studied during the last 10+ years, but comparable little is know on the impact of CC on local scale.





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PHYSICAL CHARACTERISTICS OF THE BALTIC SEA

- 1) Restricted water exchange between the North Sea and Baltic
- 2) Shallow sea, variable topography
- 3) Strongly stratified
- 4) Seasonal ice cover
- 5) Eddies, dynamic interplay between coastal and open sea regions
- 6) Bottom boundary layer dynamics





NORTH ATLANTIC OSCILLATION – NAO MAJOR DRIVER OF NATURAL VARIABILITY



WIND DRIVEN AND THERMOHALINE CIRCULATION



SURFACE SALINITY



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SALINITY SECTIONS



SMALL SCALE CIRCULATION DYNAMICS

Surface currents at the central Baltic proprer : blue-green algea as a tracer





Courtesy of Mati Kahru

SMALL SCALE CIRCULATION DYNAMICS

Mixing of fresh water : Luleå river bloom



Eddies close the Rugen island – sea ice as a tracer



BALTIC SEA IN WINTER

ICE THICKNESS OF THE DRIFT ICE

Measurement on February - March 2012

ICE THICKNESS (RED SECTION)



ANNUAL MAXIMUM ICE EXTENT OF THE BALTIC (MIB)



BACC-2

Bay of Bothnia was only partially ice covered on winter 2015 No hard evidences that it has occurred before



1900 – 2015

1908 – 1938

1985 - 2015

Propability distribution of ice extent is now statistically significantly different than any other 30 years period since 1720. Extreme severe winters has become even more uncommon?

Uotila et al, 2015

1) Enhance production of environmental parameters

2) Including EO data to Marine Spatial Planning (MSP)