

# Wind from satellite imagery and ice conditions

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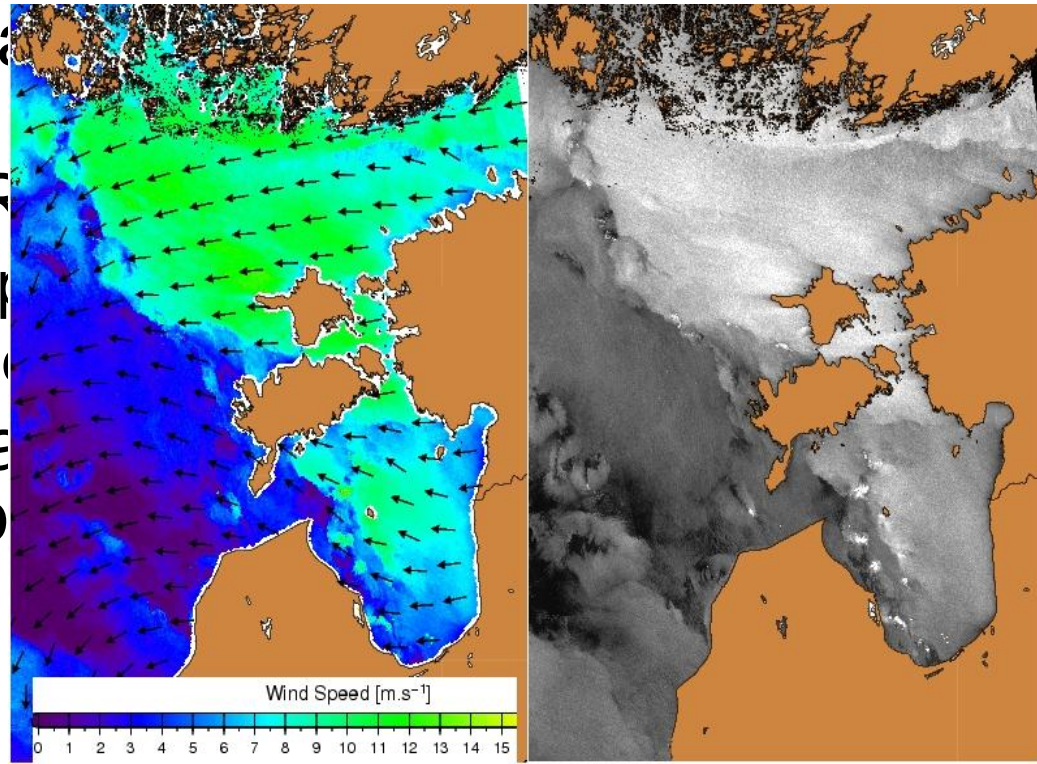


Linking Estonia and Latvia  
Part-financed by the European Regional Development Fund

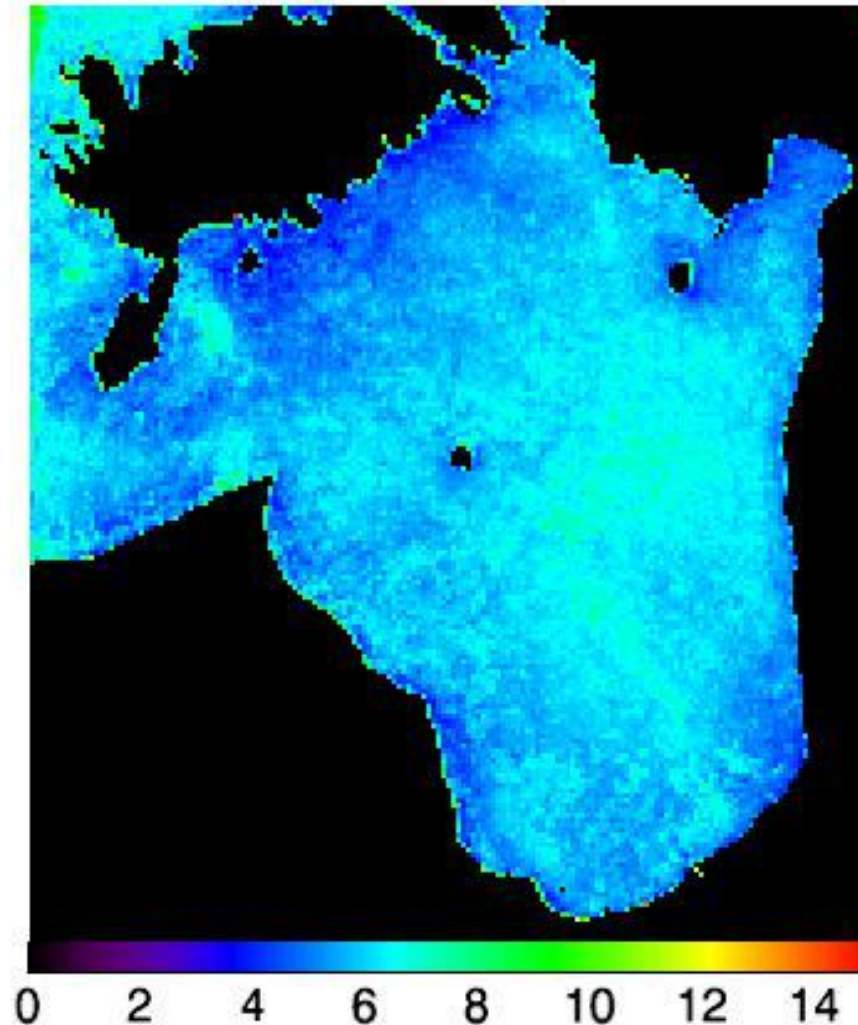


# Wind from SAR

- Number of SAR images -1068
- Resolution – 75m
- Resolution was reduced to 1 km to save processing time
- We applied CMOD5 to retrieve wind speed
- Wind maps from SAR
  - Monthly mean wind speed
  - Mean annual wind speed
- SAR also provides value of operational monitoring

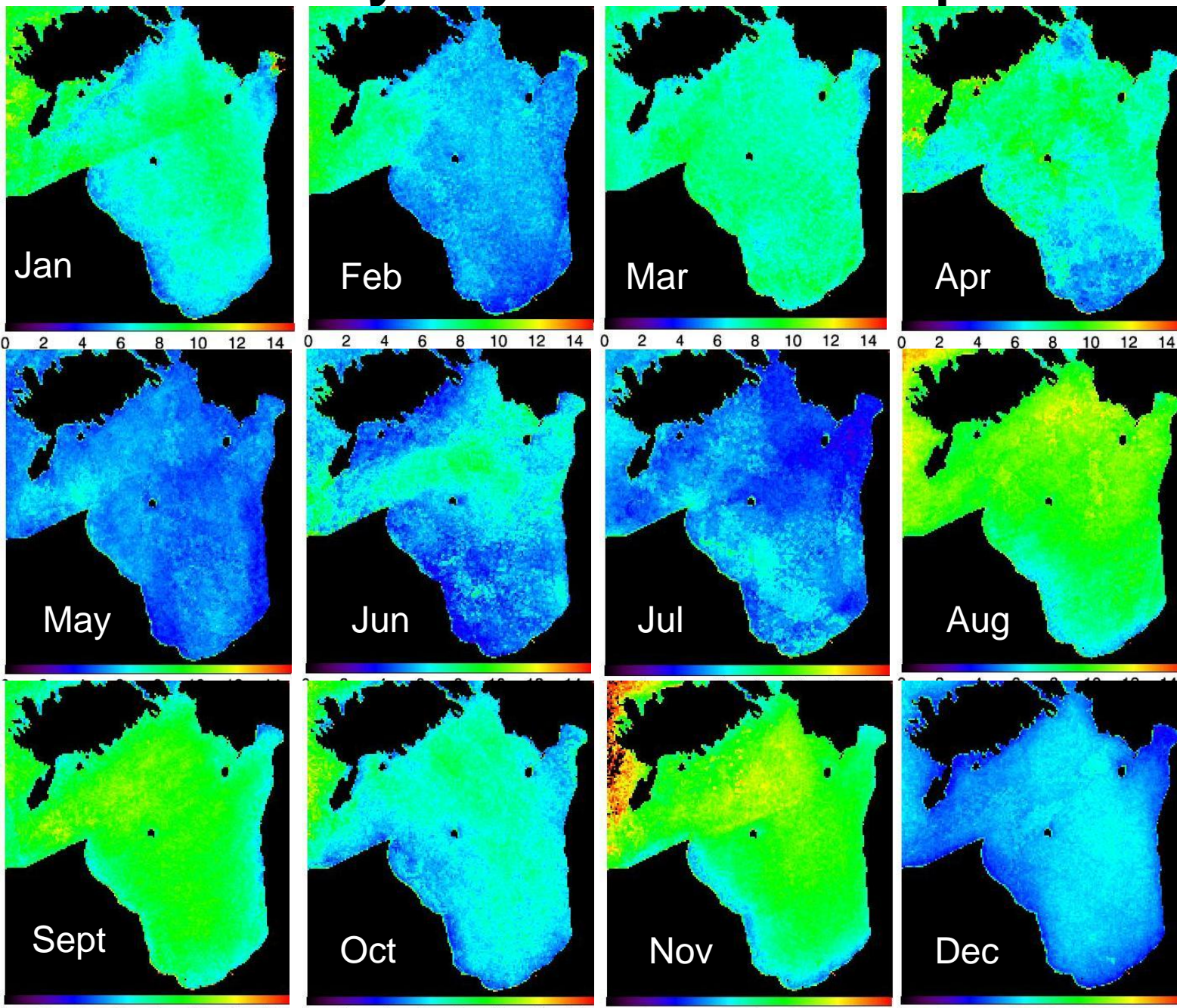


# 2009 October – wind speed



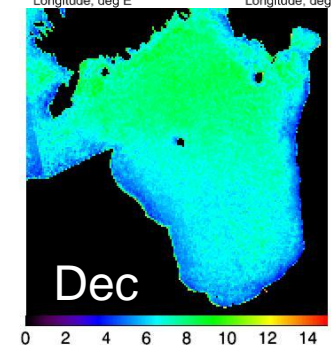
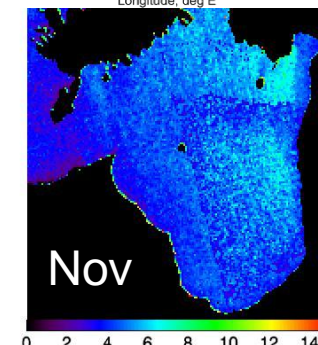
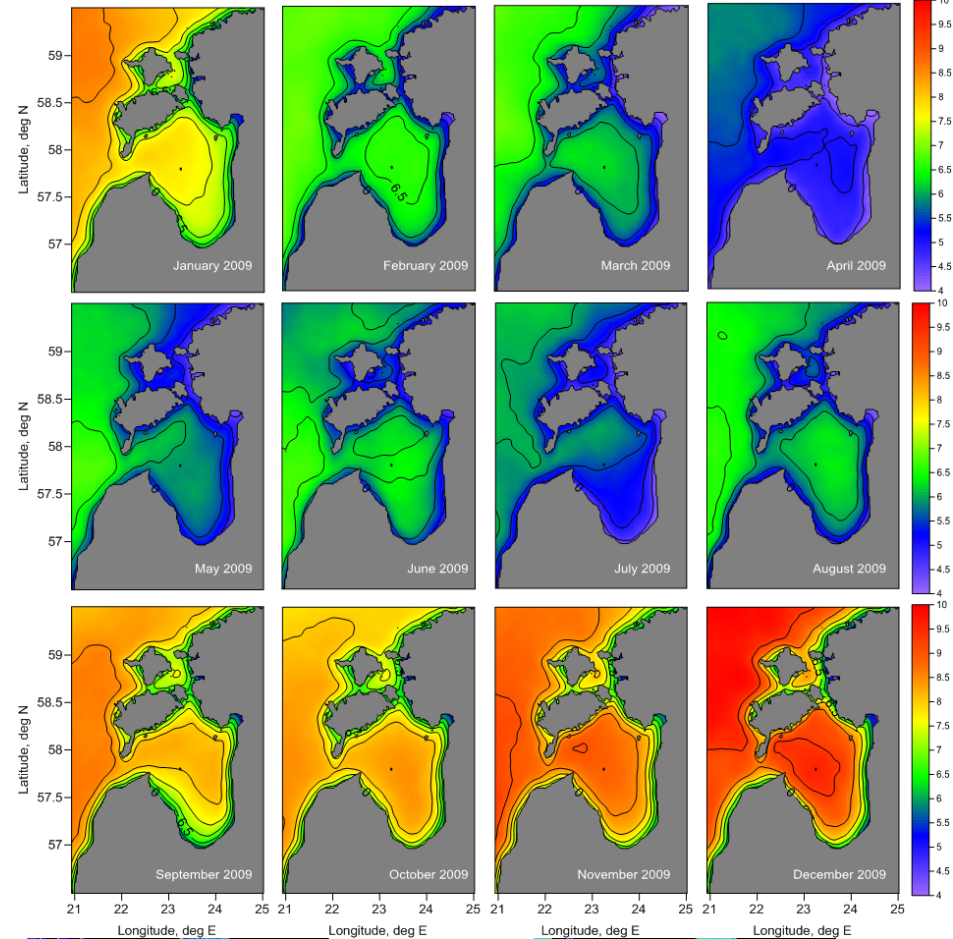
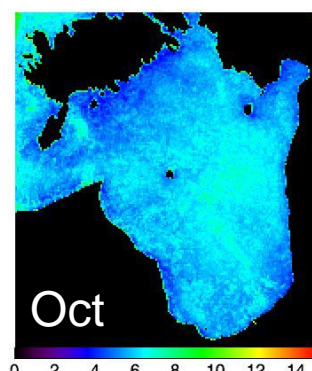
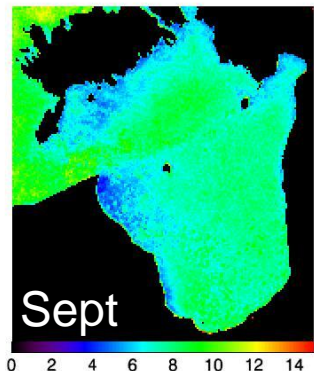
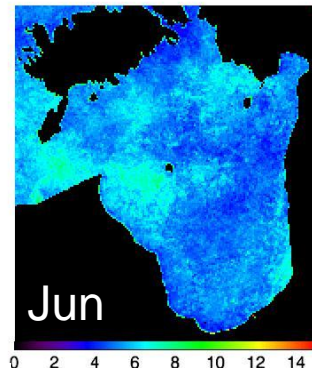
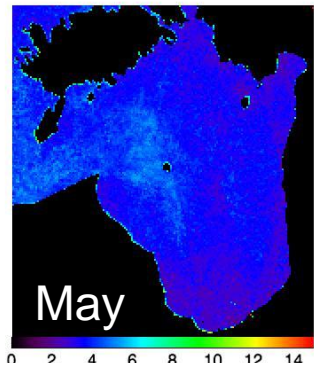
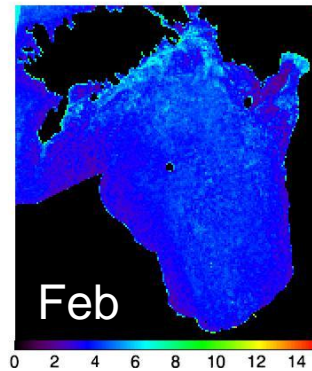
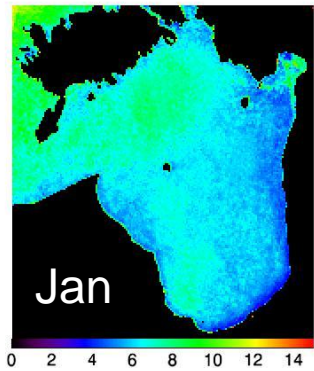


# Monthly mean wind speed 2008

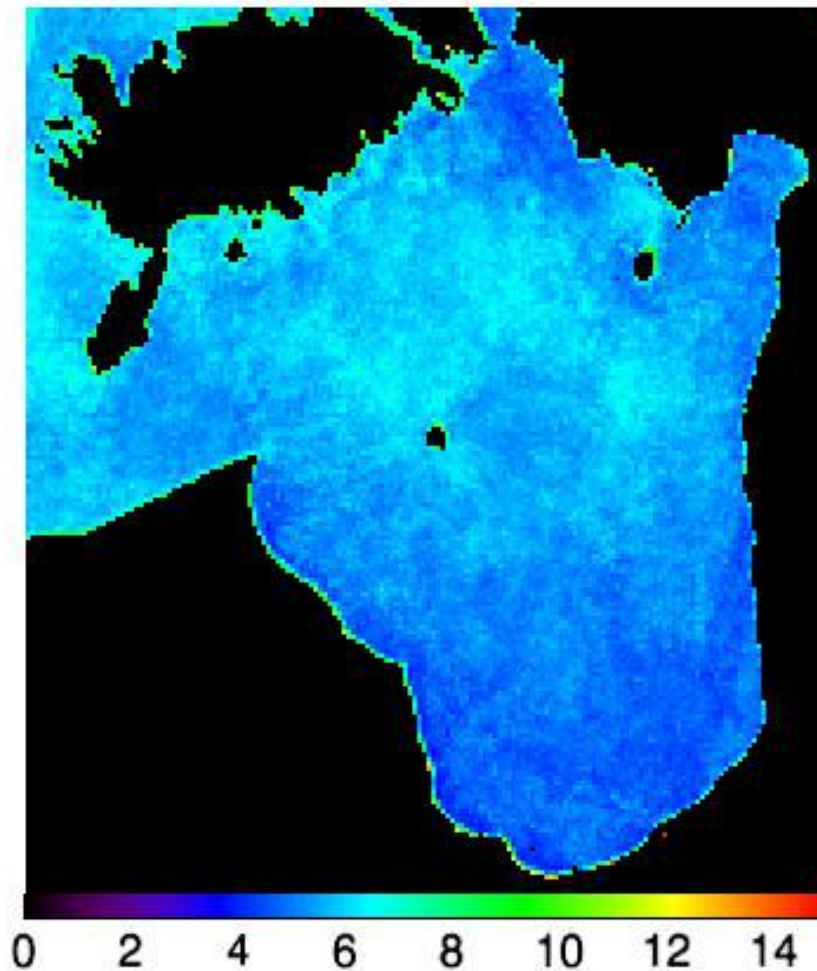




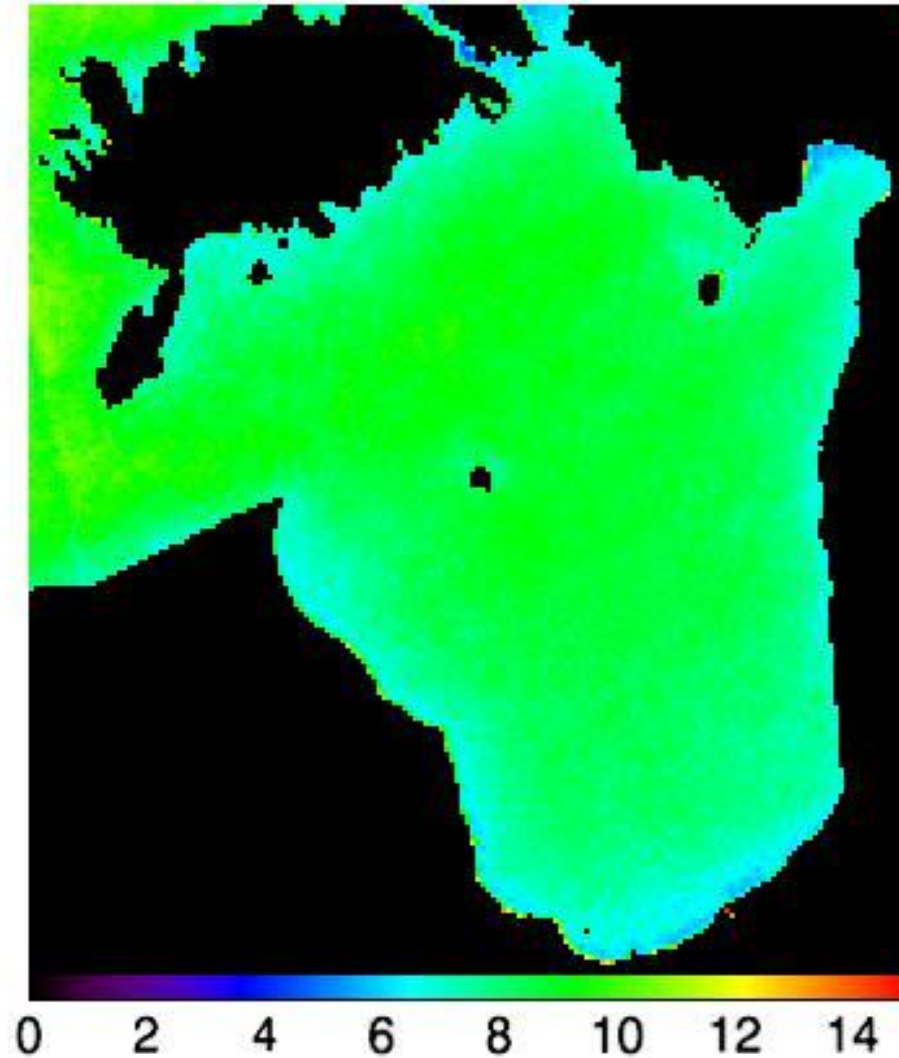
# Monthly mean wind speed 2009



# Monthly: April 2007-2010

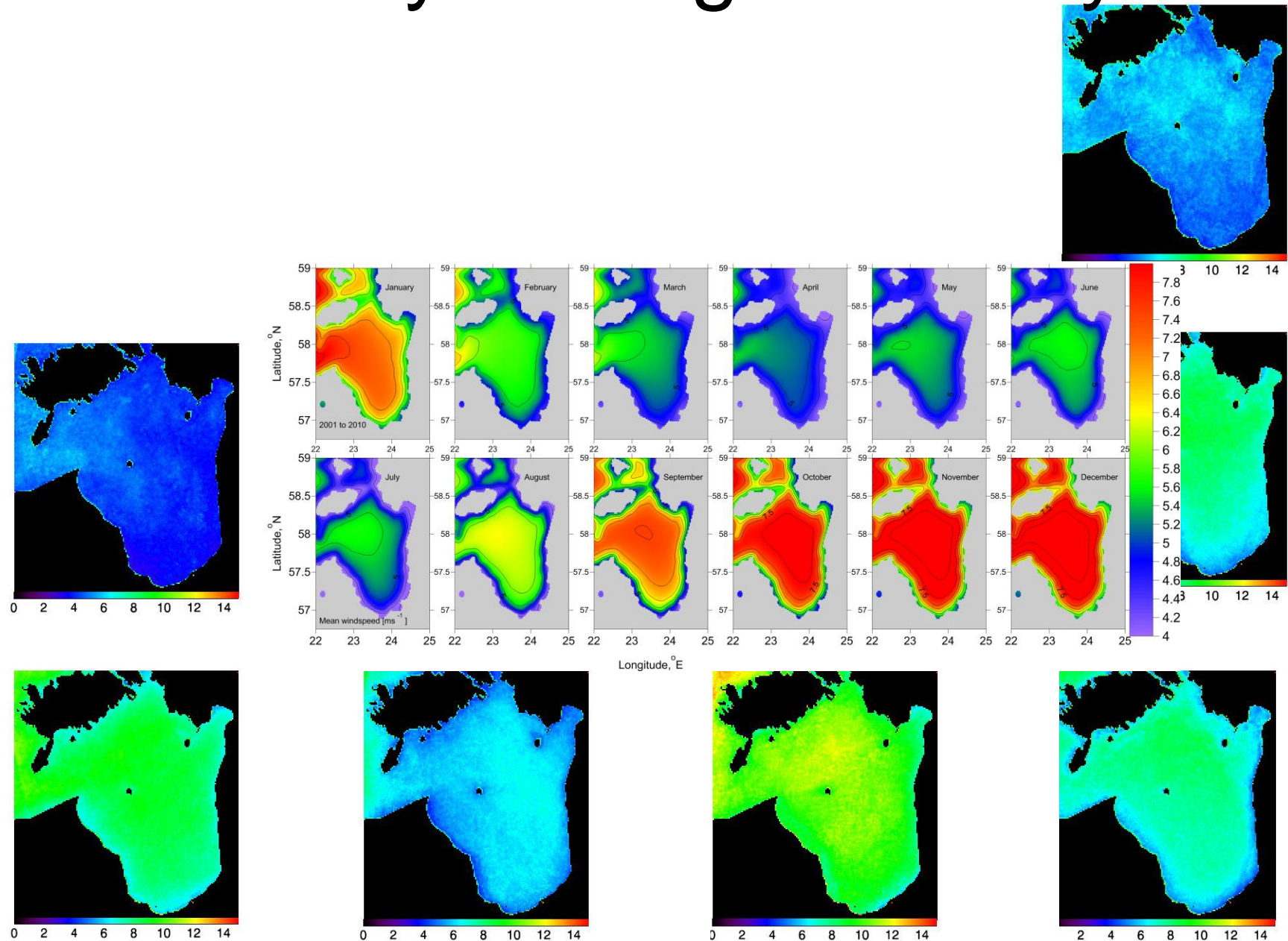


# Monthly: September 2007-2010





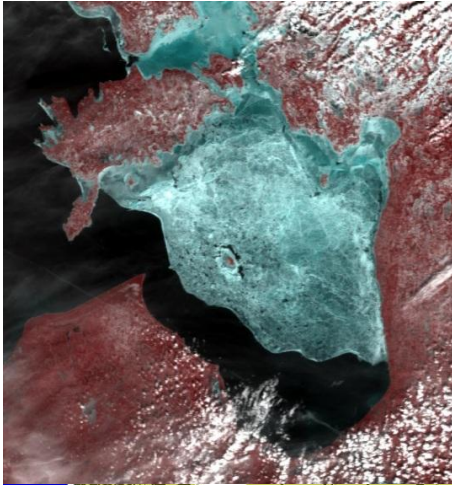
# Monthly average over 4 years



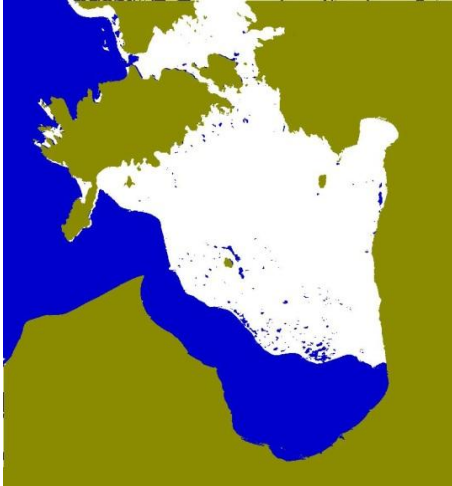


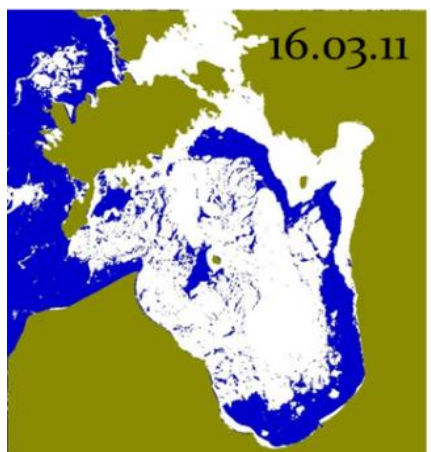
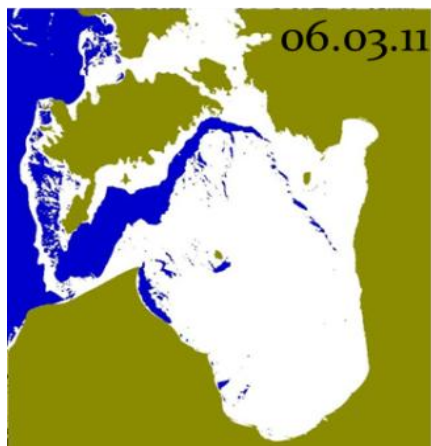
# ICE CONDITIONS

# Methods and Image analysis

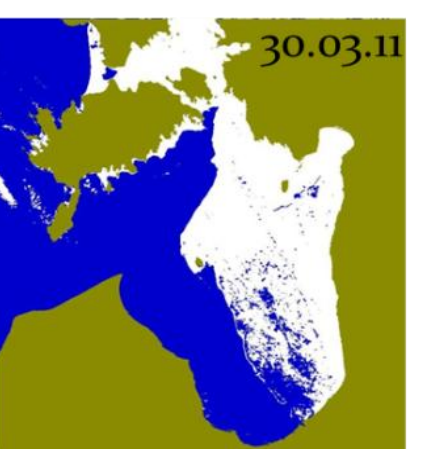
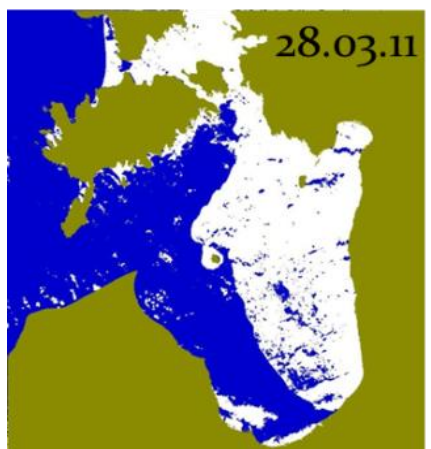
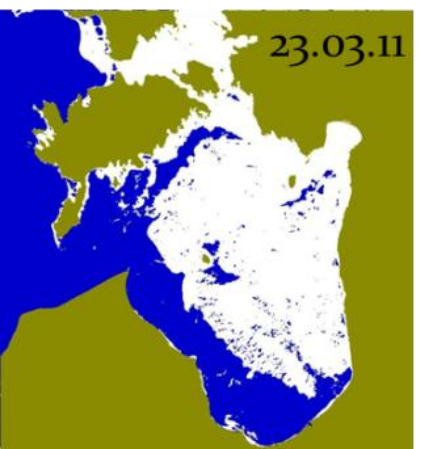
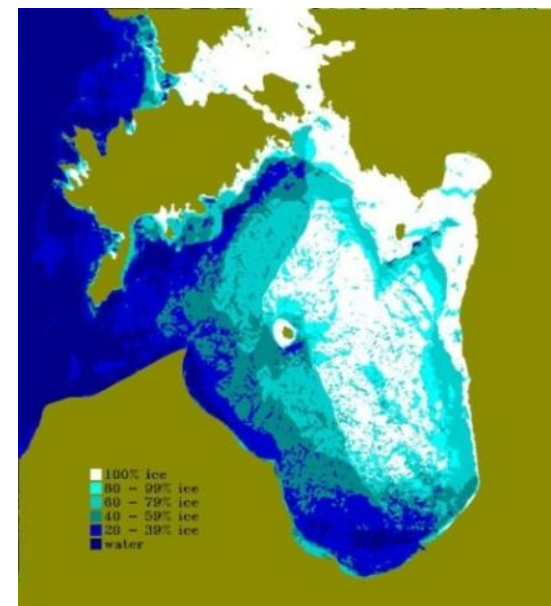


- Satellite image(MODIS Terra and Aqua) analysis was performed for years 2002-2011.
- Resolution – 250 m
- Ice was distinguished from open water using reflectance value.
- Based on the bimodal histogram the water and Ice were classified.





March 2011 average

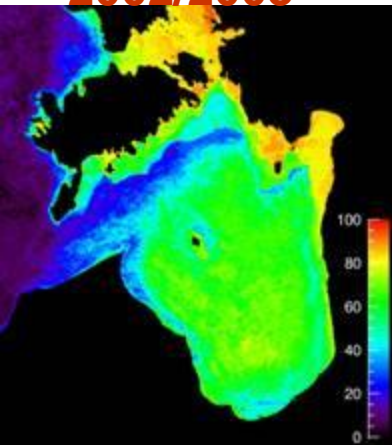




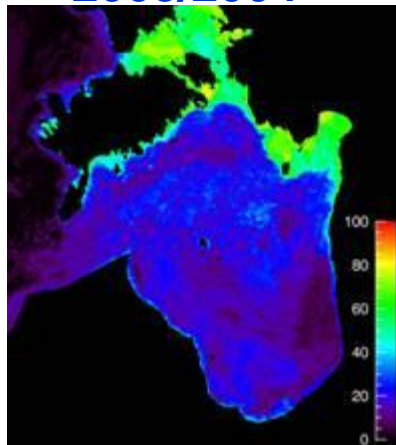
# Ice products

- Ice probability
- Duration of ice season
- Different winter scenarios
  - Mild
  - Medium
  - Severe

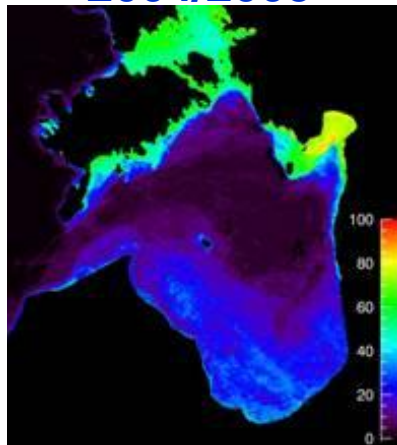
2002/2003



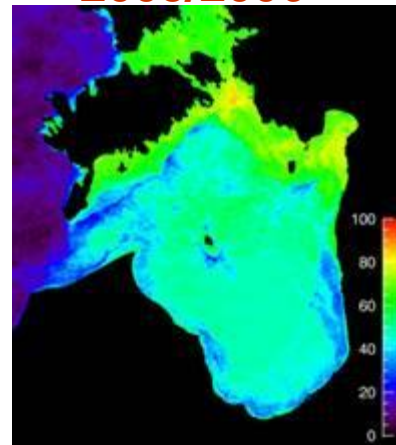
2003/2004



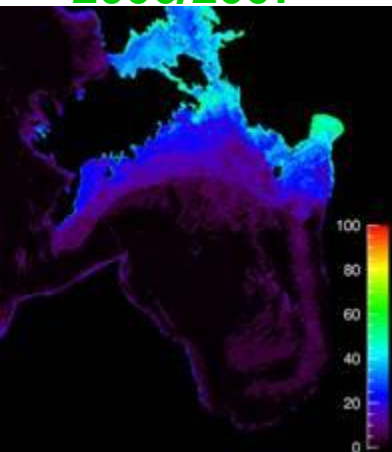
2004/2005



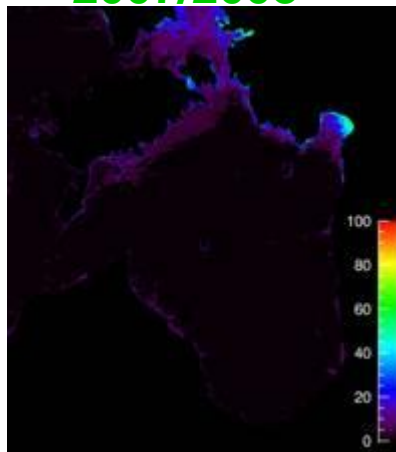
2005/2006



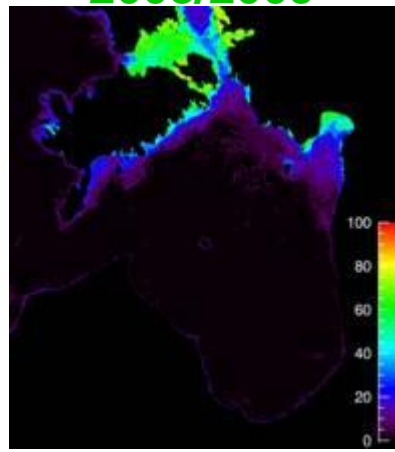
2006/2007



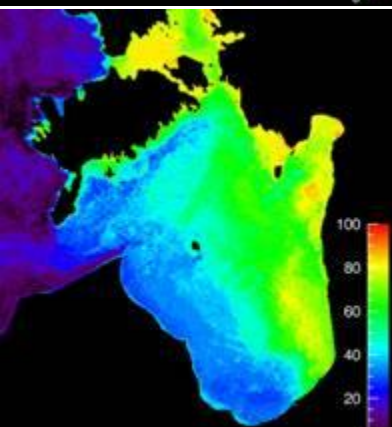
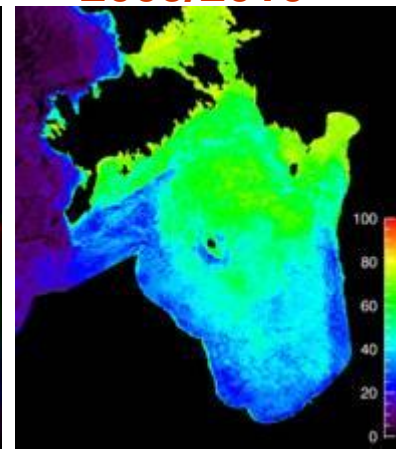
2007/2008



2008/2009



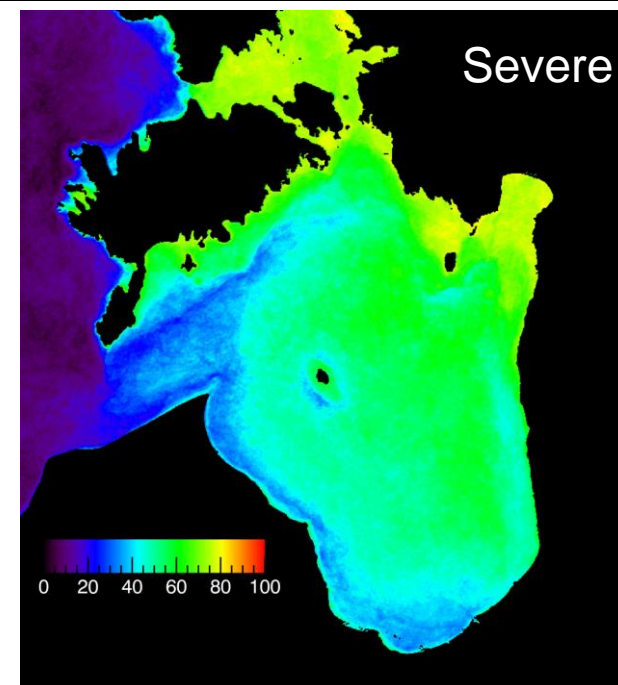
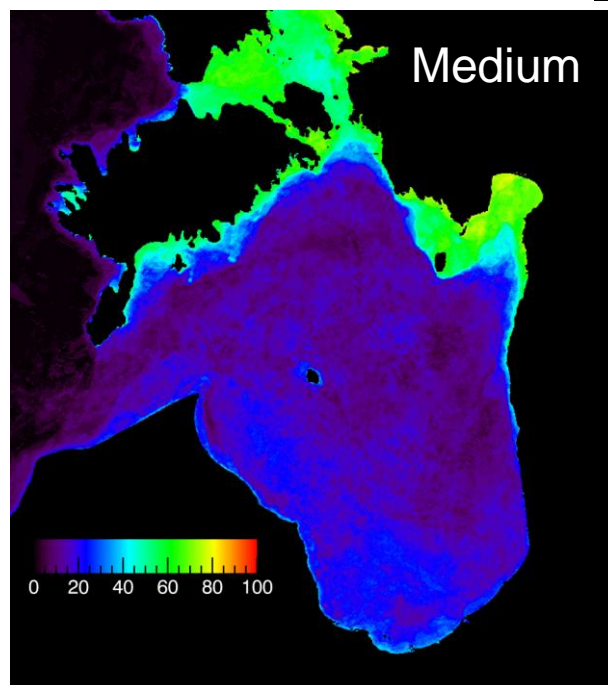
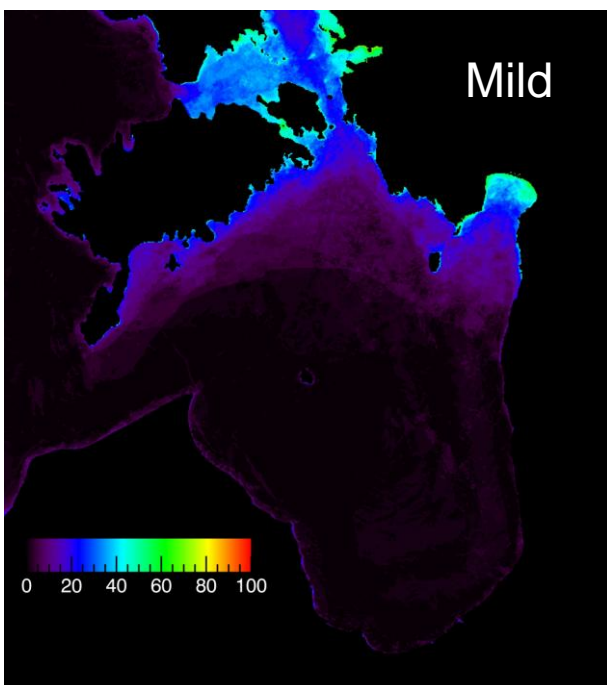
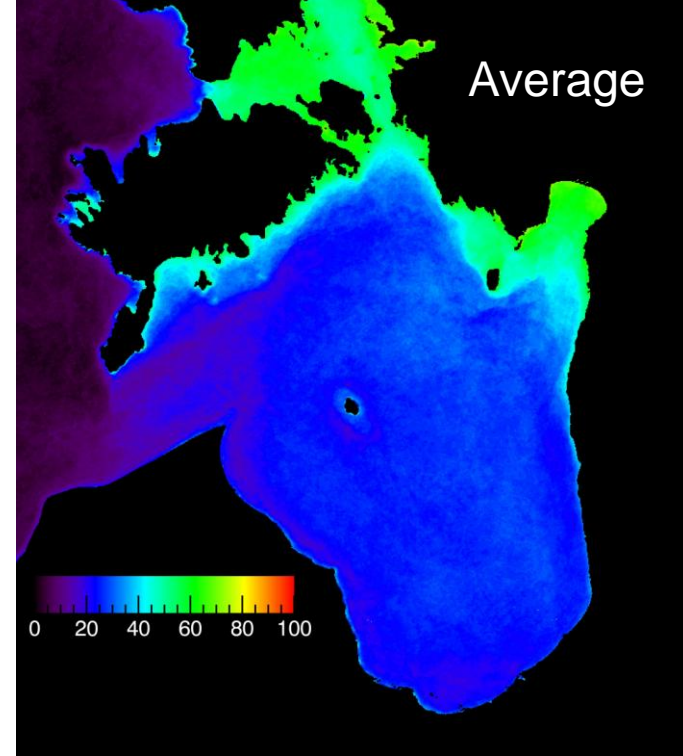
2009/2010



2010/2011

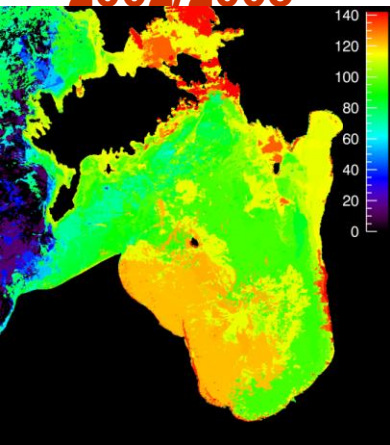
Ice probability

# Ice probability

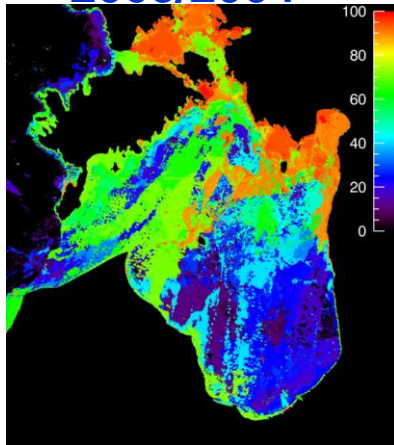




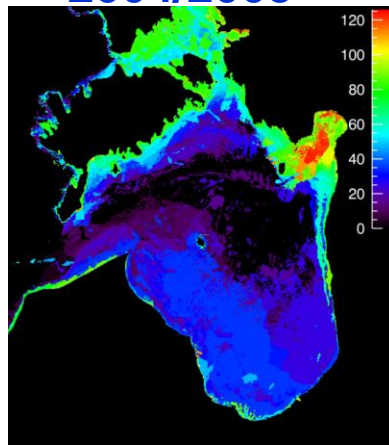
2002/2003



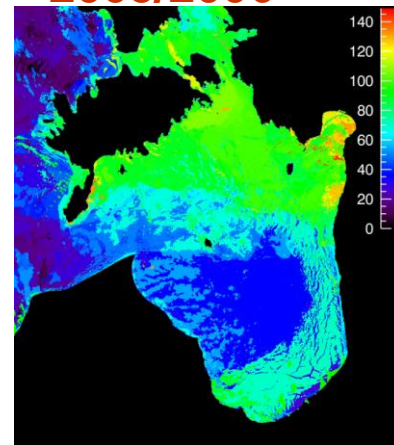
2003/2004



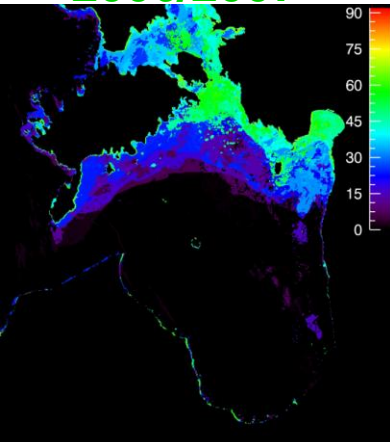
2004/2005



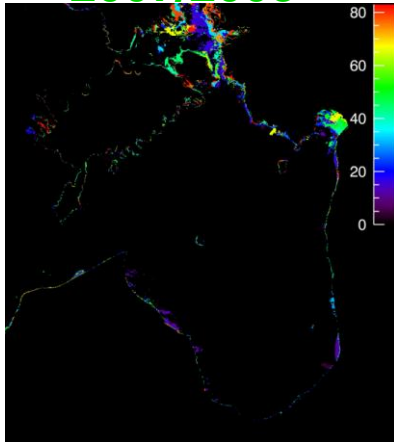
2005/2006



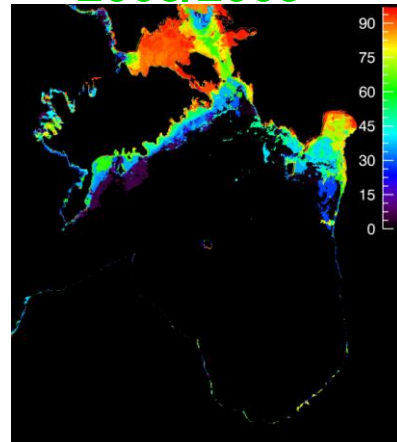
2006/2007



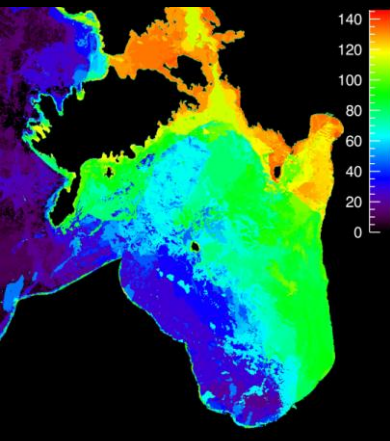
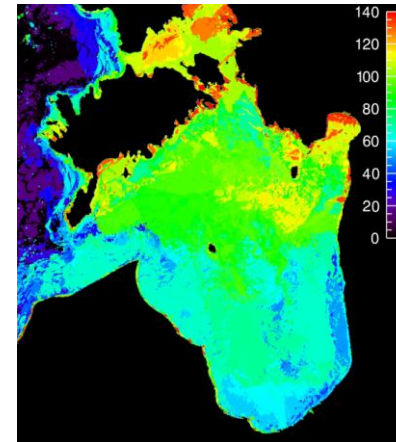
2007/2008



2008/2009



2009/2010

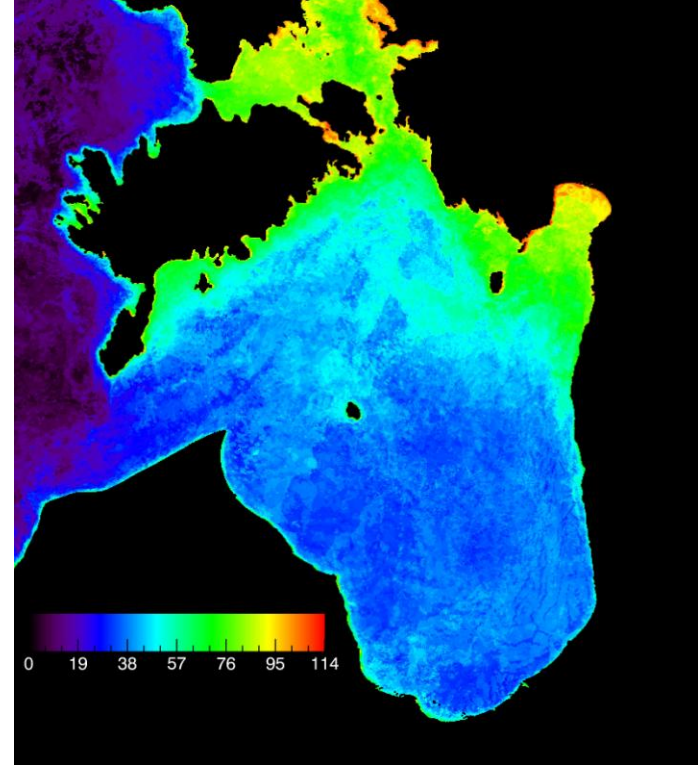


2010/2011

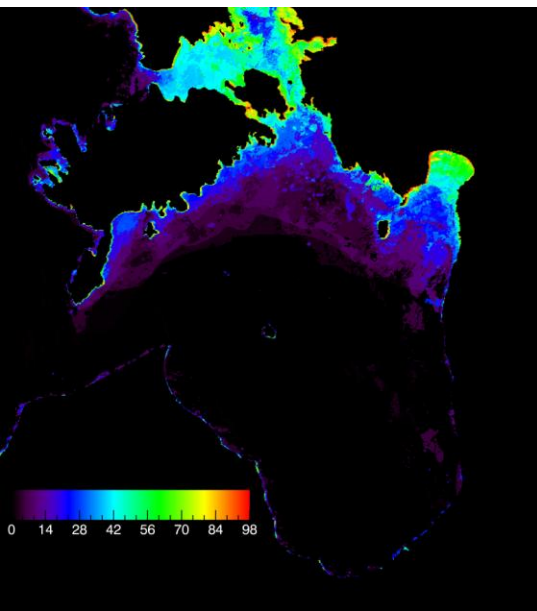
Number of ice days

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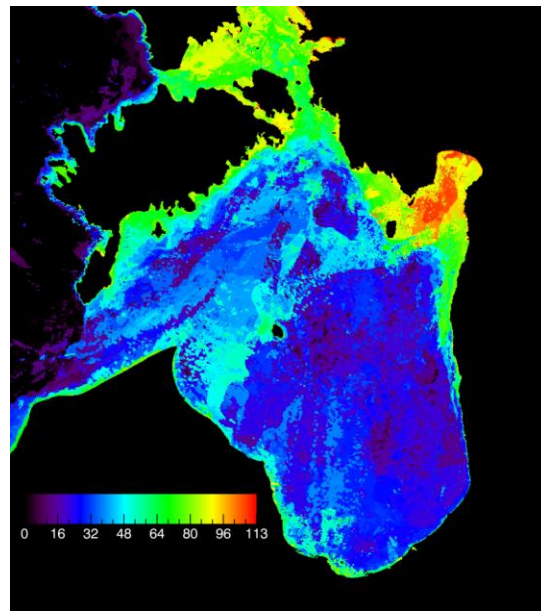
Average



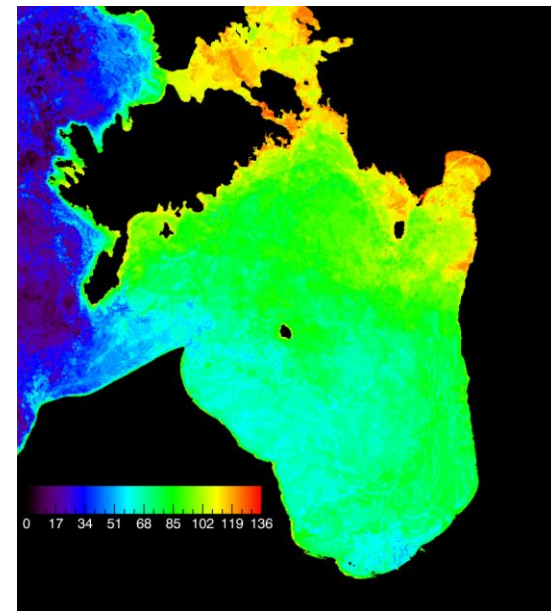
Mild



Medium



Severe



# Conclusions

- Wind field maps from SAR imagery
  - Monthly wind speed 10m
  - Annual wind speed
- Ice maps from MODIS imagery
  - Ice probability
  - Number of ice cover days