Antarctic sea ice cover during the Heroic Age of Exploration

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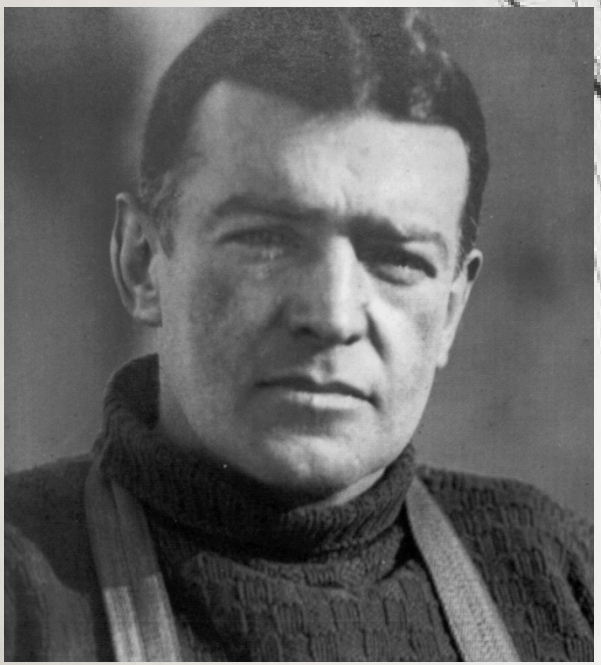
Thanks to:
Philip Brohan (Met Office), Clive Wilkinson (UEA), the ICOADS team and Royal Geog. Soc.

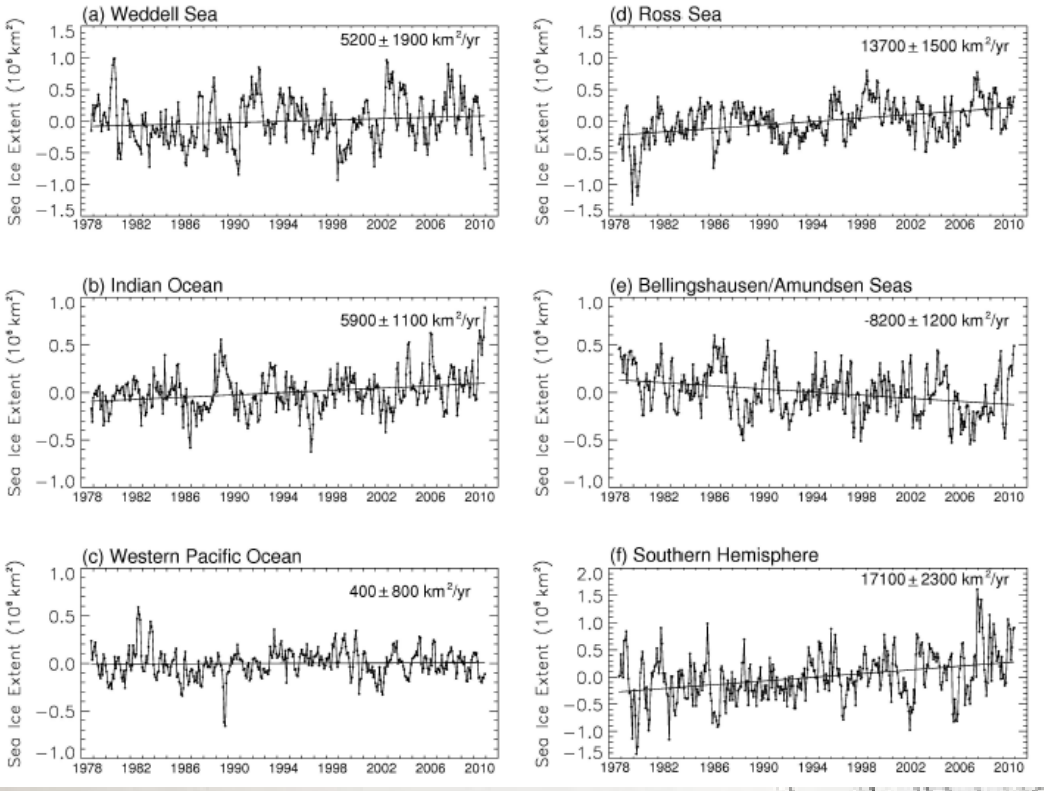
Imperial Trans Antarctic Expedition

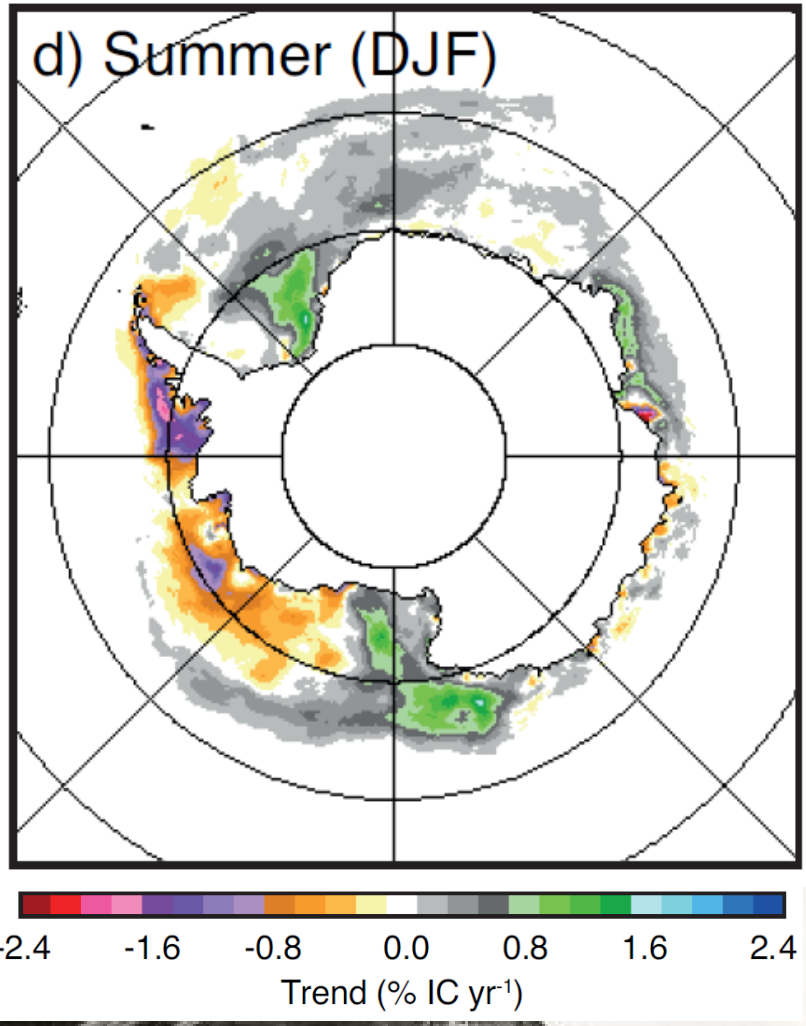


- **Were the ice conditions unusual?**

How have conditions changed since Shackletons time?

Satellite-era Trends

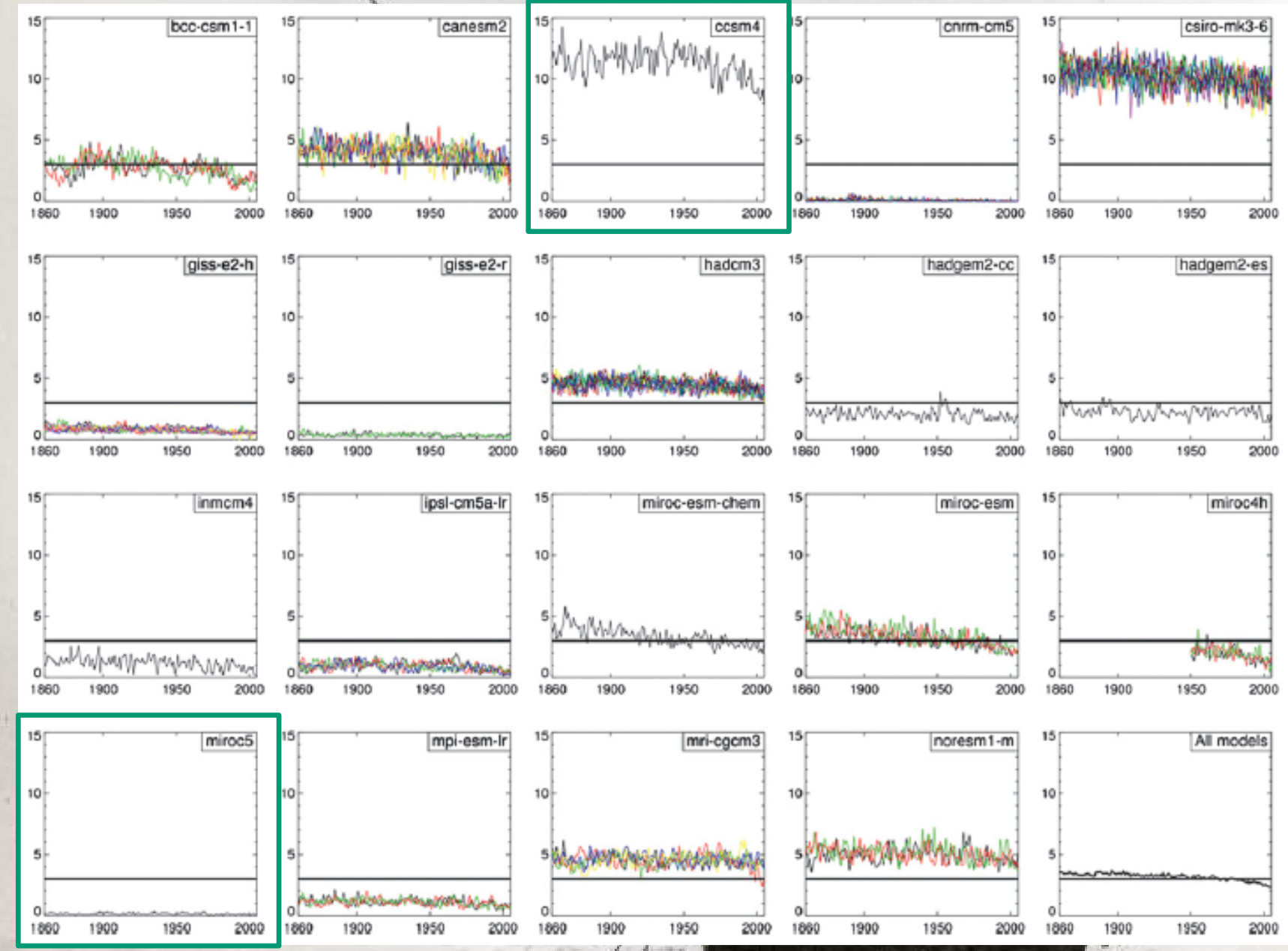




- Positive trends in the Weddell and Ross sea sectors
- Negative or constant elsewhere.

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

CMIP5 model trends (Summer sea ice extent)



Turner et al. (2012)

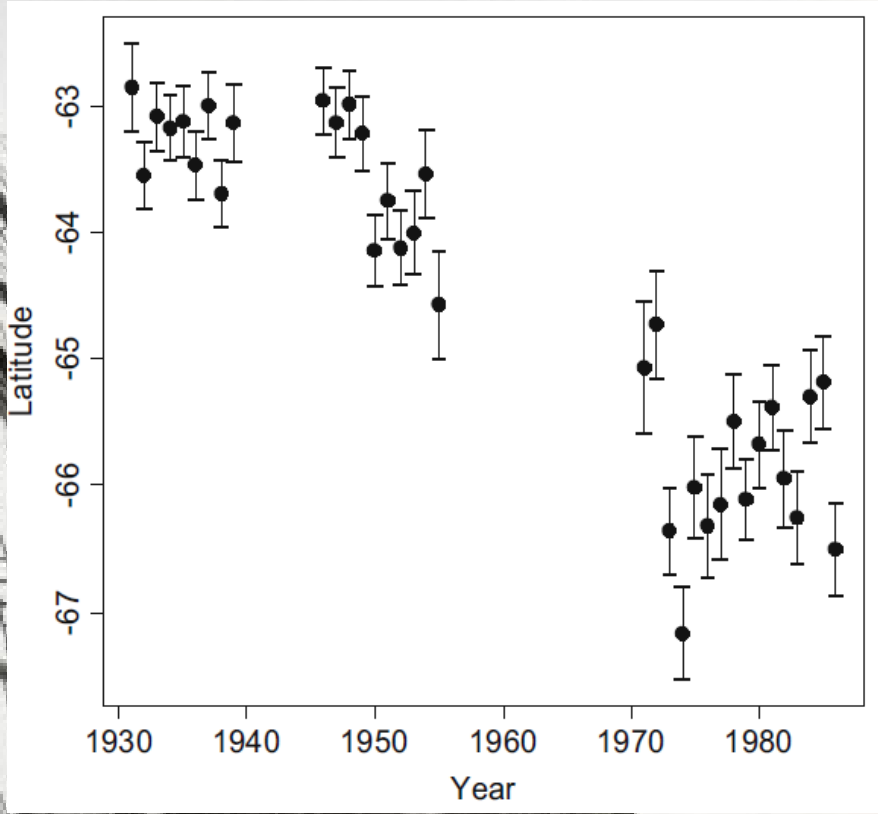
Pre-Satellite observations.

Whaling records:

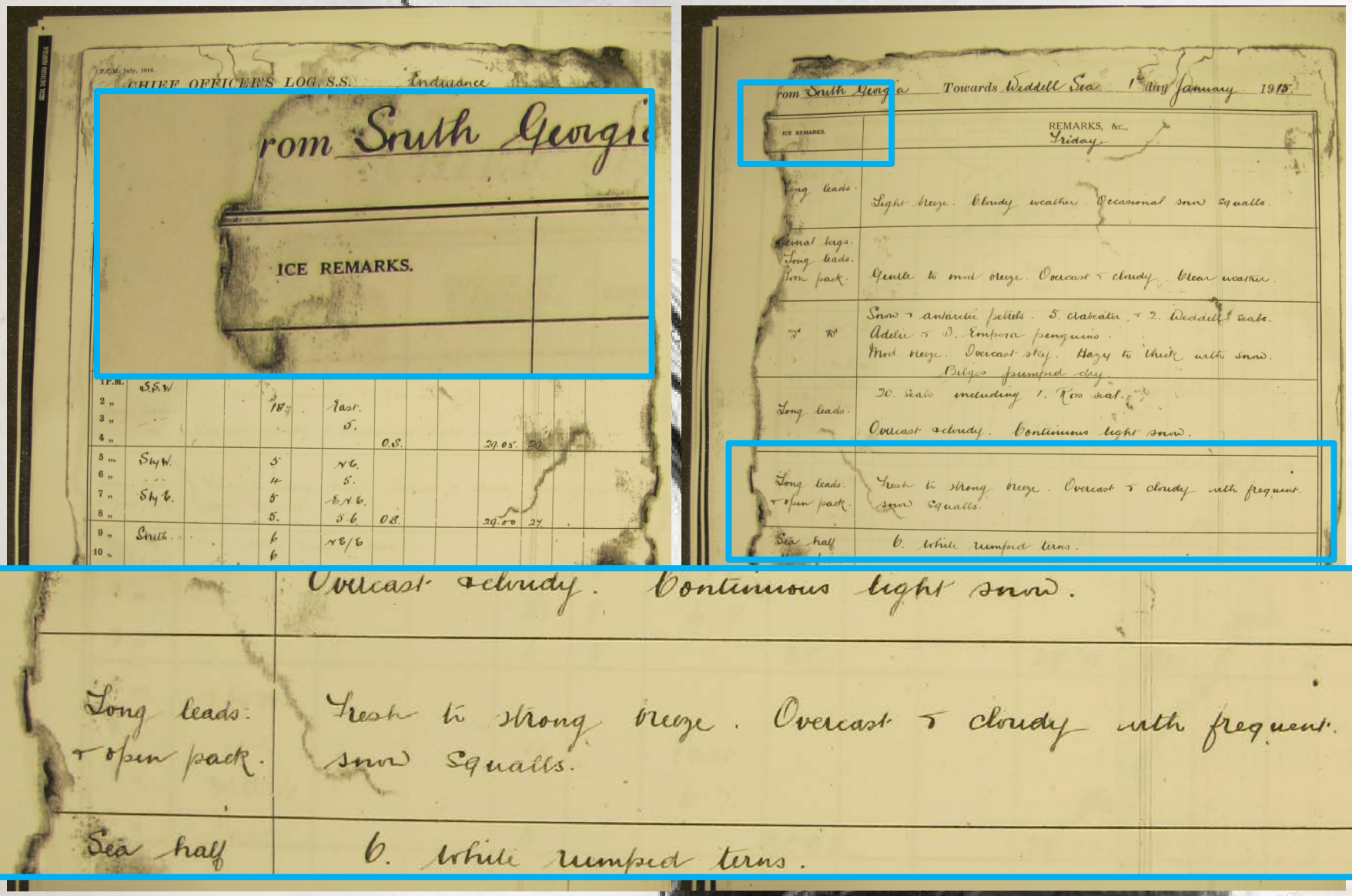
- Show a 2.8º southward shift in ice edge latitude between 1930s and 1970/80s (de la Mare, 1997 & 2009).
- Controversial due to assumptions made about the position of whale catch to ice edge (e.g. Ackley et al., 2003).

Direct observations from ship logbooks:

- Less abundant, but also less open to interpretation



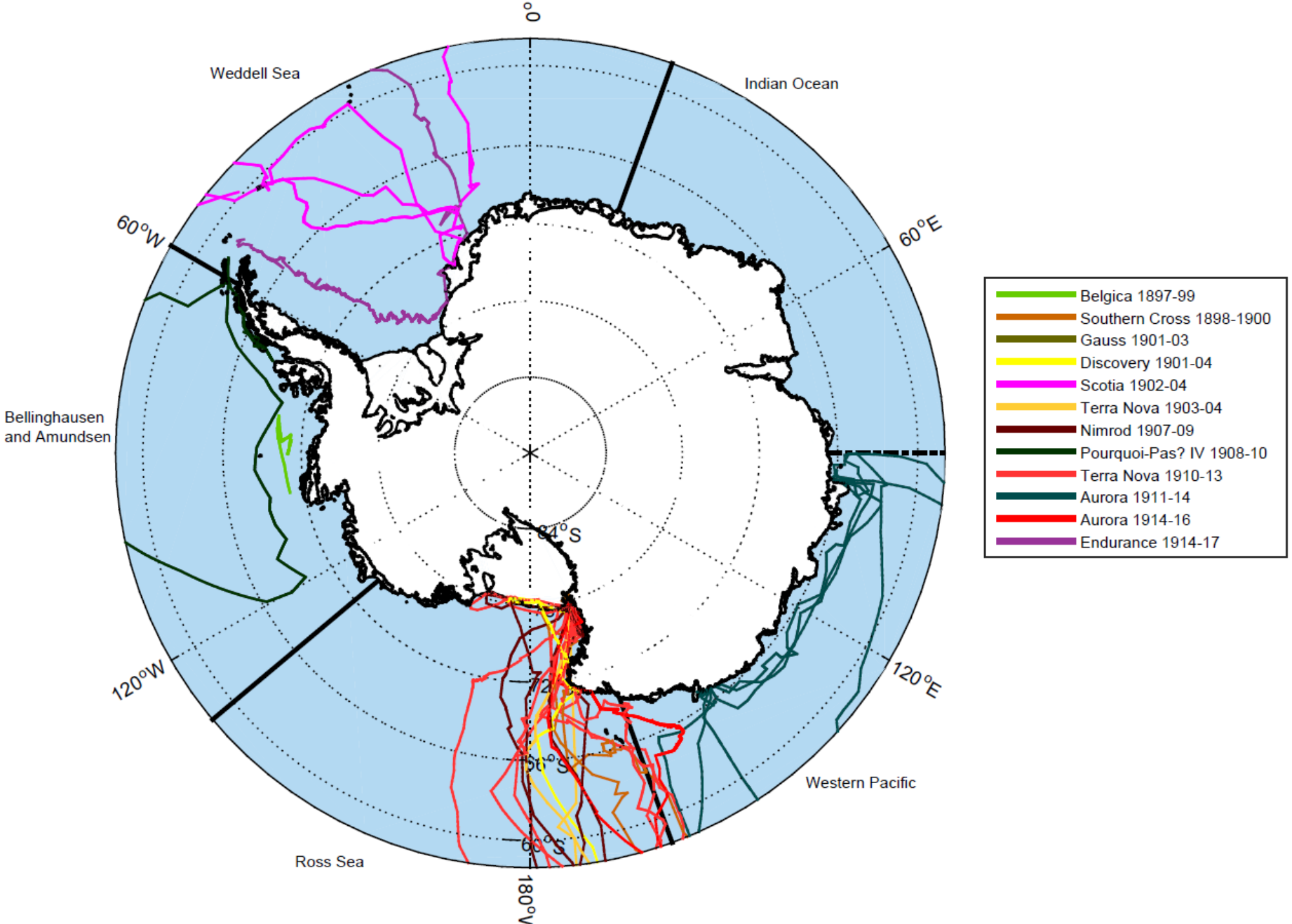
Logbooks



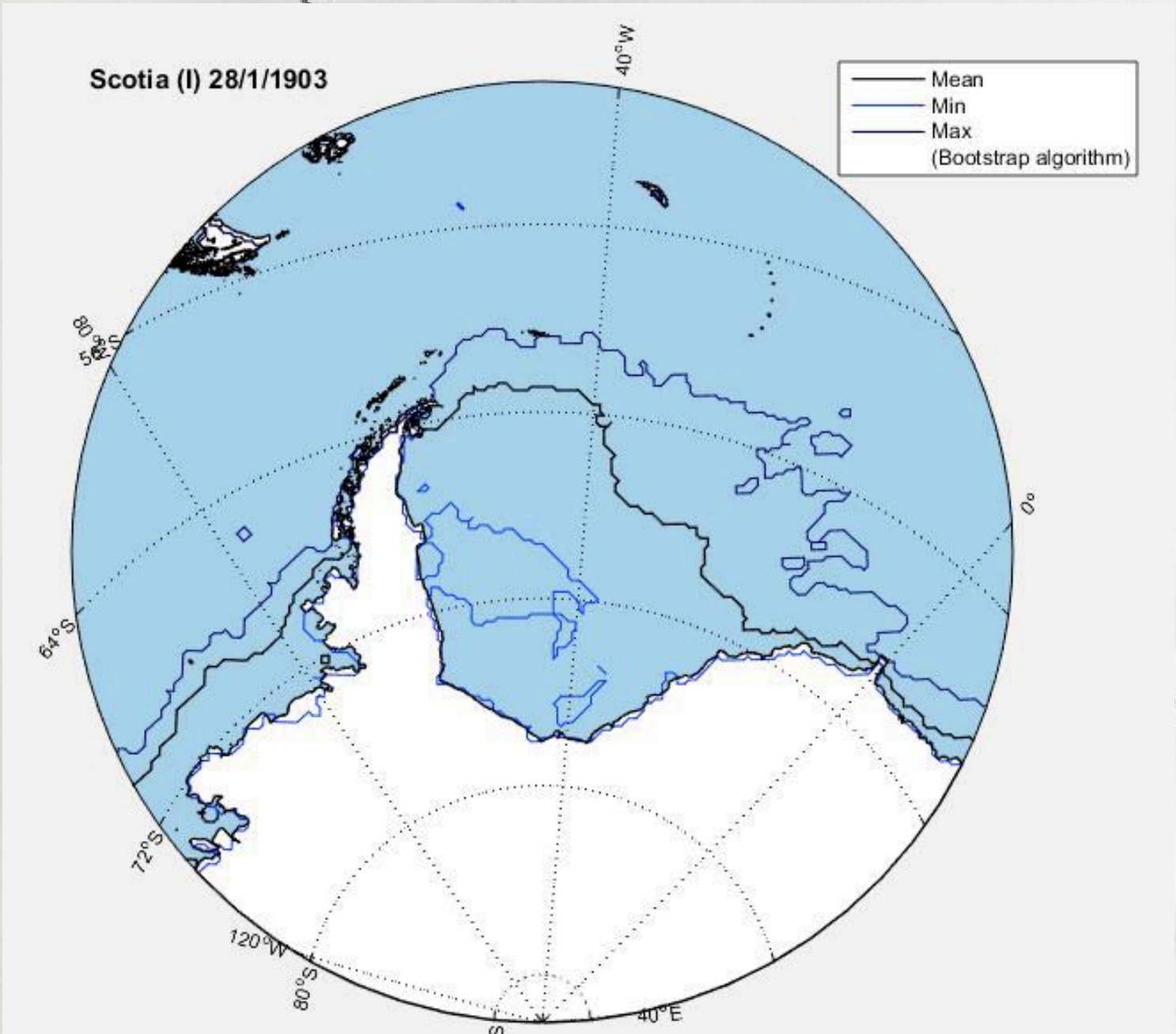
rom South Georgia Towards Weddell Sea 1st day January 1915.

ICE REMARKS.	REMARKS, &c., Friday.
Long leads.	Light breeze. Cloudy weather. Occasional snow squalls.
Several bags. Long leads. Few pack.	Gentle to mod breeze. Overcast & cloudy. Clear weather.
" "	Snow & antarctic petrels. 5. crabeater & 2. Weddell seals. Adelie & 3. Emperor penguins. Mod. breeze. Overcast sky. Hazy to thick with snow. Bilges pumped dry.
Long leads.	20. seals including 1. Ross seal. Overcast & cloudy. Continuous light snow.
Long leads. & open pack.	Fresh to strong breeze. Overcast & cloudy with frequent snow squalls.
Sea half	6. white rumped terns.

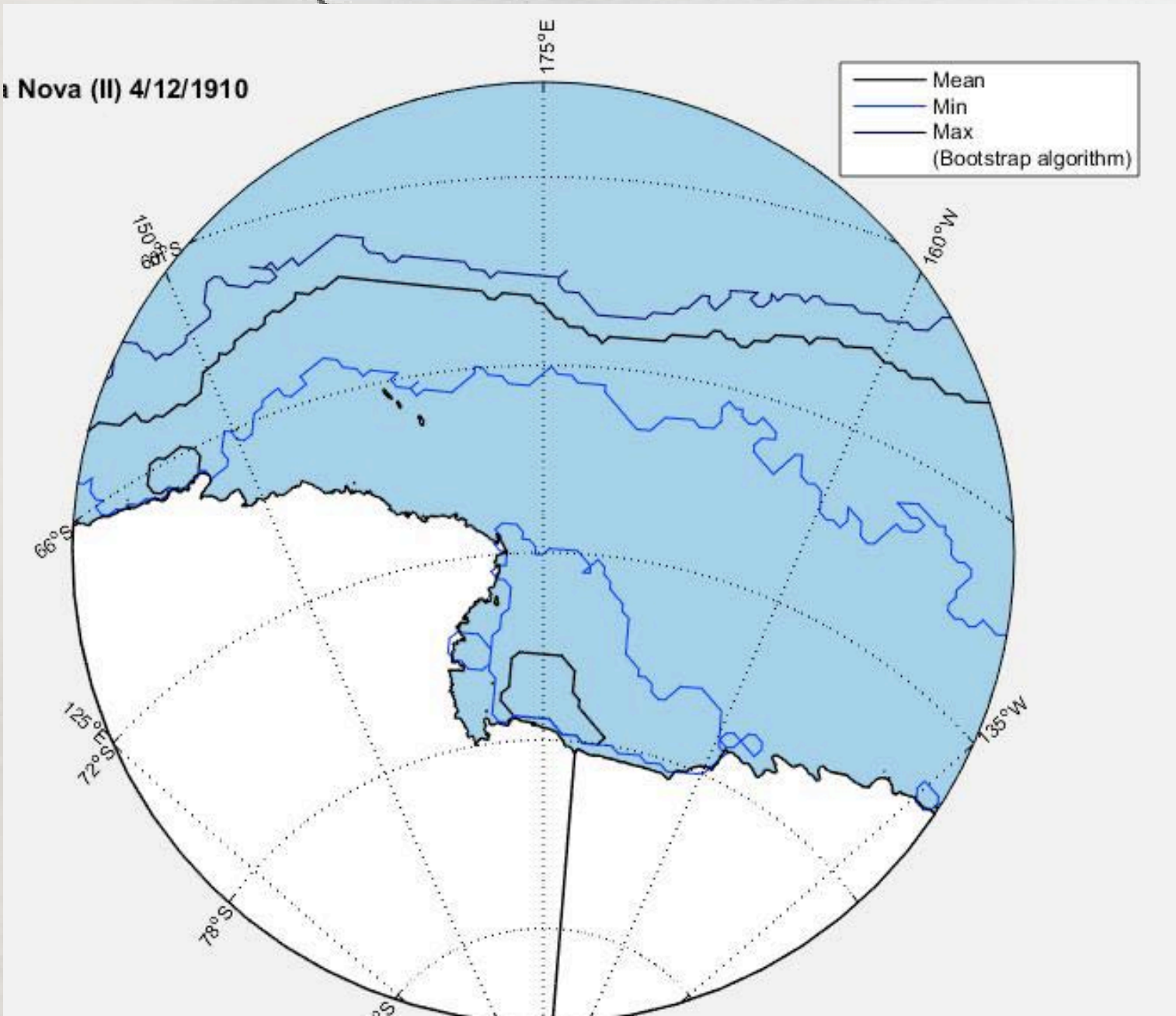
Expeditions digitised by ICOADS or us.



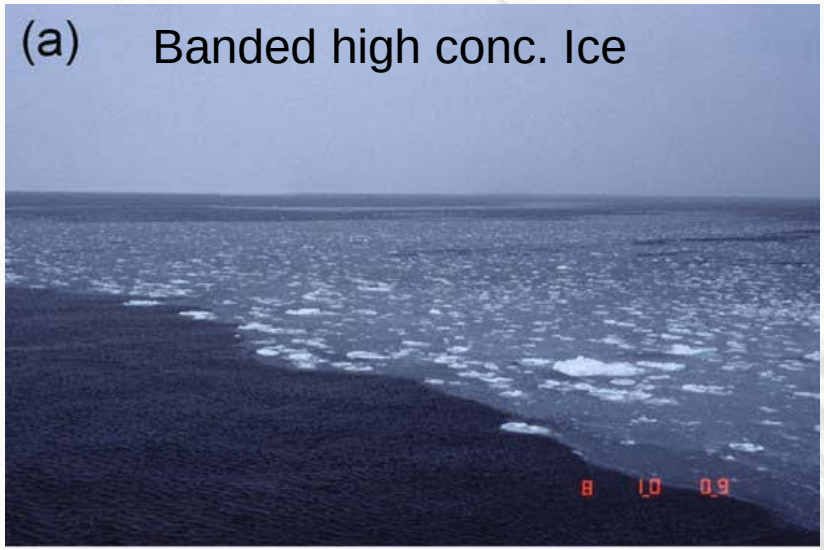
Voyage of the Scotia (Scottish expedition of 1902-1903)

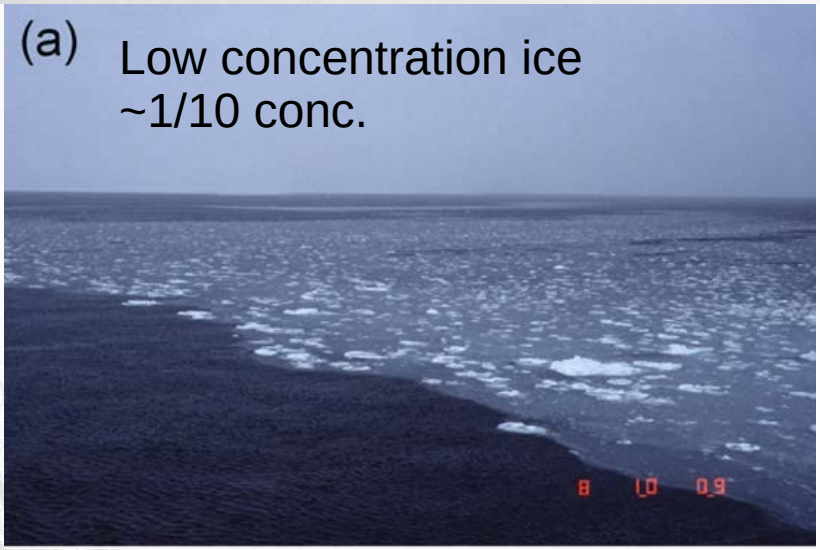


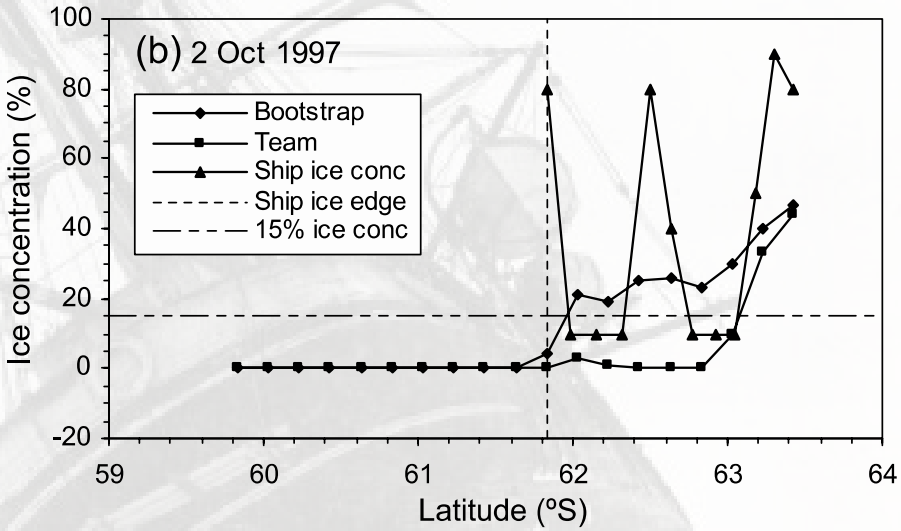
Scott's Terra Nova Expedition (1910-1913)



Difficulties in satellite vs. ship ice edge observations

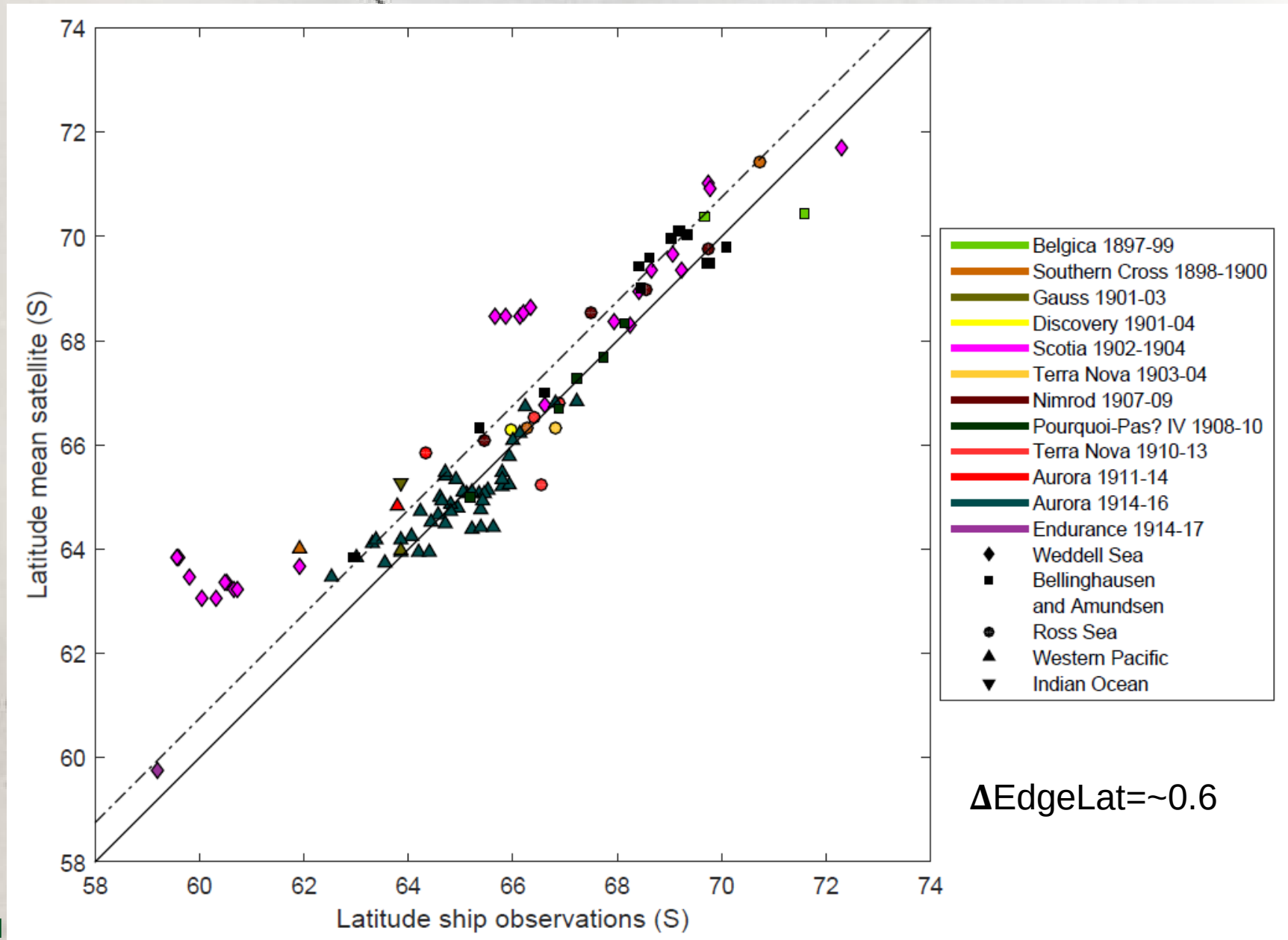






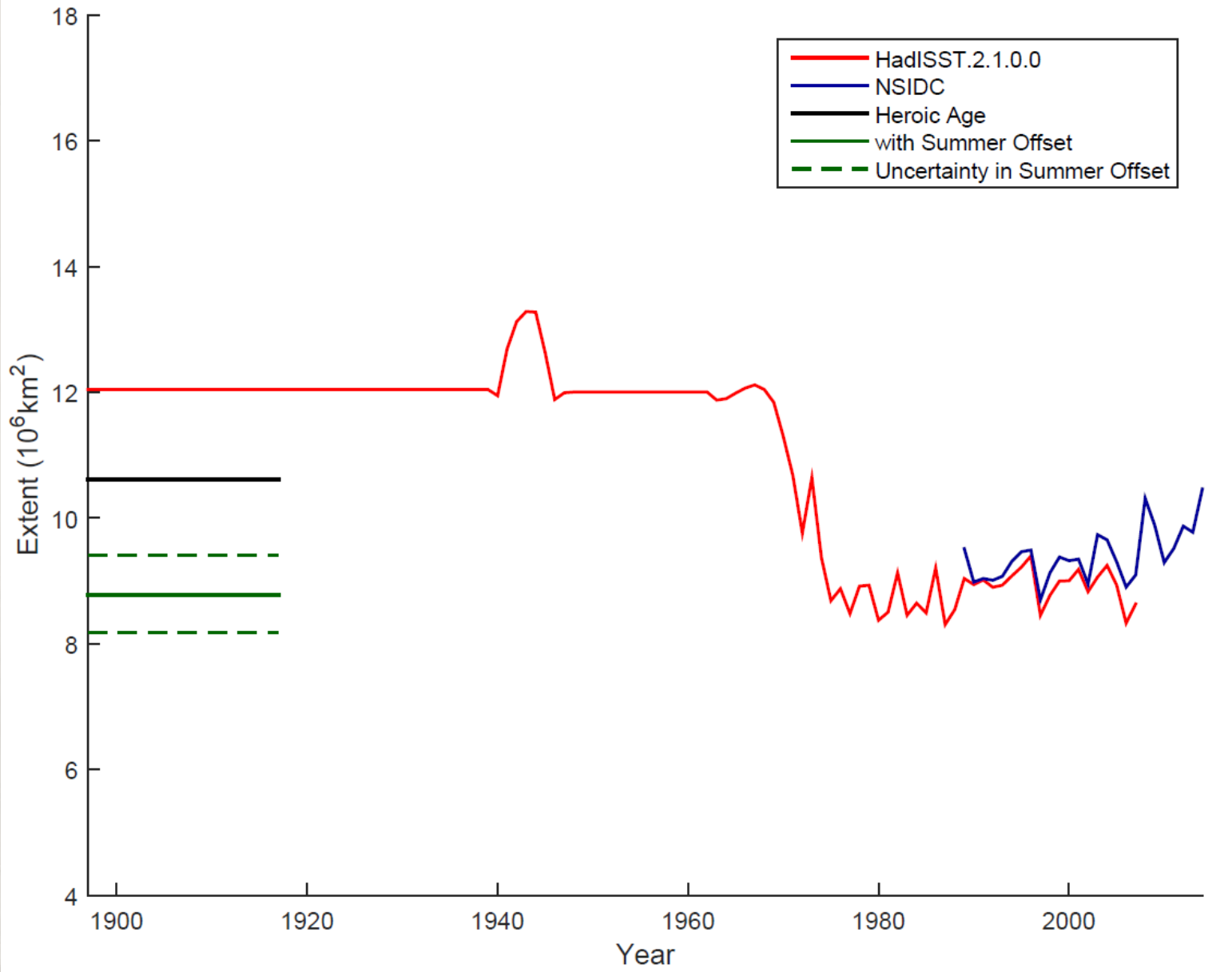
The ship observed sea ice edge is on average 0.75±0.61° north of PM Bootstrap ice edge (Worby and Comiso, 2004)

Have things changed?



ΔEdgeLat=~0.6

Comparison to HadISST

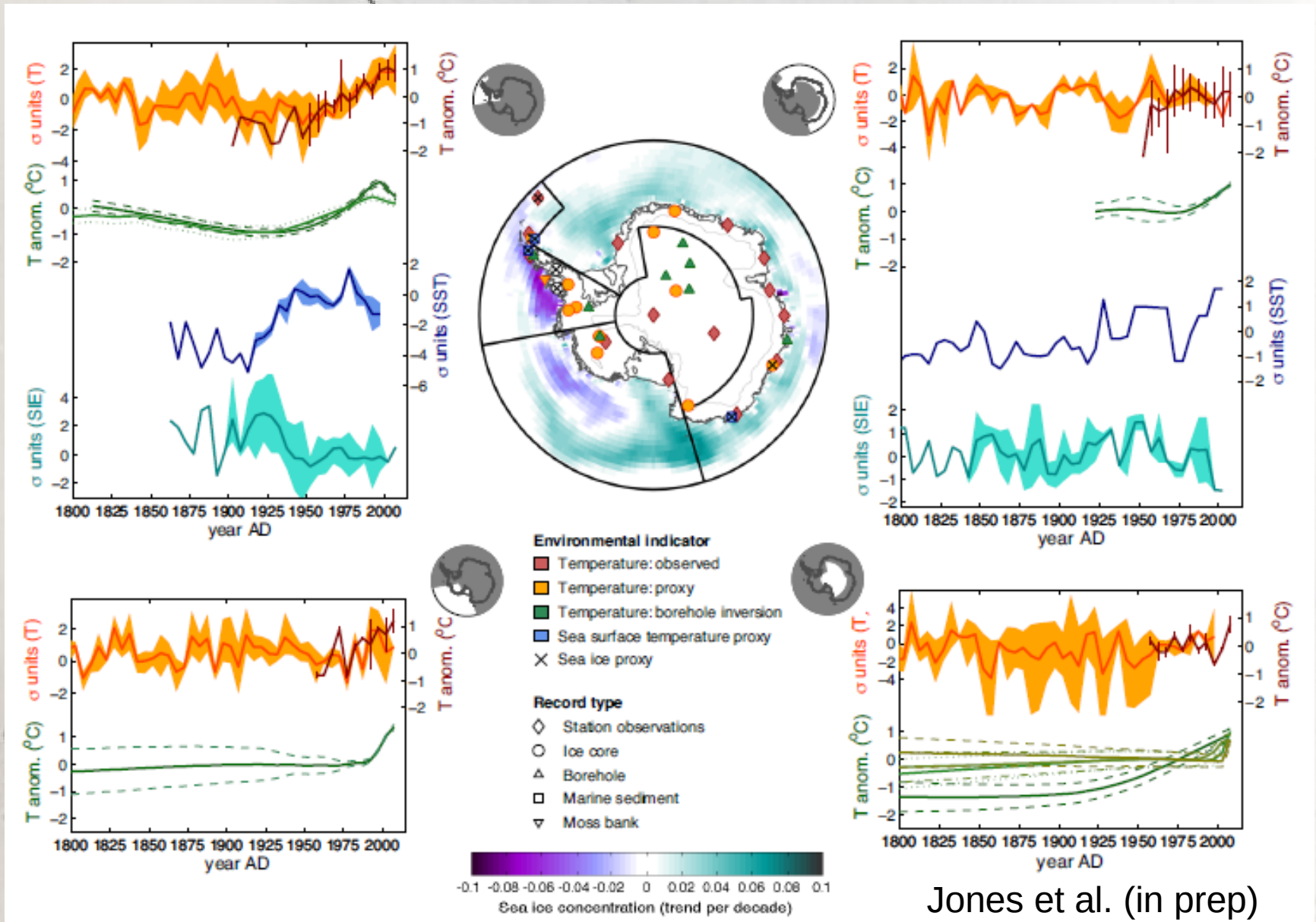


Tentative Conclusions

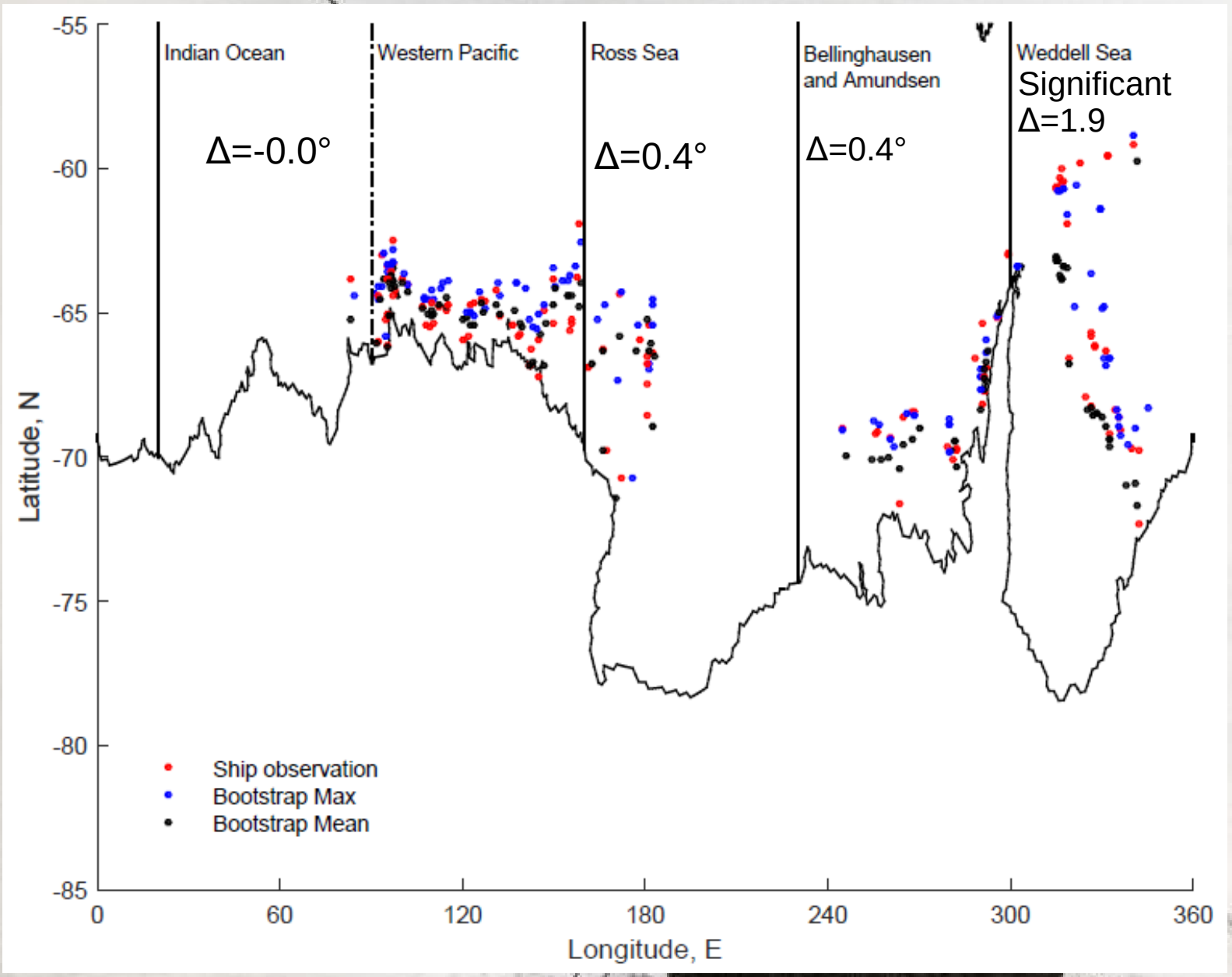
- We've gathered over 100 ice edge data points from ships logbooks from the Heroic Age of Exploration (1900-1917) from ICOADS or Primary source (actual logbooks).
- The change in sea ice cover is small ($\Delta \sim 0.6^{o}$), only identifiable difference is in the Weddel Sea (where $\Delta IceEdge \sim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