

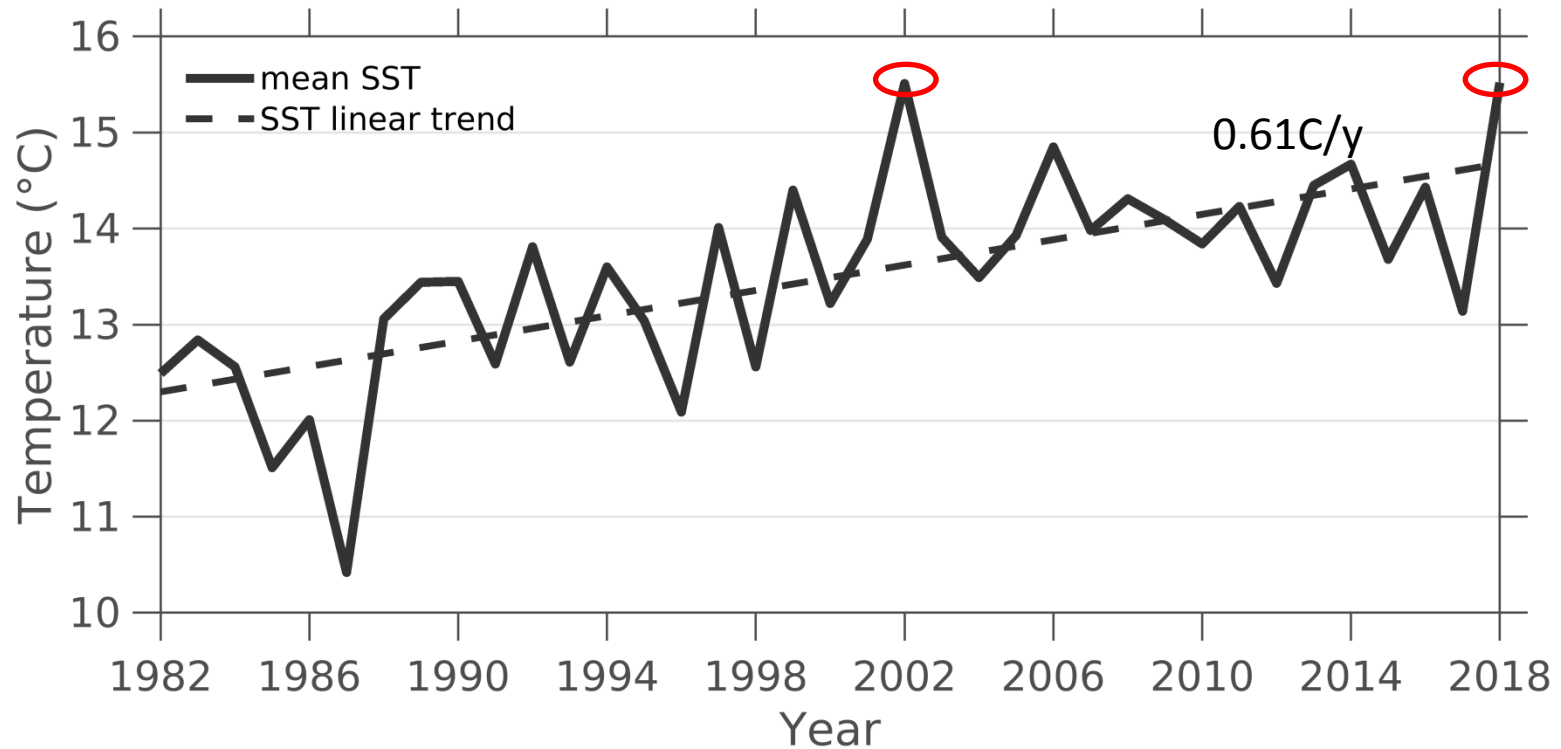
# **Baltic Sea Marine Heatwave in summer 2018**

Jun She, Jian Su and Ann-Sofie Zinck

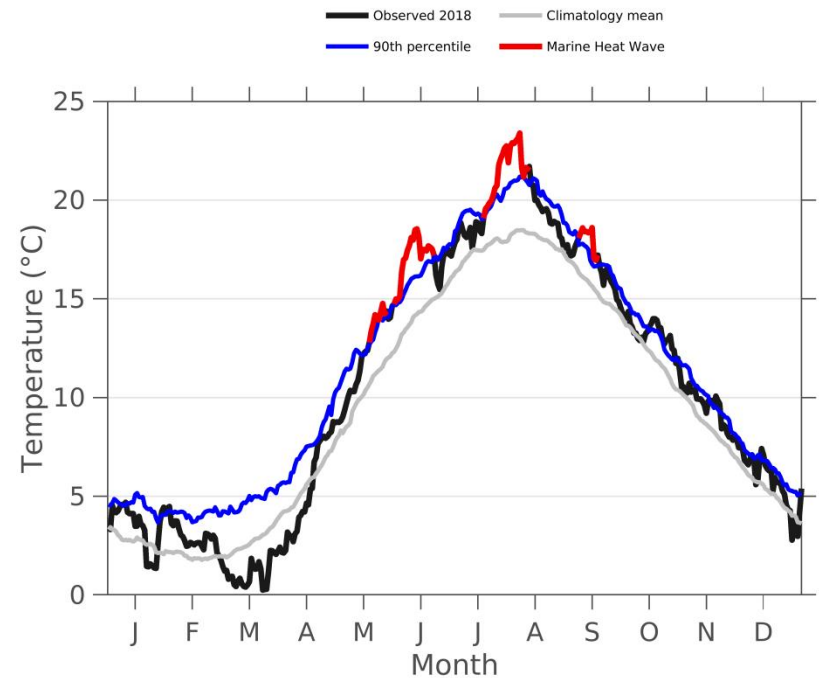
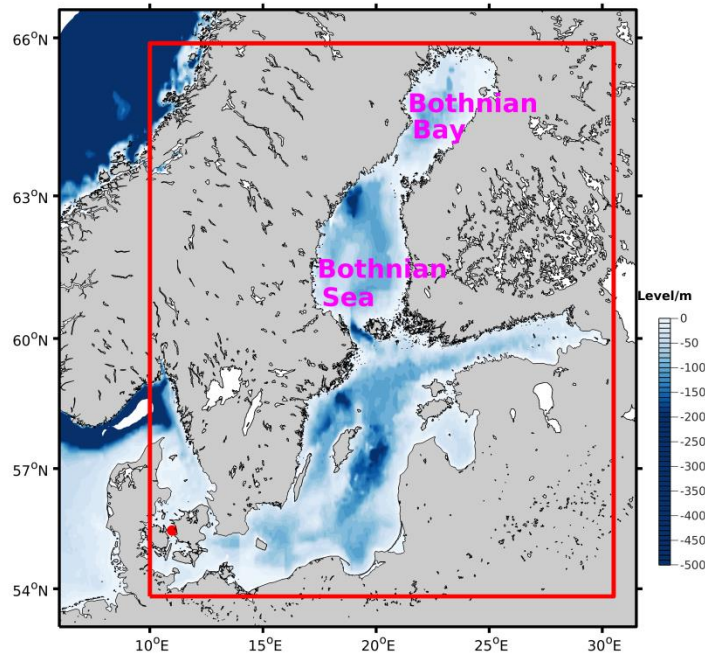
Danish Meteorological Institute

*The work is part of CMEMS OSR4 paper  
submission*

# Baltic Sea SST 1982-2018 (CMEMS L4)

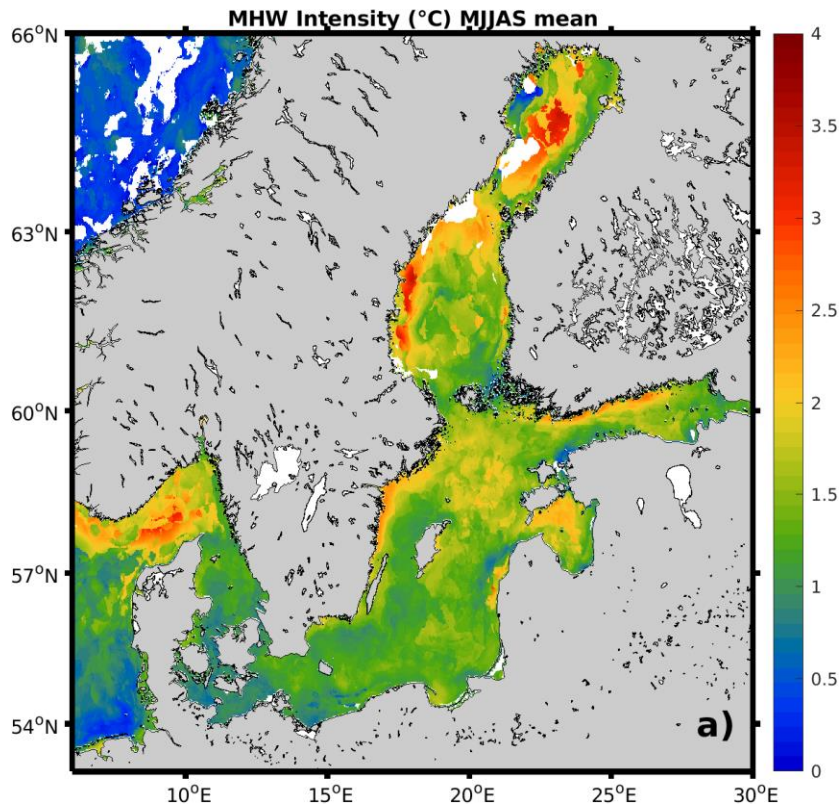


# Marine heatwave in 2018: definition and an example

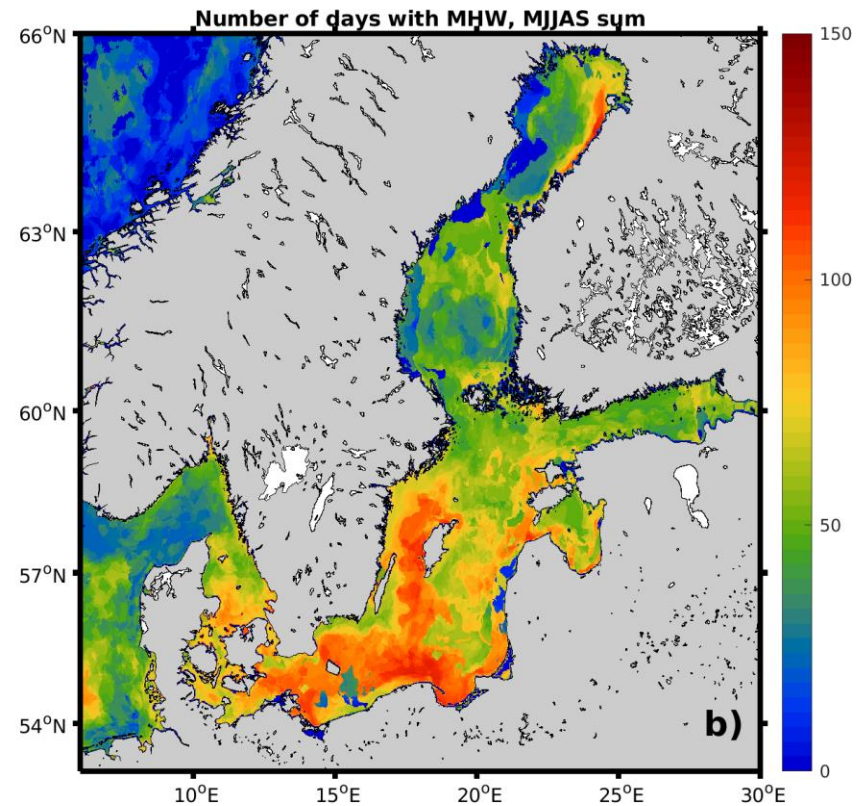


# Mean MHW patterns in summer 2018

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



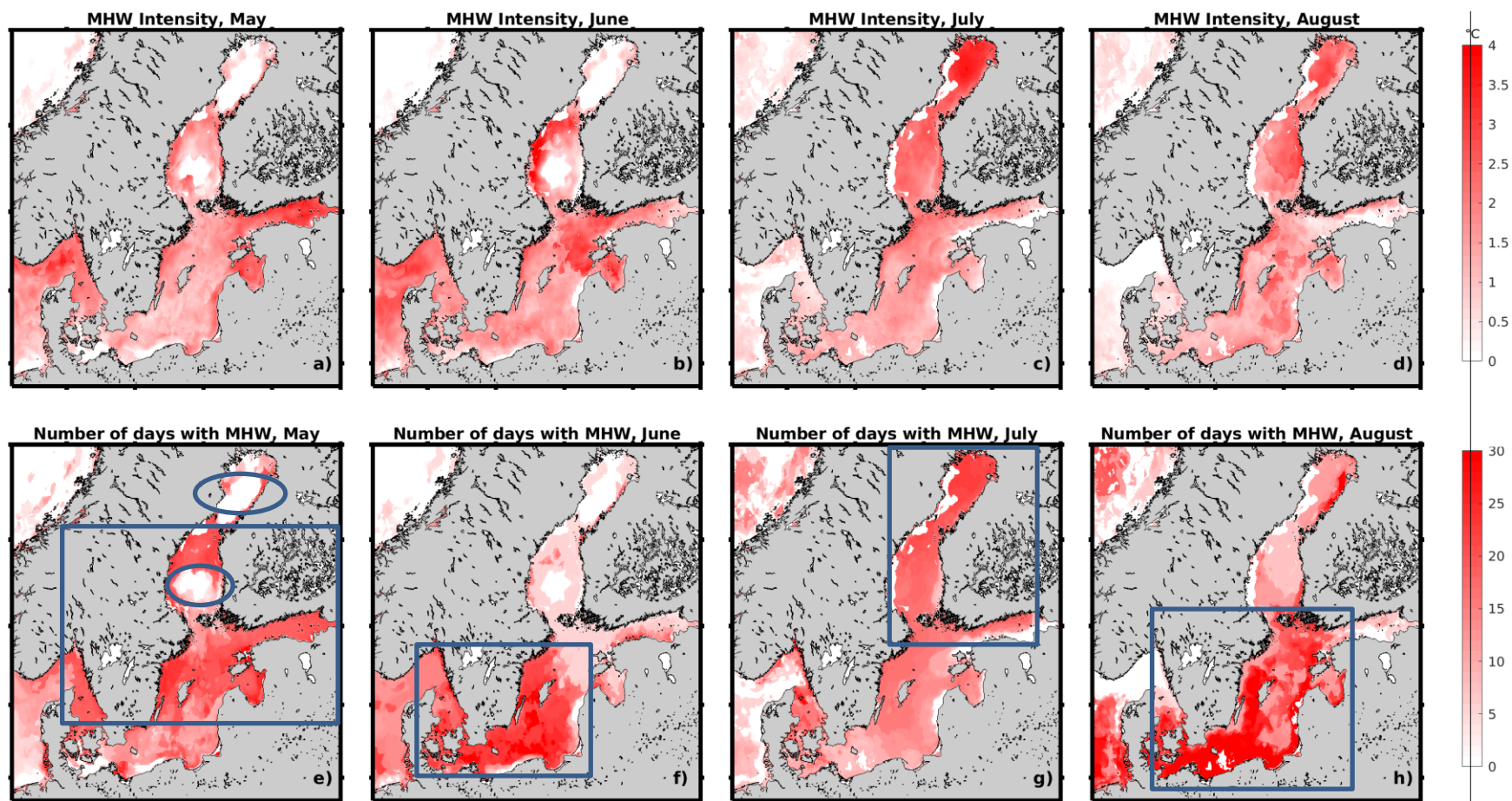
**MHW duration:** number of accumulated days of MHW



# Spatiotemporal variability (May-August 2018)

Bimonthly oscillation

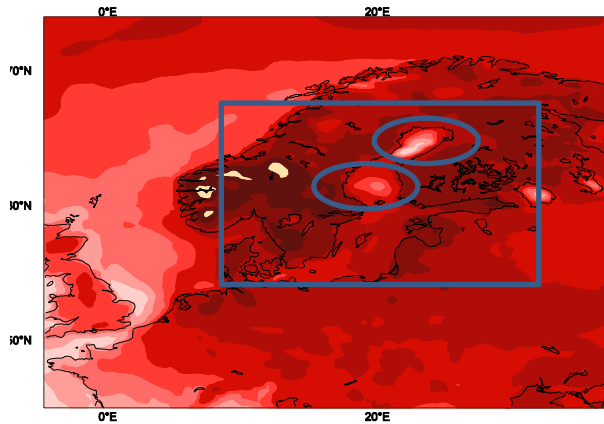
Bothnian low in May/June



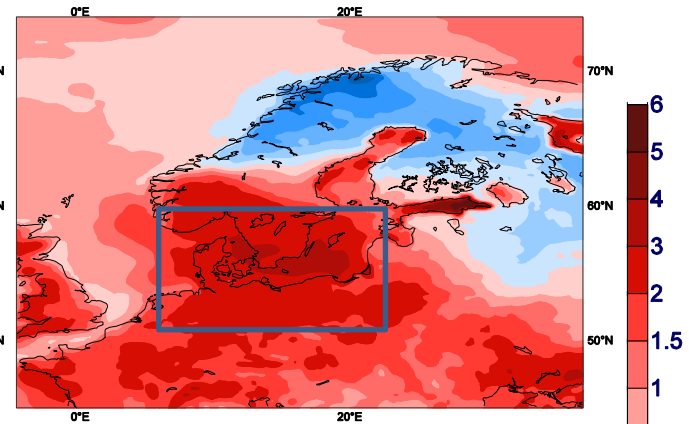


# Surface air temperature anomaly (ERA5)

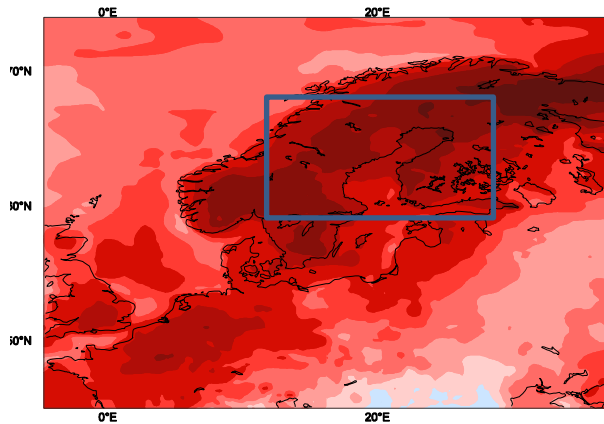
ERA5 2m temperature anomaly May 2018



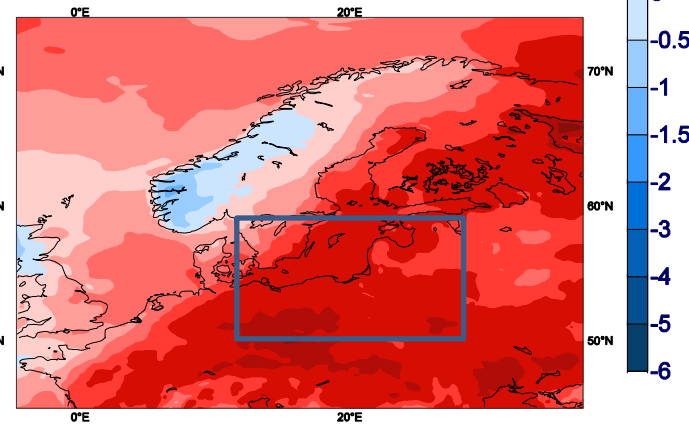
ERA5 2m temperature anomaly June 2018



ERA5 2m temperature anomaly July 2018



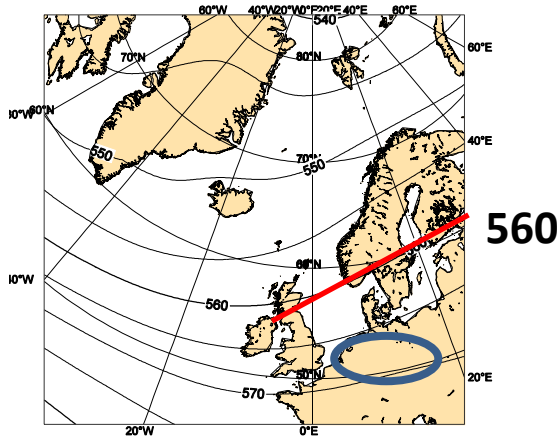
ERA5 2m temperature anomaly August 2018



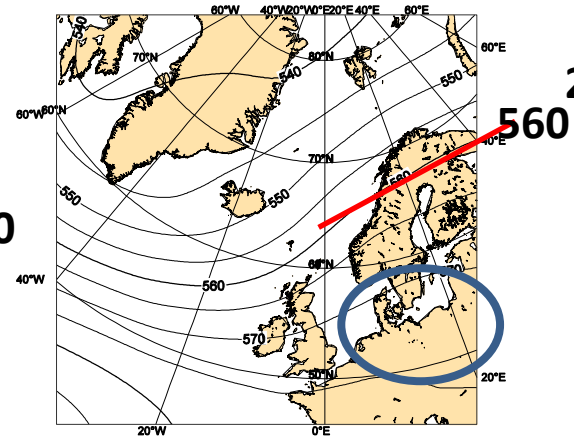
# Anomaly of large circulation patterns

CLIMATE  
MJJA

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

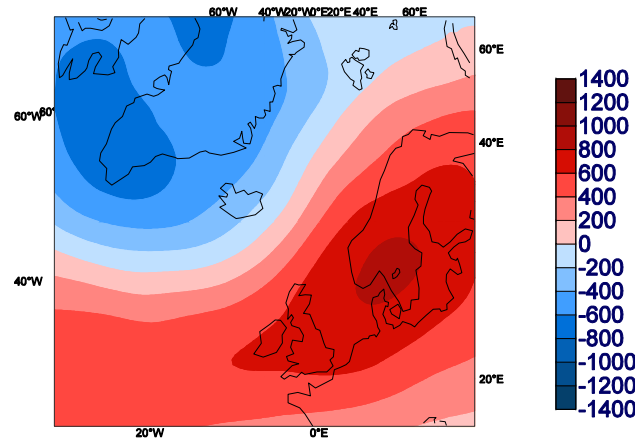


ERA5 geopotential (m2 s-2) 500 hPa MJJA mean 2018



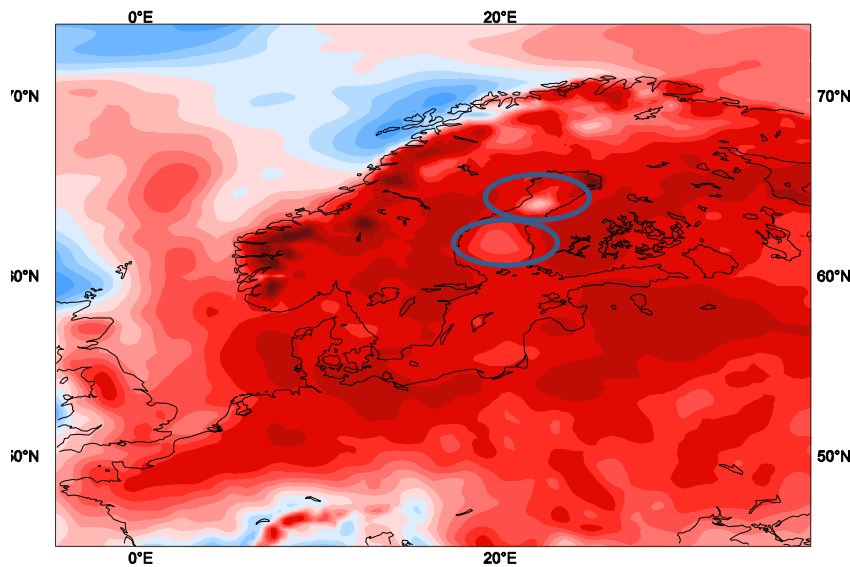
2018 MJJA

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

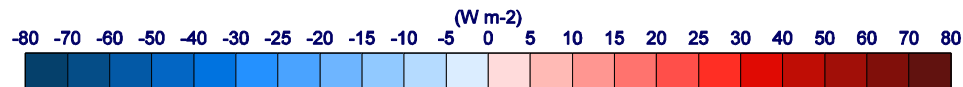
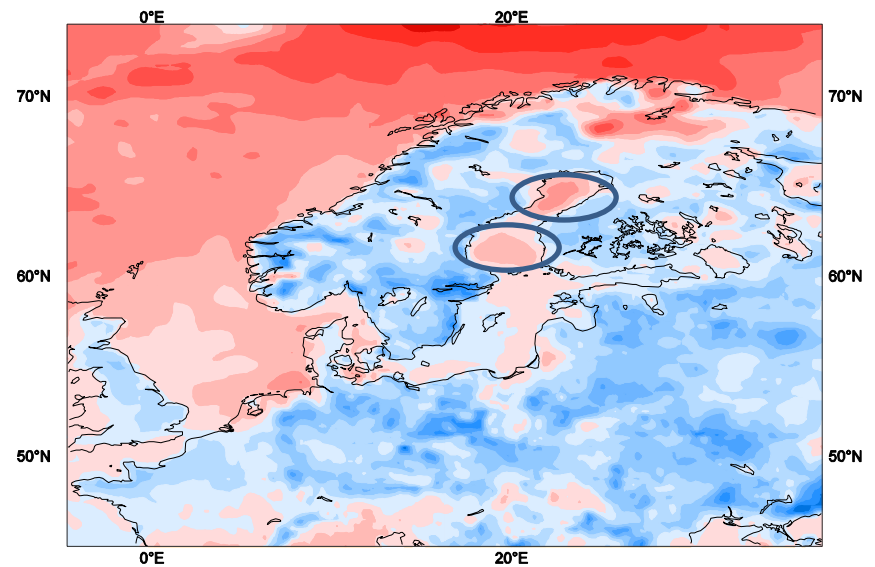


# Anomaly of short wave radiation and sensible heat flux in May 2018

Surface net solar radiation anomaly May 2018



Surface sensible heatflux anomaly 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.

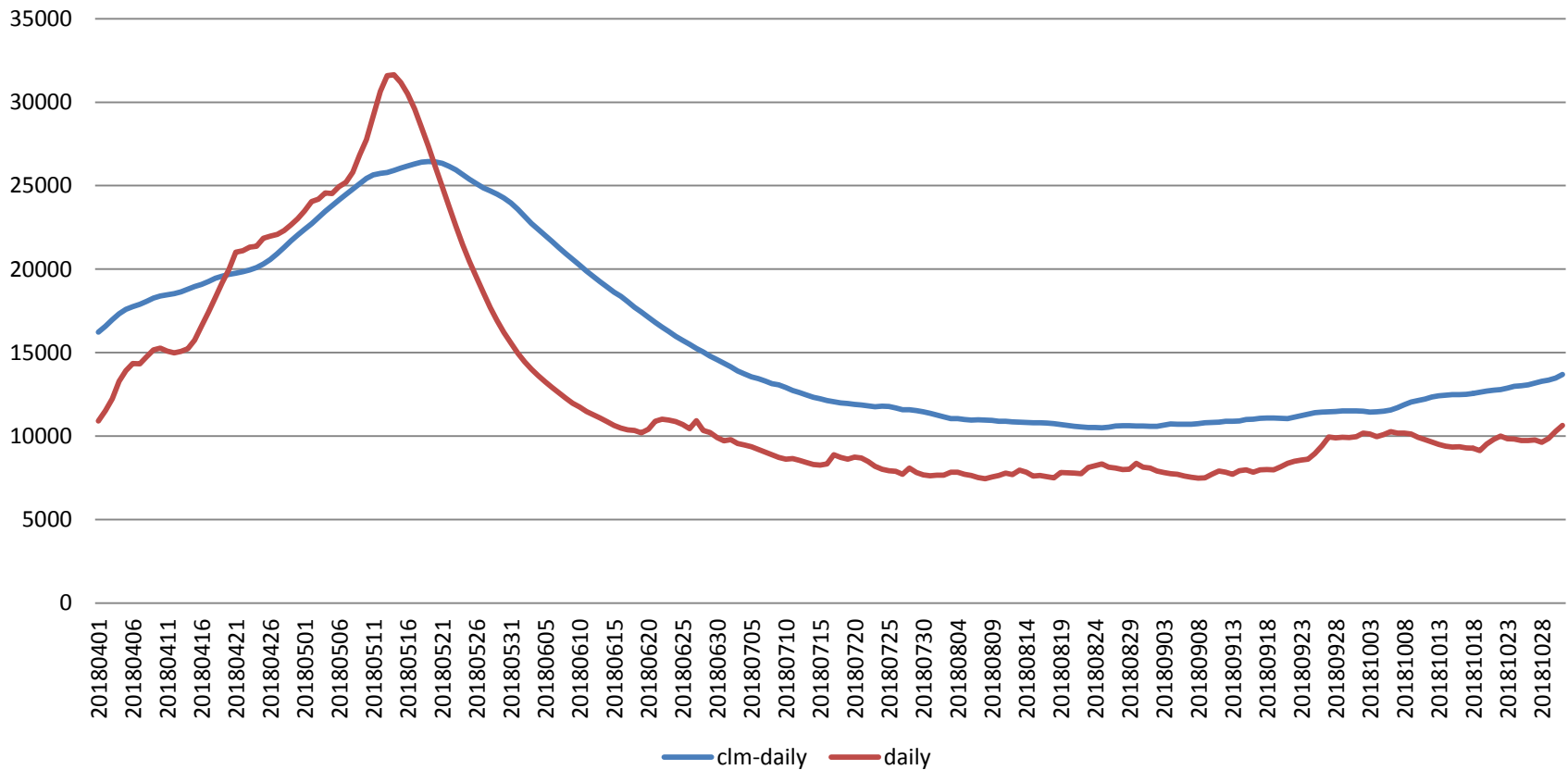
## Suggestions for more research

- 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 (m<sup>3</sup>/s)



Runoff of 4 largest Baltic rivers (m3/s)

