

# Antarctic sea ice cover during the Heroic Age of Exploration

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Thanks to:

Philip Brohan (Met Office), Clive Wilkinson  
(UEA), the ICOADS team and Royal Geog. Soc.

# Imperial Trans Antarctic Expedition

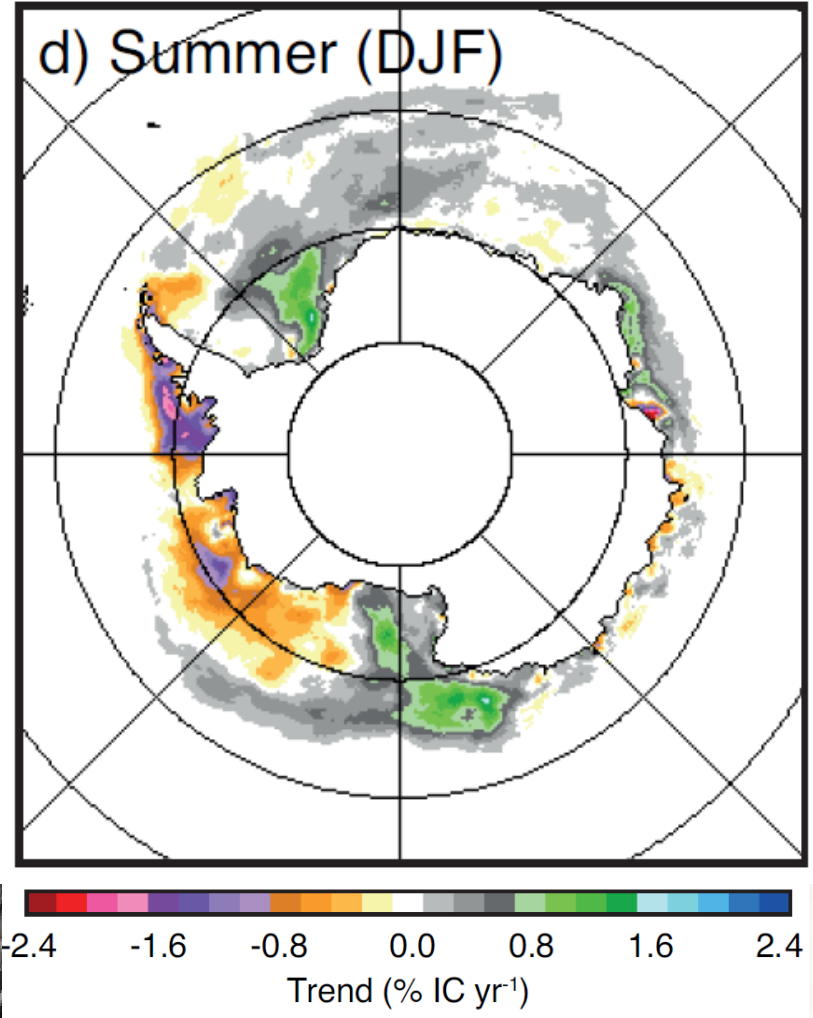
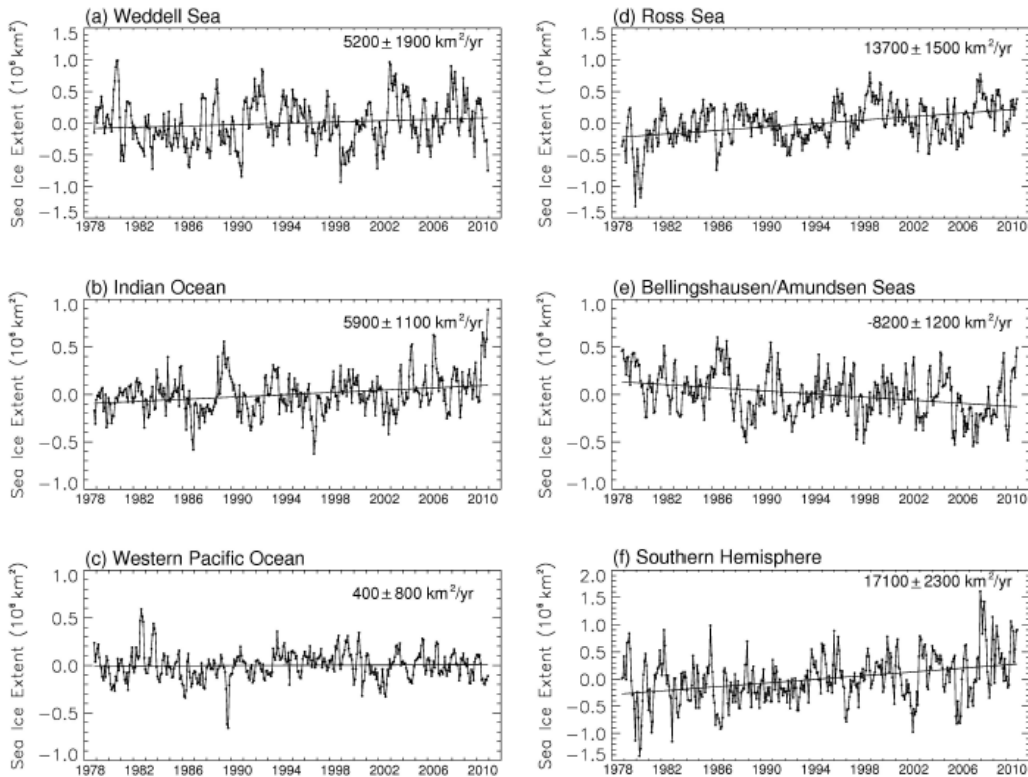


•Were the ice conditions unusual?

How have conditions changed since Shackletons time?



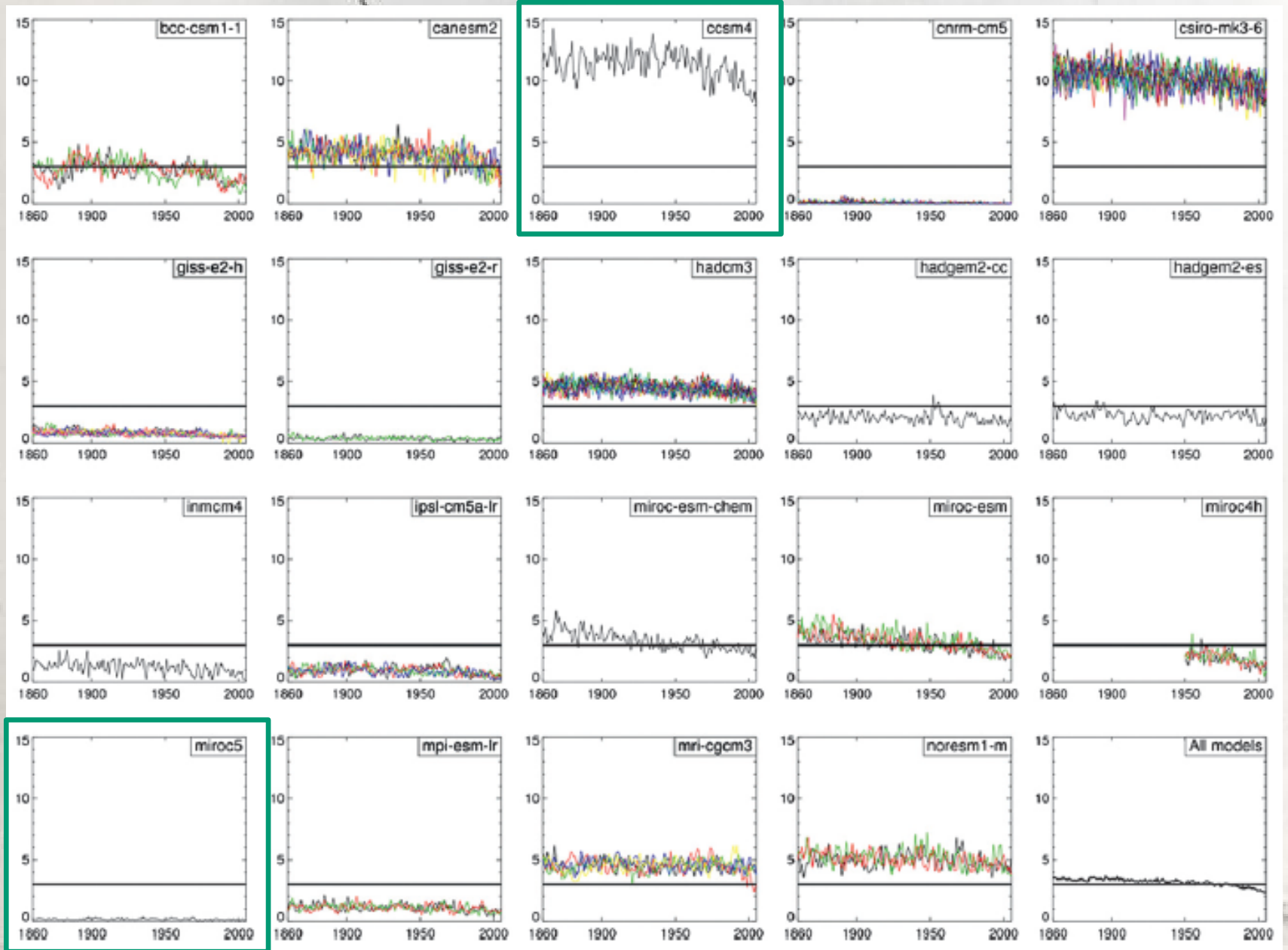
# Satellite-era Trends



- Positive trends in the Weddell and Ross sea sectors
- Negative or constant elsewhere.

Parkinson and Cavalieri (2012)  
IPCC Chapter 4 (2013)

# CMIP5 model trends (Summer sea ice extent)



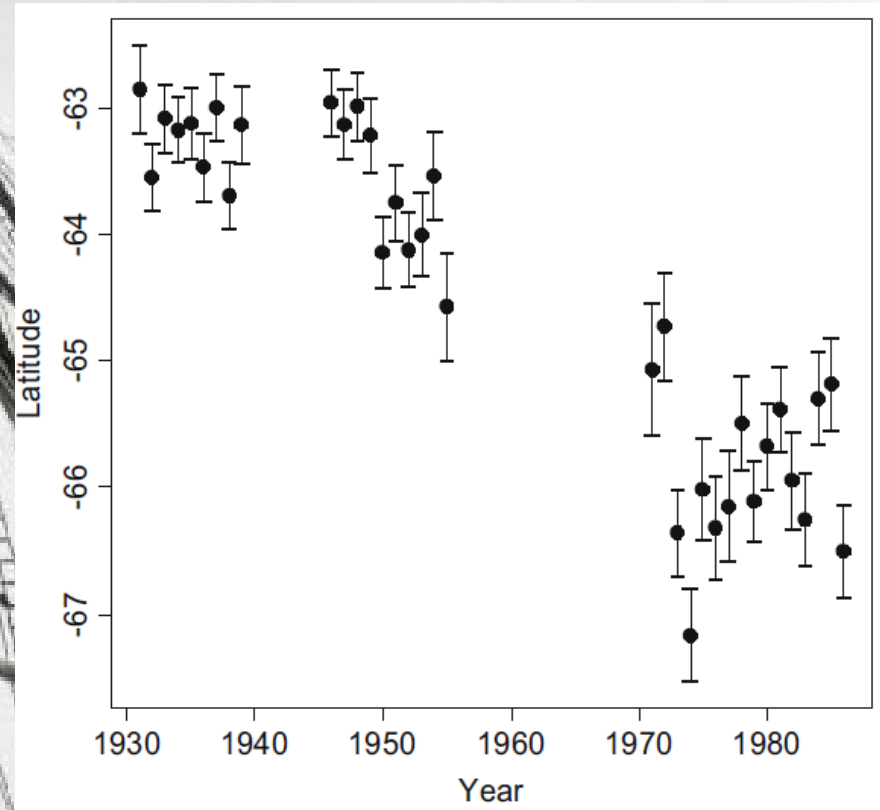
## Pre-Satellite observations.

Whaling records:

- Show a  $2.8^\circ$  southward shift in ice edge latitude between 1930s and 1970/80s (de la Mare, 1997 & 2009).
- Controversial due to assumptions made about the position of whale catch to ice edge (e.g. Ackley et al., 2003).

Direct observations from ship logbooks:

- Less abundant, but also less open to interpretation



# Logbooks

U.S.M. 107, 1914.

CHIEF OFFICER'S LOG, S.S. *Indivance*

From South Georgia

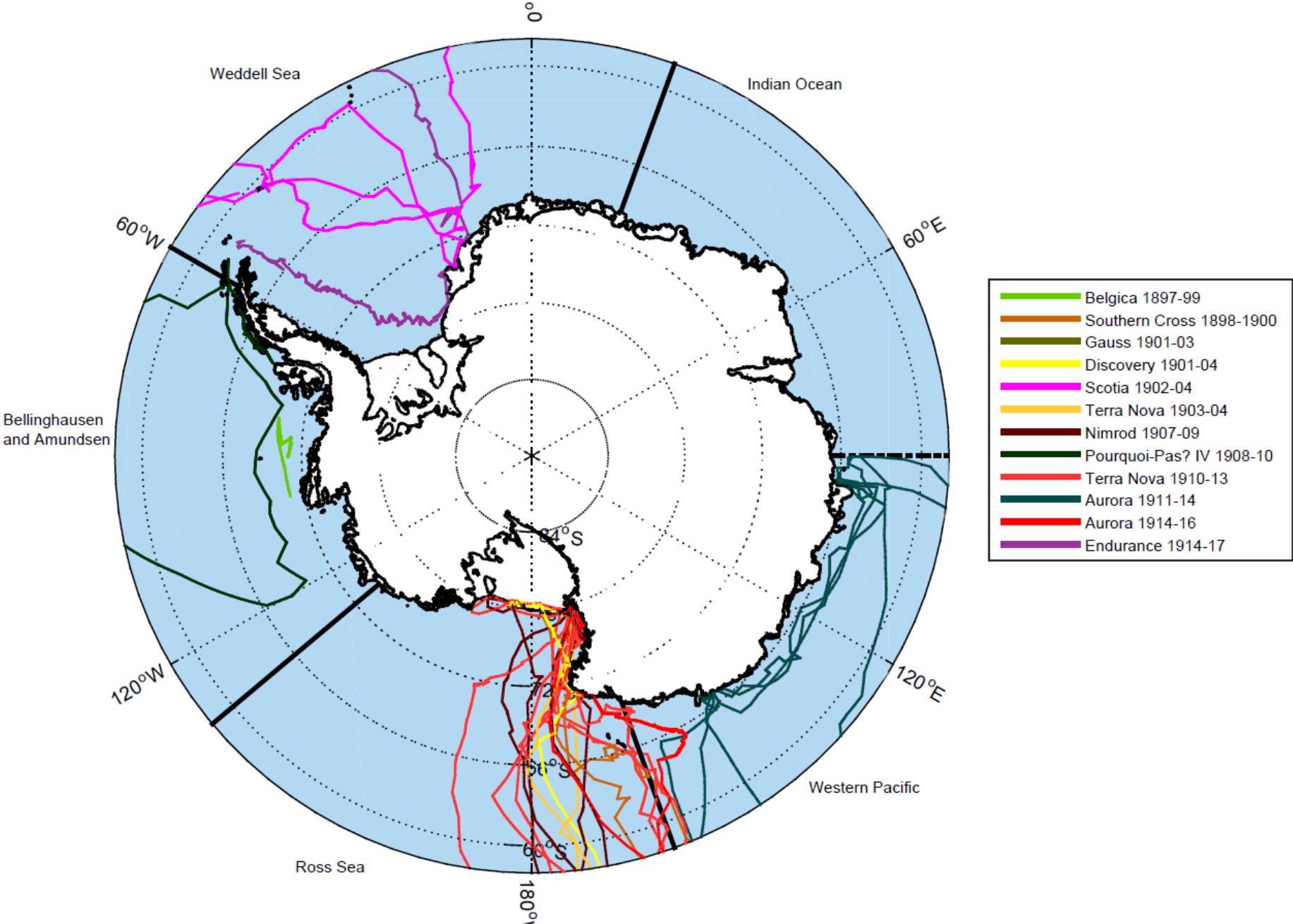
ICE REMARKS.	
1 P.M.	S.S.W.
2 "	
3 "	
4 "	
5 "	Sly W.
6 "	
7 "	Sly E.
8 "	
9 "	South.
10 "	

From South Georgia Towards Weddell Sea 1<sup>st</sup> day January 1915

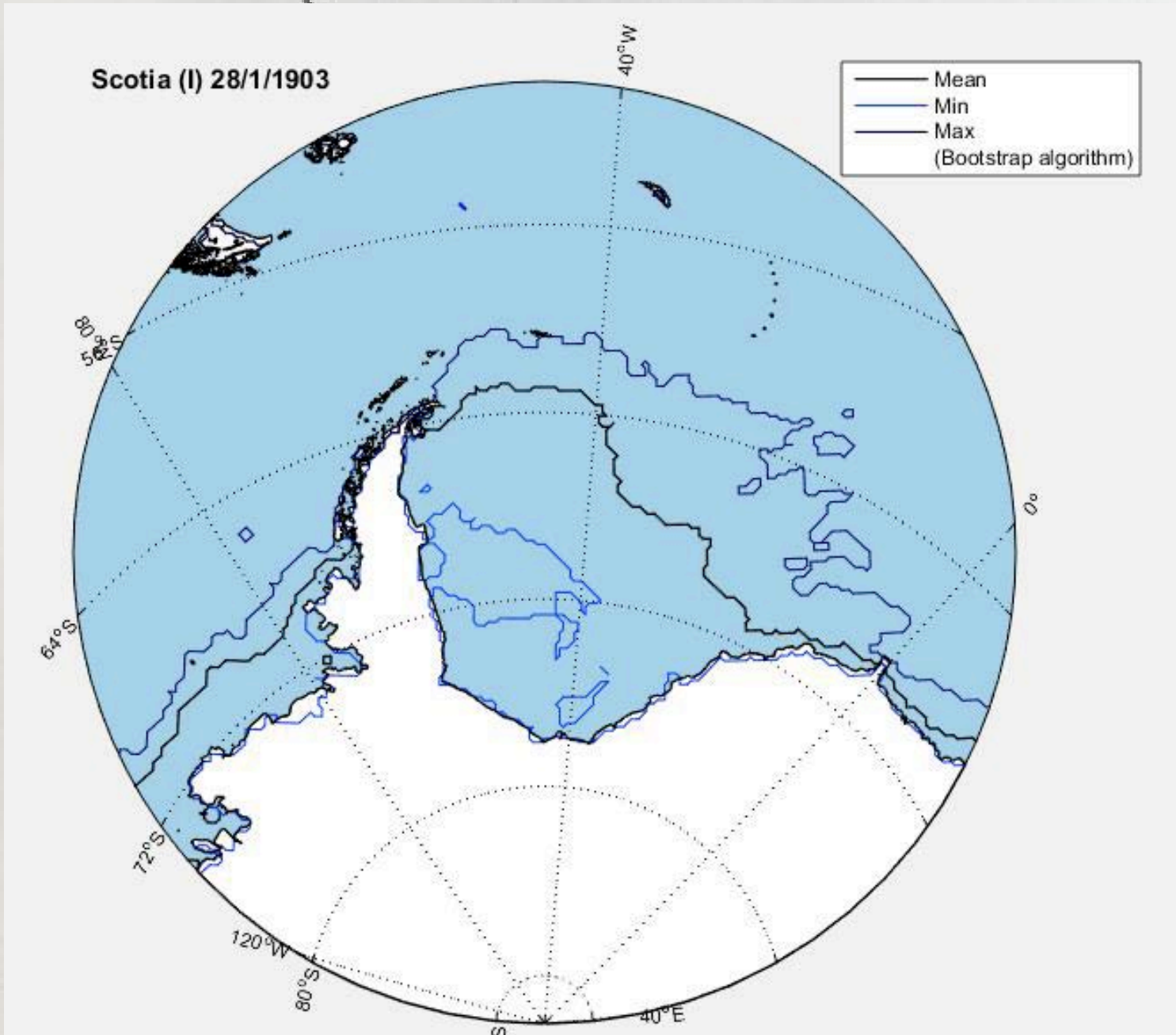
ICE REMARKS	REMARKS, &c.
	Friday
Long leads.	Light breeze. Cloudy weather. Occasional snow squalls.
Open pack.	Gentle to mod breeze. Overcast & cloudy. Clear weather.
Long leads.	Snow & antarctic petrels. 5. Adelia & 3. Emperor penguins.
Open pack.	Mod breeze. Overcast sky. Hazy to thick with snow. Pelges jumped day.
Long leads.	20. seals including 1. Ross seal.
	Overcast & cloudy. Continuous light snow.
Long leads.	Fresh to strong breeze. Overcast & cloudy with frequent snow squalls.
Open pack.	
Sea half	6. White rumped terns.

	Overcast & cloudy. Continuous light snow.
Long leads.	Fresh to strong breeze. Overcast & cloudy with frequent snow squalls.
Open pack.	
Sea half	6. White rumped terns.

# Expeditions digitised by ICOADS or us.



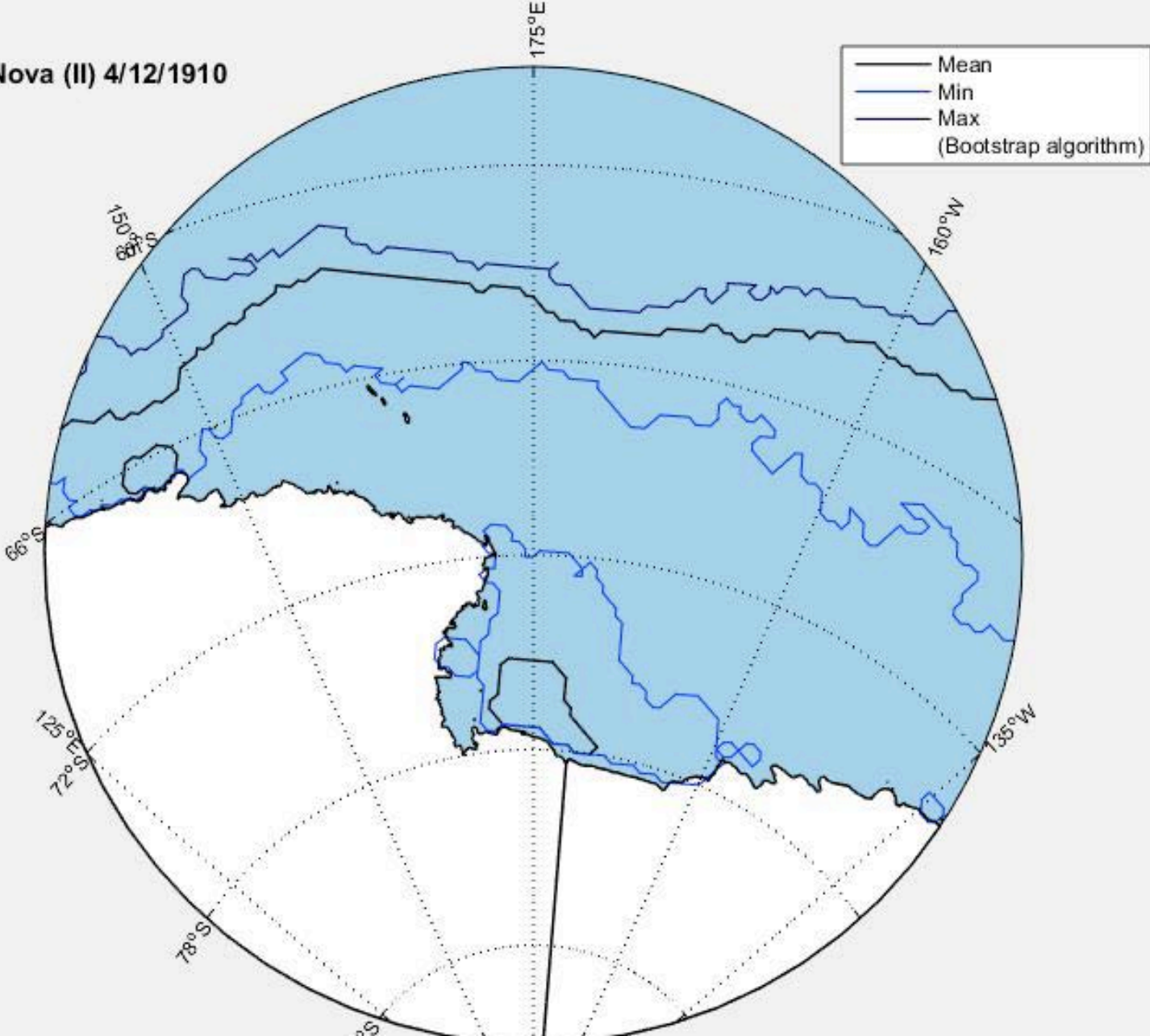
# Voyage of the Scotia (Scottish expedition of 1902-1903)



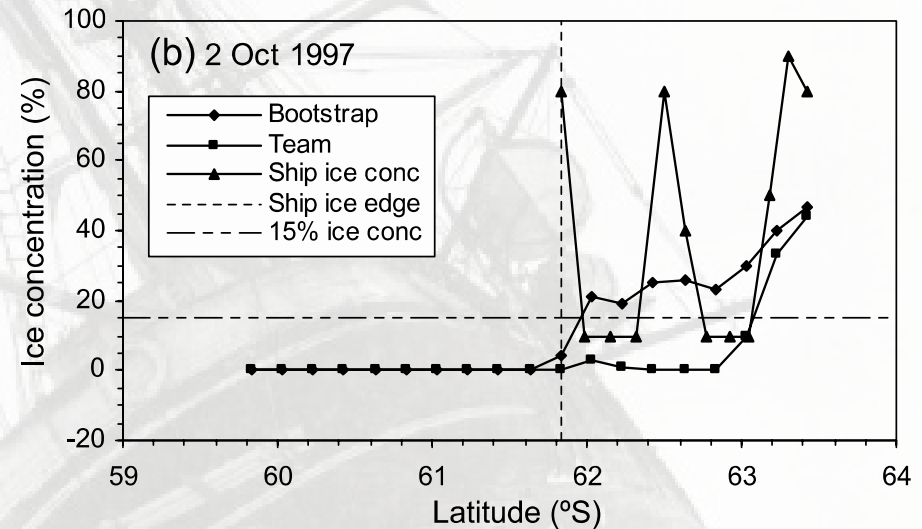


# Scott's Terra Nova Expedition (1910-1913)

Terra Nova (II) 4/12/1910

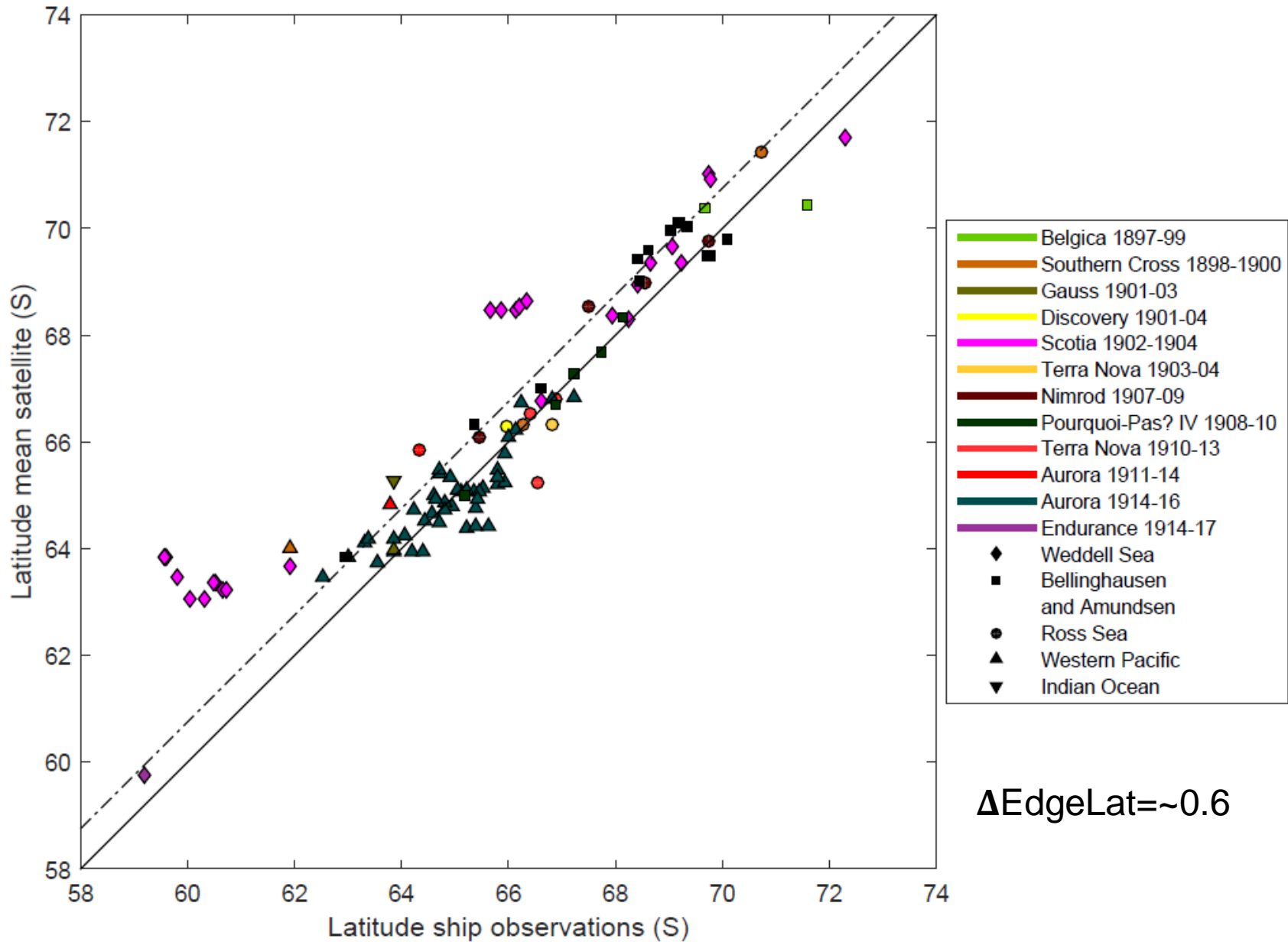


# Difficulties in satellite vs. ship ice edge observations

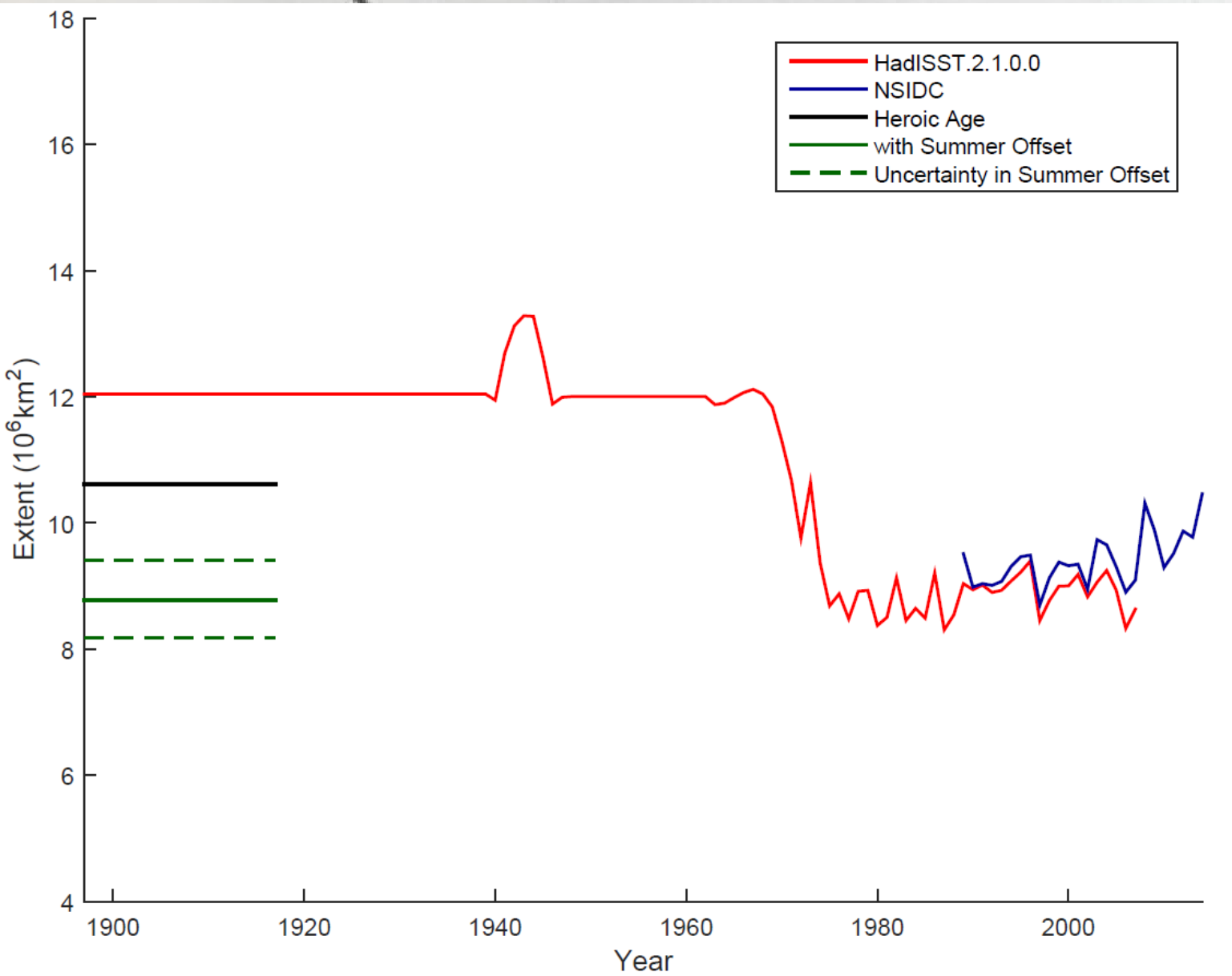


The ship observed sea ice edge is on average  $0.75 \pm 0.61^\circ$  north of PM Bootstrap ice edge  
(Worby and Comiso, 2004)

# Have things changed?



# Comparison to HadISST



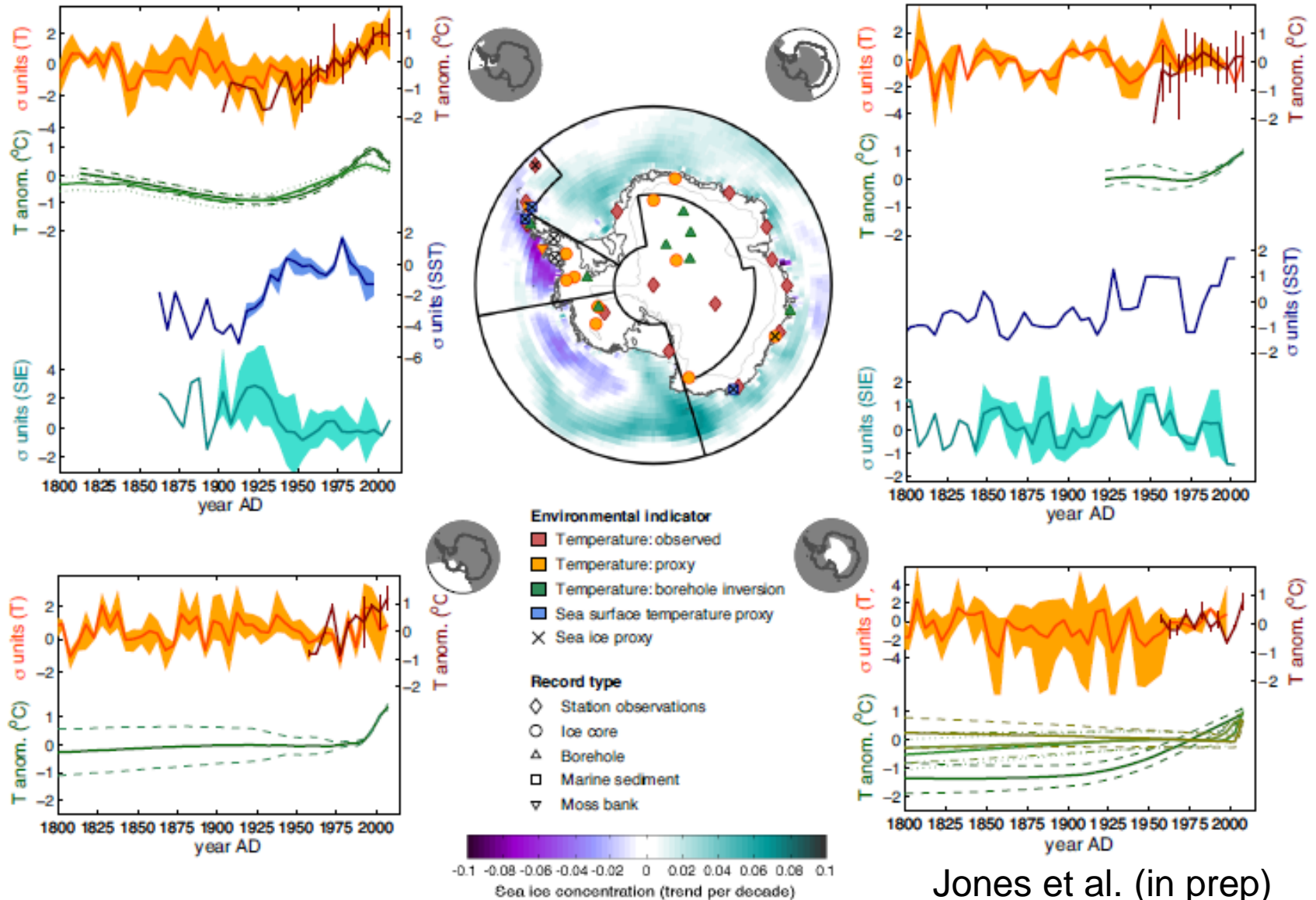
## Tentative Conclusions

- We've gathered over 100 ice edge data points from ships logbooks from the Heroic Age of Exploration (1900-1917) from ICOADS or Primary source (actual logbooks).
- The change in sea ice cover is small ( $\Delta \sim 0.6^\circ$ ), only identifiable difference is in the Weddel Sea (where  $\Delta \text{IceEdge} \sim 1.9^\circ$ ).
- Useful pinning point for constraining GCMs/Sea ice proxy's.



**QUESTIONS?**

# Evidence from temperature, SST and sea ice proxies



Jones et al. (in prep)

Proxy records of surface air temperature and sea ice extent were grouped into four different sectors based on cross-correlation and PCA analysis

# Map of points

