



Chapter 3.B.iii Sea ice

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GENERAL REMARKS

- Only few papers about sea ice climatology has been published since BACC -I. How much this chapter should be based on the existing BACC-1 text, updating or completely new ? Now fresh text, but rather short contribution.
- Parameters considered
 - maximum annual ice extent (MIB)
 - ice occurrence
 - freezing date, break-up date
 - ice thickness
- Focus on changes during the instrumental period (~1900 →)
- Some discussion on past changes will be included



SEA ICE IS STILL HAZARD FOR SHIPPING

2010

The screenshot shows a Mozilla Firefox browser window displaying a BBC News article. The address bar shows the URL: <http://news.bbc.co.uk/2/hi/8550687.stm>. The page title is "Dozens of ships freed from Baltic Sea ice". The article features a video player with a play button and the text "CLICK TO PLAY". The BBC News navigation bar is visible at the top, and a sidebar on the left lists various news categories like Africa, Americas, Asia-Pacific, Europe, Middle East, South Asia, UK, Business, Health, Science & Environment, Technology, and Entertainment. The page is dated Friday, 5 March 2010.

2010

The screenshot shows a page from The Telegraph website. The main headline is "Over 1000 trapped as ships stuck in Baltic ice". Below the headline, it says "Nearly 1,100 people were trapped on two passenger ferries and two other ships stuck in ice in the Baltic Sea." There is a large photograph of a Tallink ferry ship stuck in ice. The website's navigation bar includes sections like HOME, NEWS, SPORT, FINANCE, COMMENT, BLOGS, CULTURE, etc.

Dozens of merchant vessels stuck in packed ice in Gulf of Bothnia

Getting ships detached from the ice will take at least a week

Owing to the strong winds and the difficult ice situation, almost all ship traffic to and from harbours has been brought to a halt in Northern Finland. The ships cannot get to the harbour through the ice without the help of icebreakers.

2011

60 ships trapped in Baltic Sea Ice on Sunday: 5 icebreakers at work

By ktwop

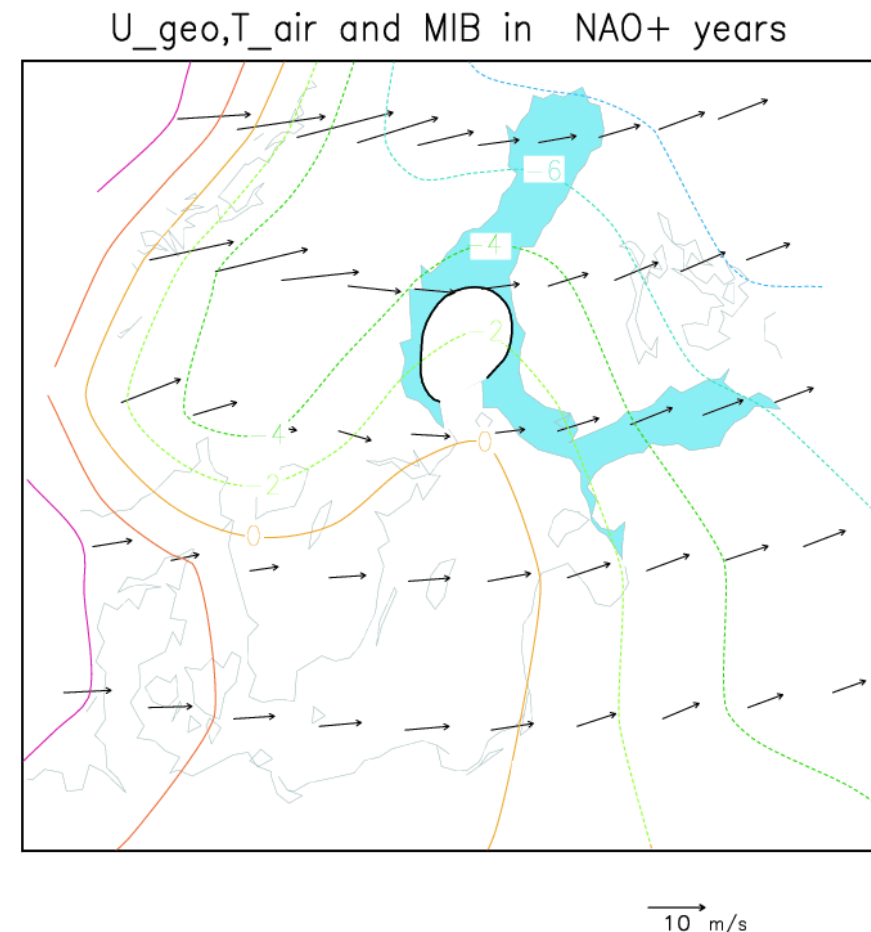
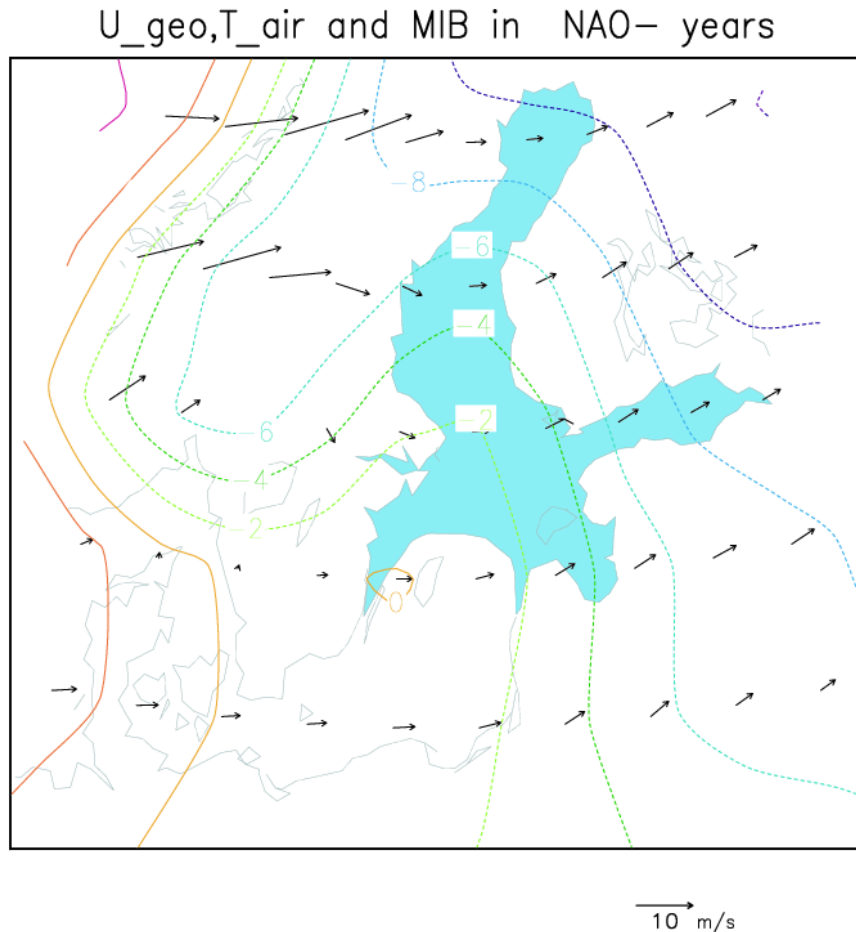


2011

Ships stuck in Baltic Sea ice

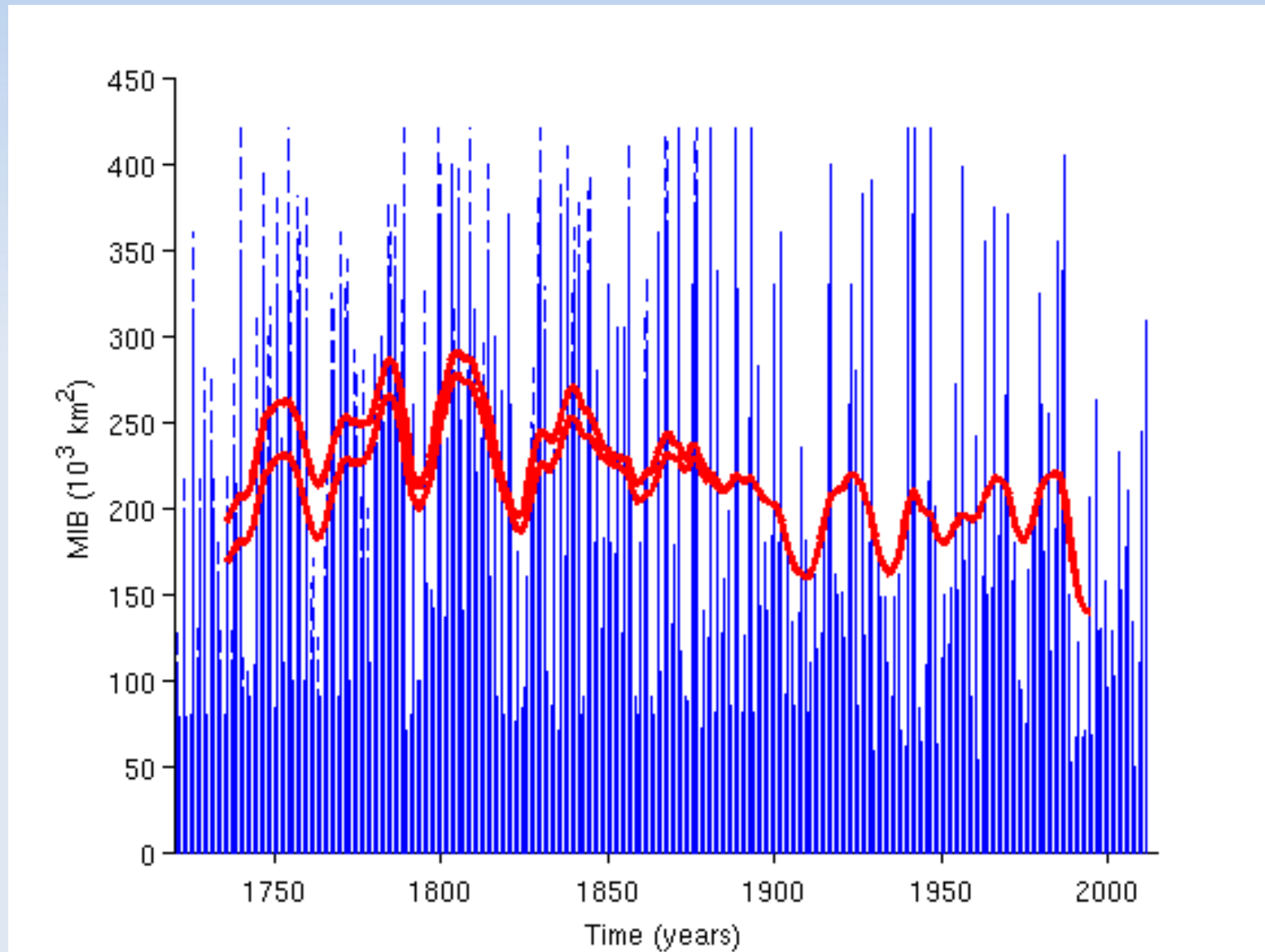
05/03/10 07:31 CET

IMPACT OF LARGE SCALE ATMOSPHERIC CIRCULATION ON ICE CONDITIONS

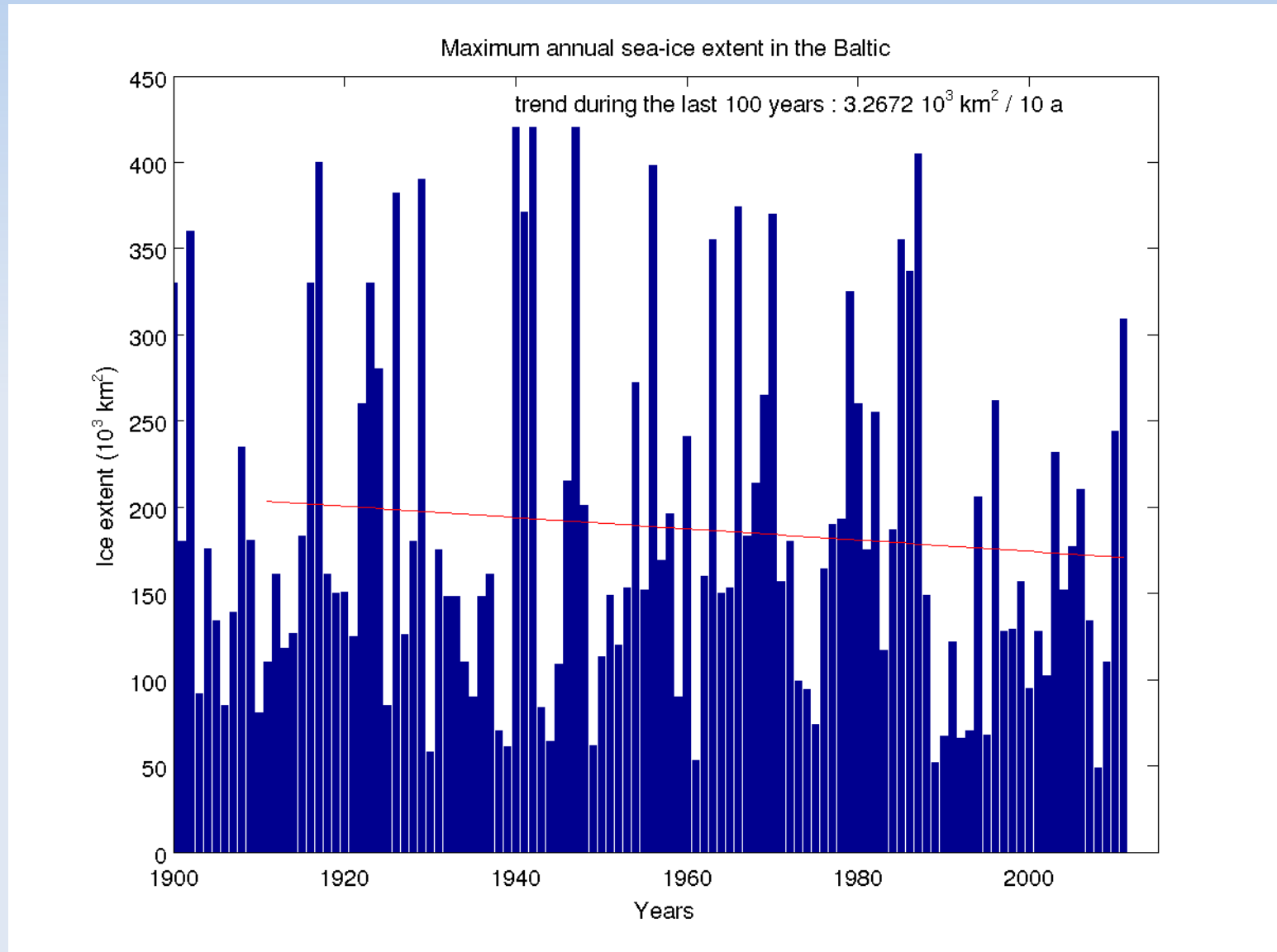


NAO > 0.5 : mean MIB : 121,000 km², range 45,000 - 337,000 km²,
NAO < 0.5 : mean MIB : 259,000 km², range 150,000 - 405,000 km²

ANNUAL MAXIMUM ICE EXTENT OF THE BALTIC (MIB)



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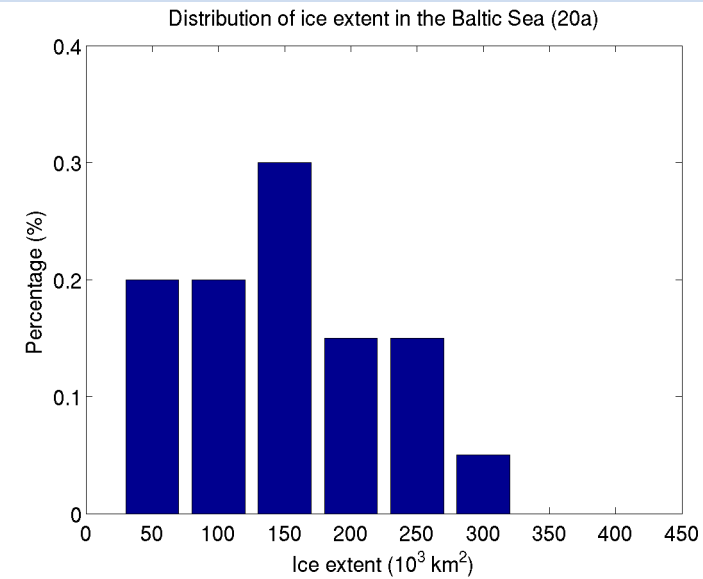
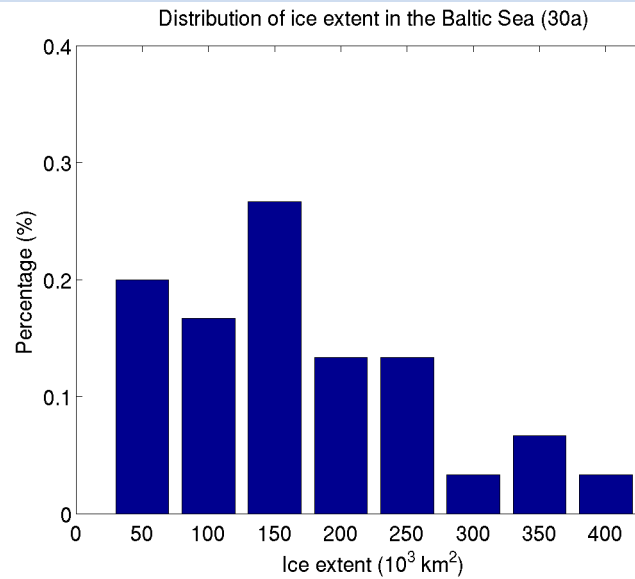
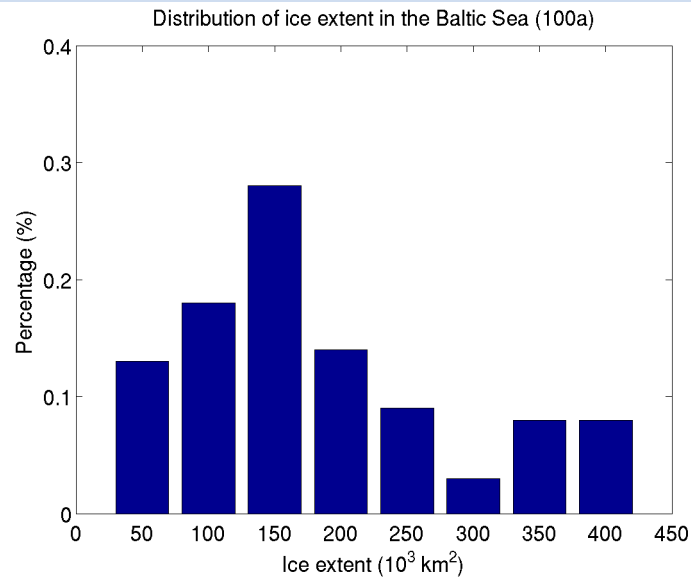


ANNUAL MAXIMUM ICE EXTENT OF THE BALTIC (MIB)

1910 - 2011

1980 - 2011

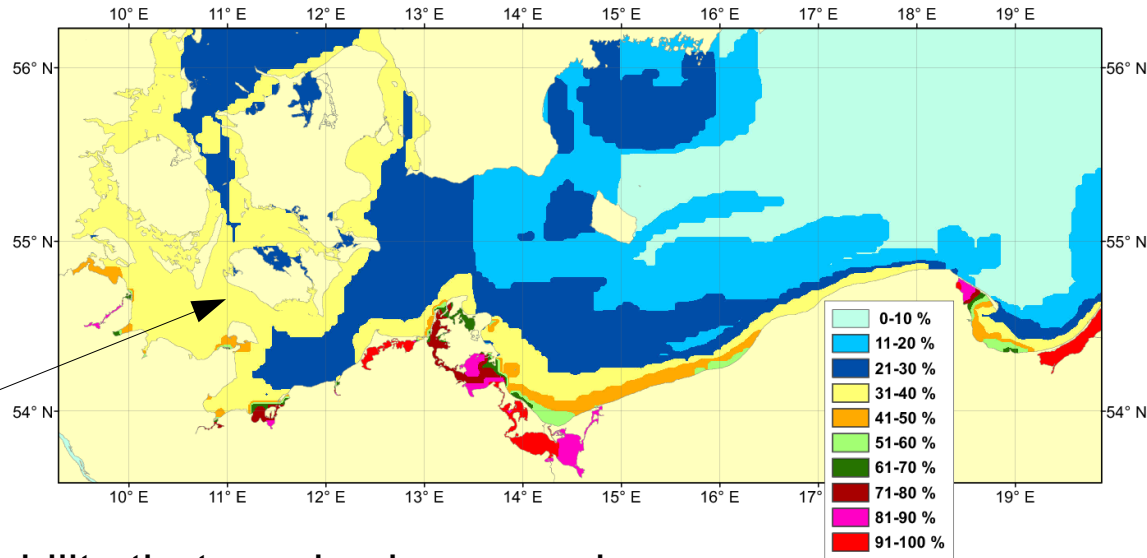
1990 - 2011



Modal MIB has remained same, but fraction of severe winter has decreased and mild winters increased during the last decades

ICE OCCURRENCE CHANGES IN THE SOUTHERN BALTIC

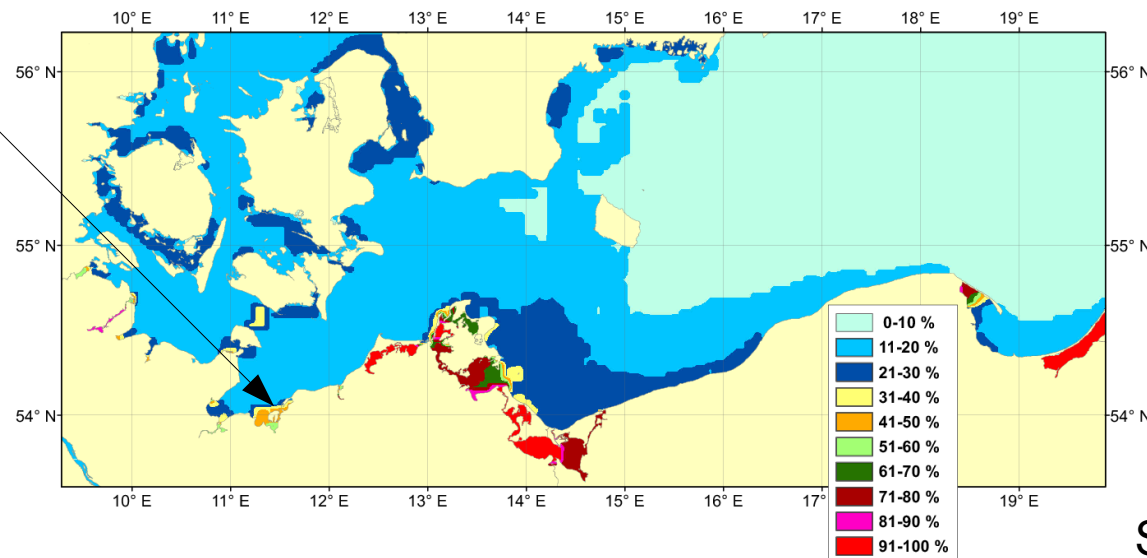
Frequency of ice occurrence in the 30-year period 1961 - 1990



1961-1990

31 – 40 % probability that sea ice is occurred

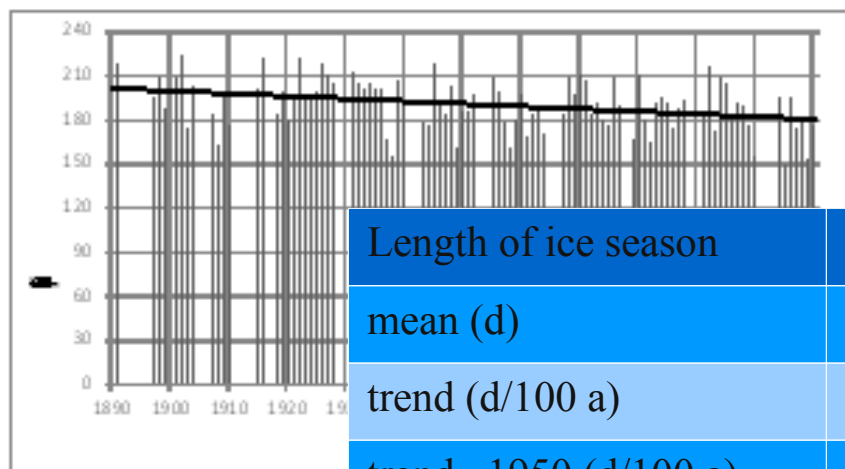
Frequency of ice occurrence in the 30-year period 1981 - 2010



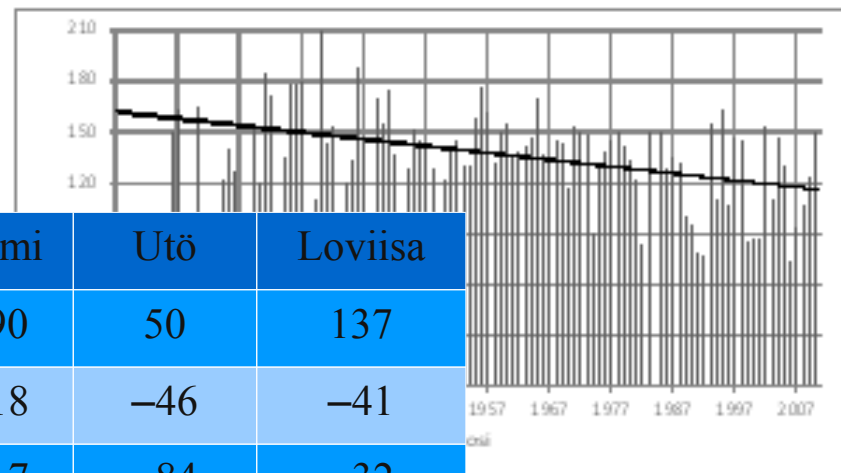
1961-2010

LENGTH OF ICE SEASON AND ICE THICKNESS (Update for Jevrejeva et al. 2004 paper)

a)

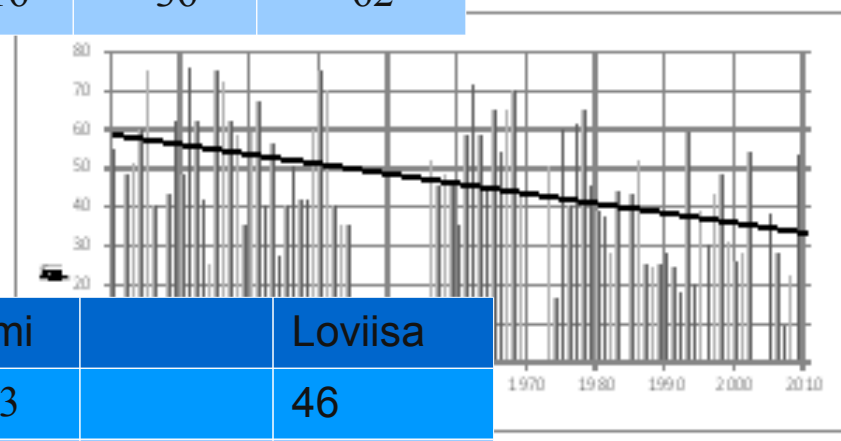
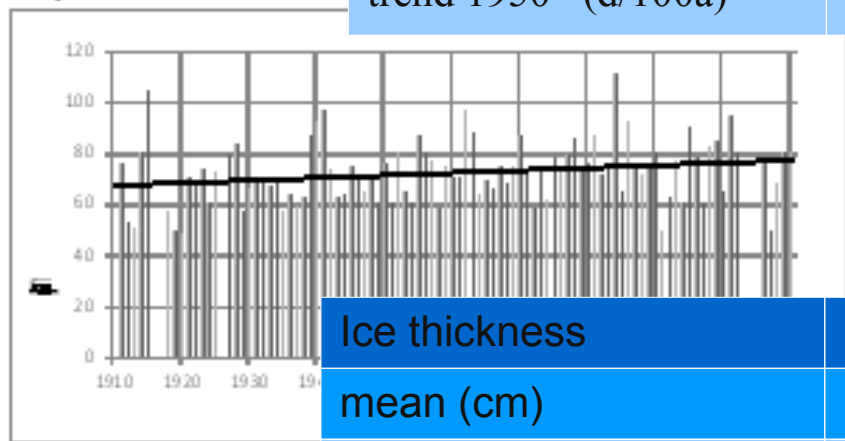


b)



Length of ice season	Kemi	Utö	Loviisa
mean (d)	190	50	137
trend (d/100 a)	-18	-46	-41
trend -1950 (d/100 a)	-17	-84	-32
trend 1950- (d/100a)	-16	-36	-62

c)



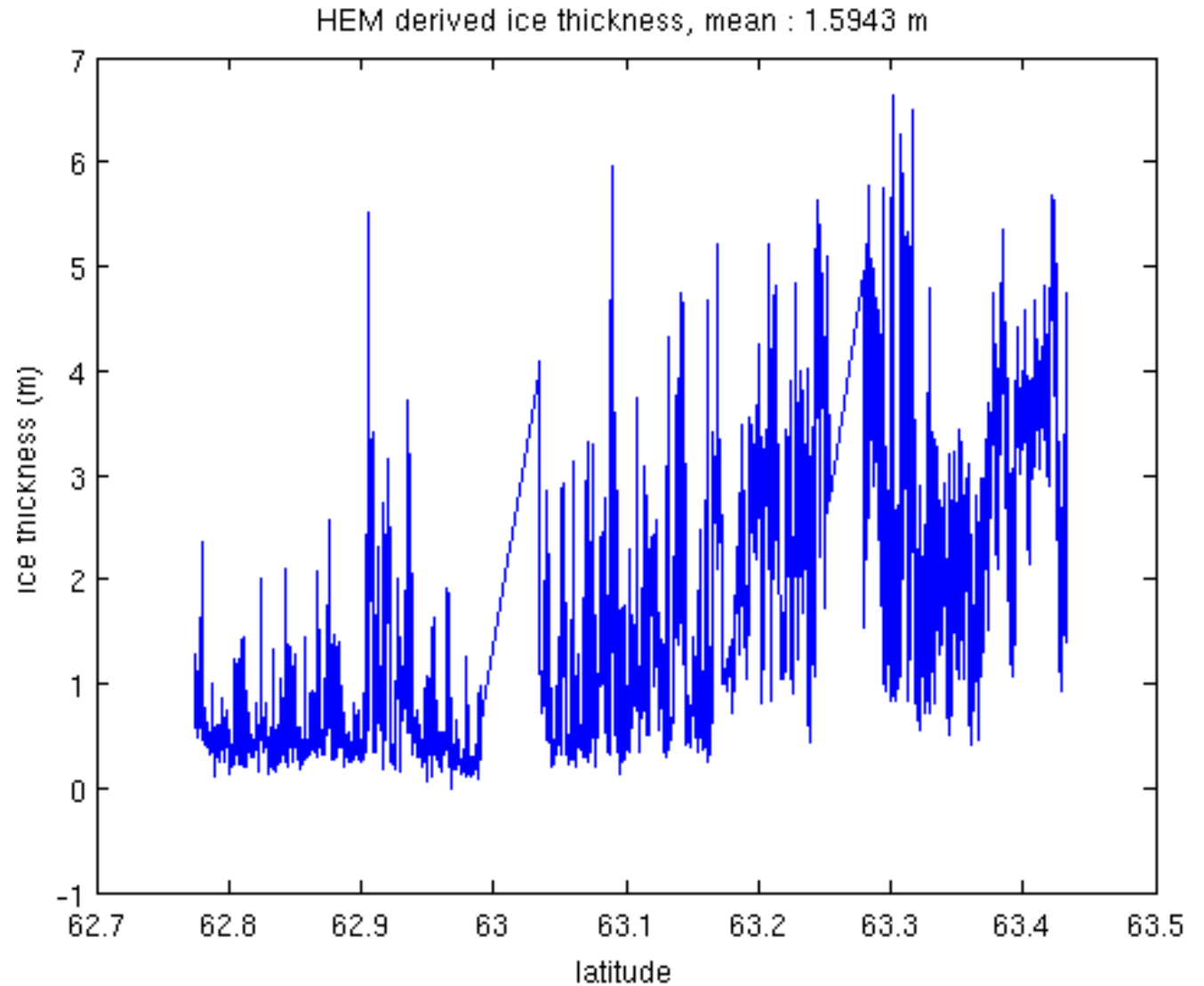
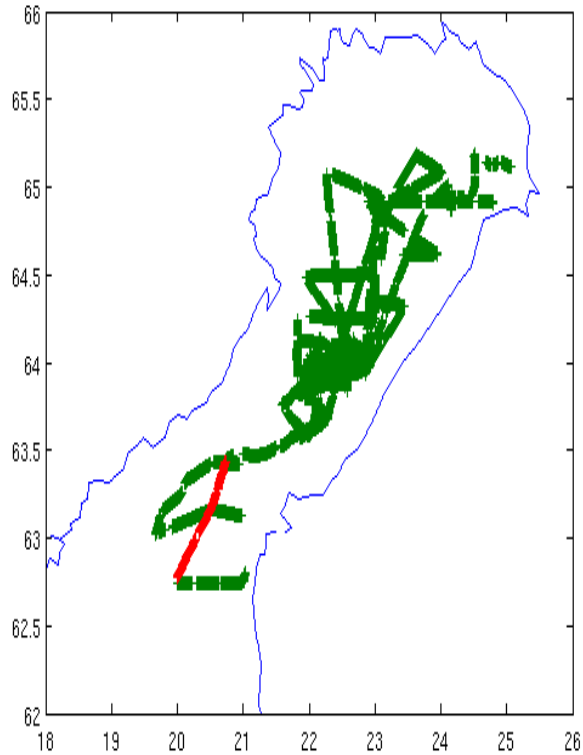
Ice thickness	Kemi	Utö	Loviisa
mean (cm)	73		46
trend (cm/100 a)	9		-25
trend -1950 (cm/100 a)	13		-29
trend 1950- (cm/100a)	4		-52

ICE THICKNESS OF THE DRIFT ICE MAJOR LACK OF THE MONITORING PROGRAMME

HEM ICE THICKNESS DATA

ICE THICKNESS (RED SECTION)

MEASUREMENT TRACKS





CHANGES IN MAJOR FINDING - NONE

- Inter-annual variability large, but it has always been, interestingly very mild and very severe winters are some times clustered (1873-1876, 1938-1941, 1985-1990, 2007-2011). In media and even some scientist are claiming that the recent inter-annual variability is an evidence that “extreme events will become more common” as the CGM's project.
- Consistent decreasing trends in annual maximum ice extent of the Baltic Sea has decreases and and the length of the ice season.
- No consistent trend of the fast ice thickness stations, however we don't have any long term ice thickness time series from the drift ice region. (Opinion : sea ice mean ice thickness i.e. ice mass of the entire Baltic Sea has decreased).