Baltic Sea Marine Heatwave in summer 2018

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The work is part of CMEMS OSR4 paper submission
Baltic Sea SST 1982-2018 (CMEMS L4)
Marine heatwave in 2018: definition and an example
Mean MHW patterns in summer 2018

**MHW intensity**: SST anomaly to 90 percentile to climatology during MHW

**MHW duration**: number of accumulated days of MHW

[Maps showing MHW intensity and duration]
Spatiotemporal variability (May-August 2018)

Bimonthly oscillation
Bothnian low in May/June
Surface air temperature anomaly (ERA5)
Anomaly of large circulation patterns

CLIMATE MJJA

2018 MJJA

ERA5 geopotential (m2 s-2) 500 hPa MJJA climatology

ERA5 geopotential (m2 s-2) 500 hPa MJJA mean 2018

ERA5 geopotential (m2 s-2) anomaly 500 hPa MJJA 2018

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

-1400 -1200 -1000 -800 -600 -400 -200 0 200 400 600 800 1000 1200 1400
Anomaly of short wave radiation and sensible heat flux in May 2018
Conclusions

- Summer 2018 is one of the two warmest summers recorded in the past 37 years in the Baltic Sea.
- MHWs in 2018 are very long and stable for the entire summer period (May – September).
- MHW showed a bimonthly north-south shift on its spatial pattern which was characterized by prevailed MHW areas occurring either in the south or north of 59°N.
- MHW events are NOT found in the open waters in Bothnian Sea and Bothnian Bay in May and June.
- The Baltic Sea surface warming in summer 2018 is caused by an anomalously extensive and strong high pressure system over Scandinavian, which brings anomalously high shortwave radiation and sensible heat flux to the sea and less surface mixing.
- Jet stream in the Baltic-North Sea is very weak, hence tend to maintain a stable, blocking situation.
- In terms of net heat flux anomaly to the sea, shortwave radiation was the dominant factor.
Suggestions for more research

• Summer 2018 is unique in many aspects, not only atmospheric circulation and sea upper layer heat anomaly, but also hydrological, biogeochemical and ecological conditions of the Baltic Earth System. It’s relation with long-term climate change in the region is also very interesting to explore.

• Potential research topics:
  – Long-term variability of blocking events and their physical basis in Scandinavian region
  – Hydrological anomaly in summer 2018 and their joint impacts with the heat anomaly on Algal conditions (modelling and analysis studies)
  – BGC anomaly in summer 2018 and their causes
Thank you for your time!
Negative river runoff anomaly in summer 2018

Total runoff in the Baltic Sea (m3/s)