

Sea ice variability and trends in the Weddell Sea for 1979 - 2006

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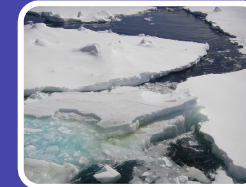
Background

Changes in sea ice extent &
Sea ice concentration



Ice-atmosphere interactions

Temperature
Wind



Drift and deformation
Volume changes

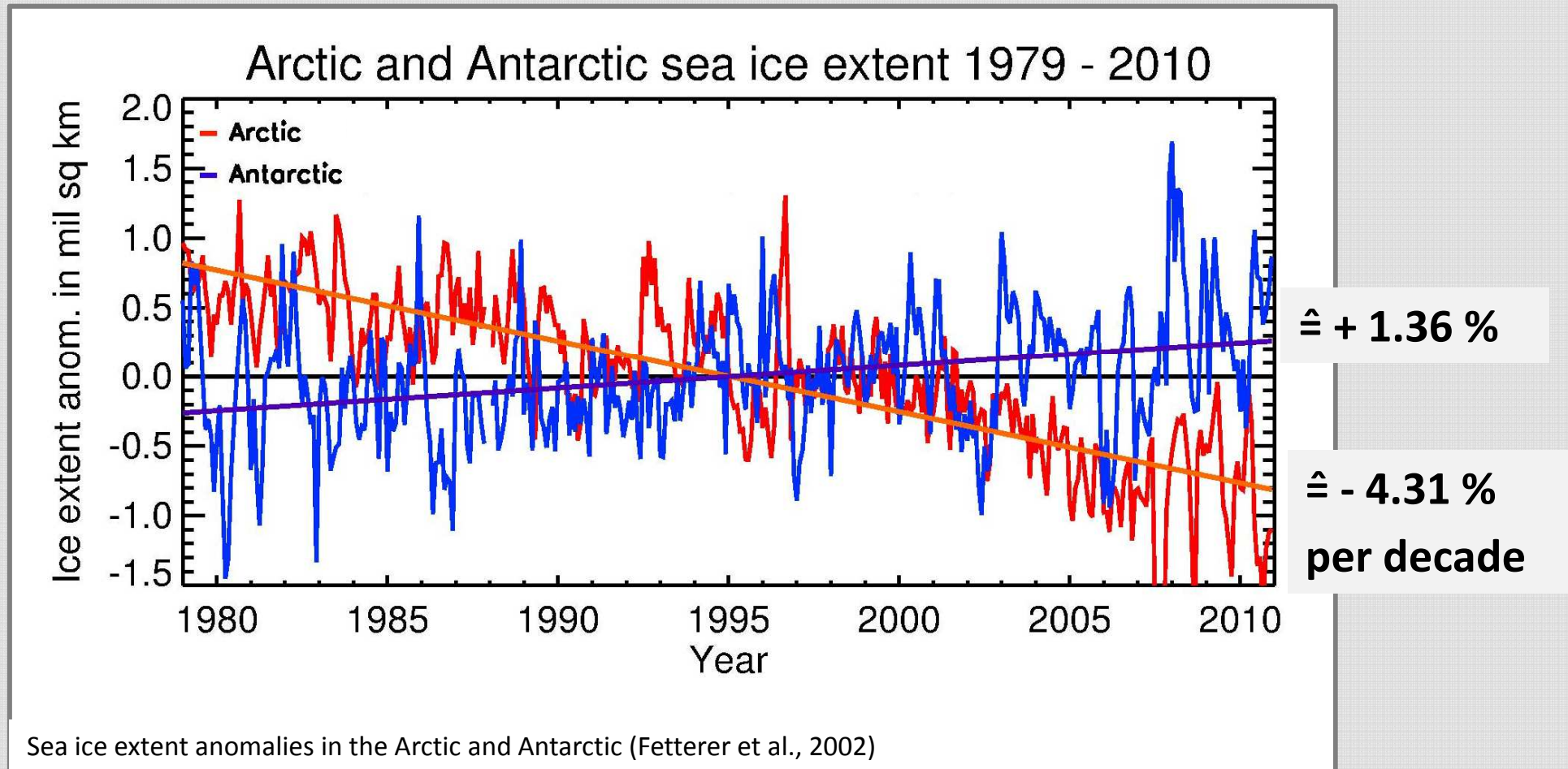
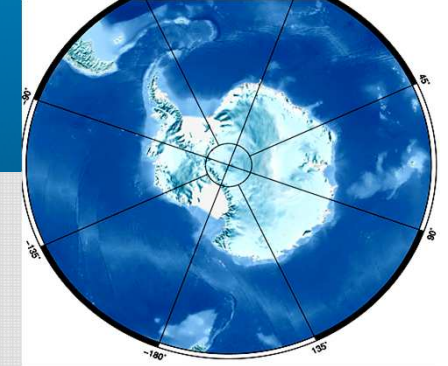


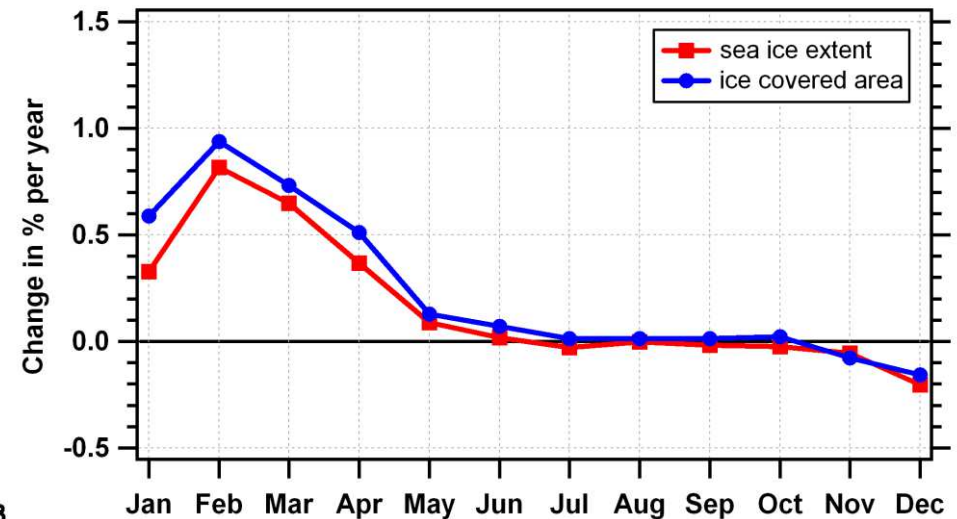
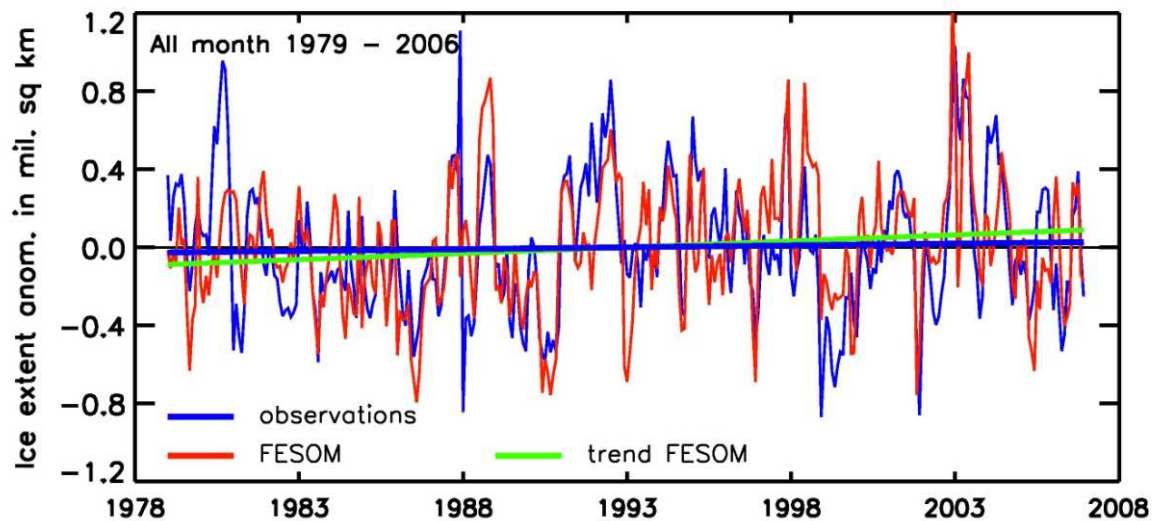
Summary and Outlook

Summary of interactions
Outlook on further needs



Sea ice extent changes





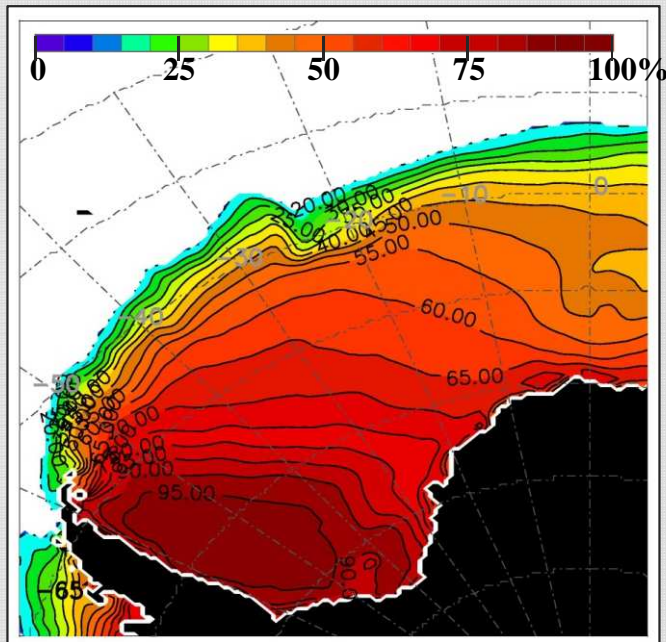
Sea ice extent anomalies in the Weddell Sea.

Seasonal trends in % per decade.

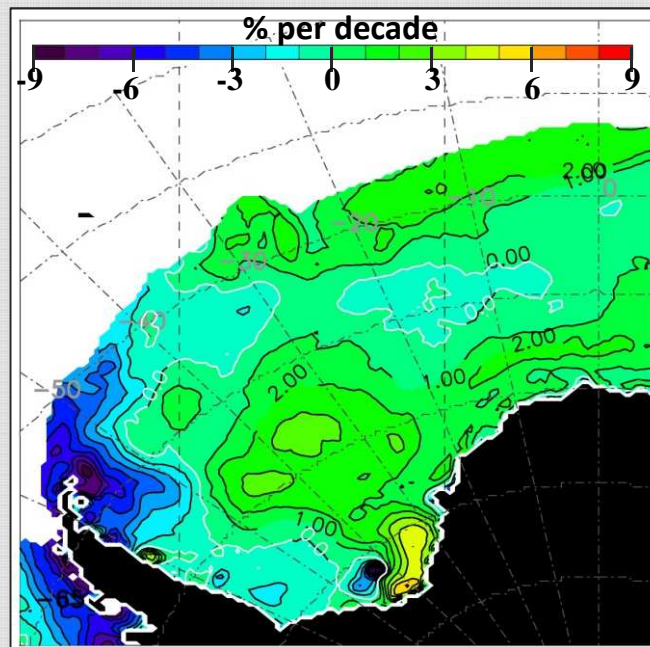
NSIDC bootstrap sea ice concentration data (Comiso, 1999) vs. FESOM model simulation.

- Largest sea ice extent in the Southern Ocean
- Special sea ice drift regime due to the Antarctic Peninsula
- Occurrence of second year ice
- Areas of potential deep and bottom water formation
- High data coverage

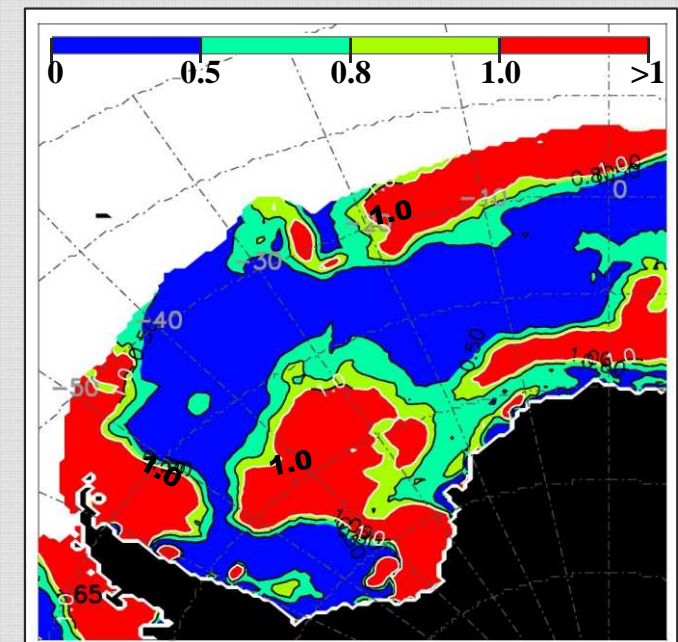
Mean SIC



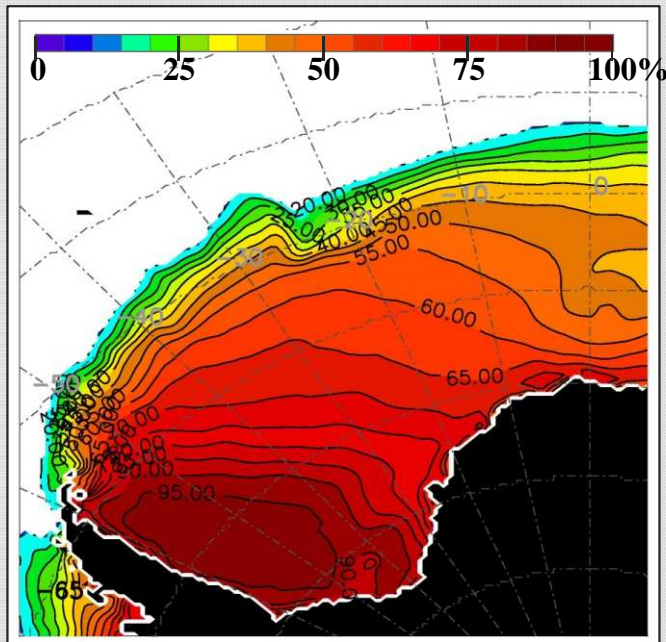
SIC trend



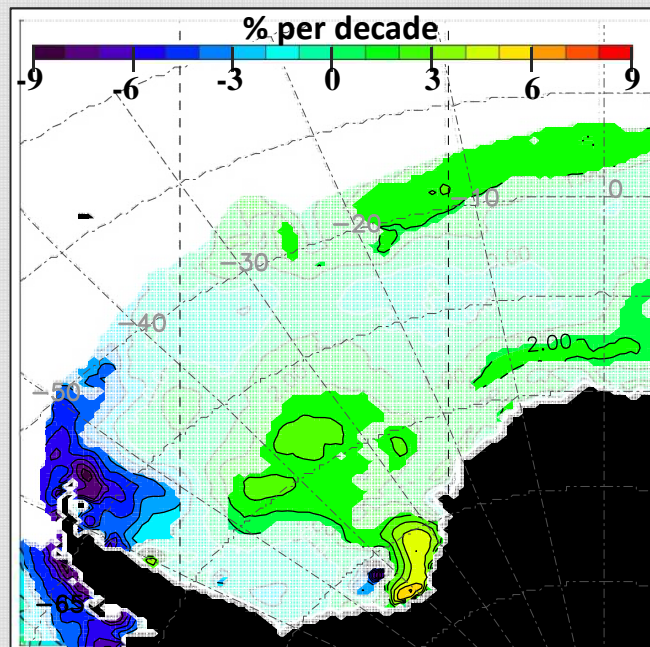
Rel. signif. (95% lev.)



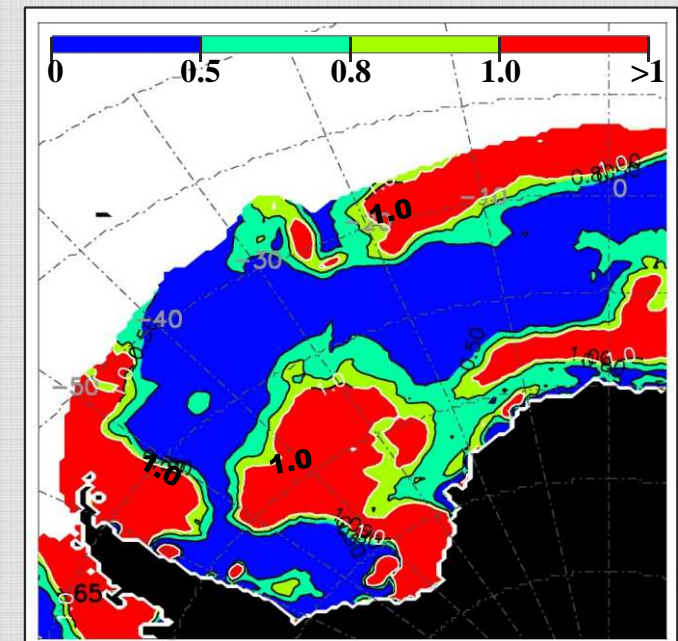
Mean SIC

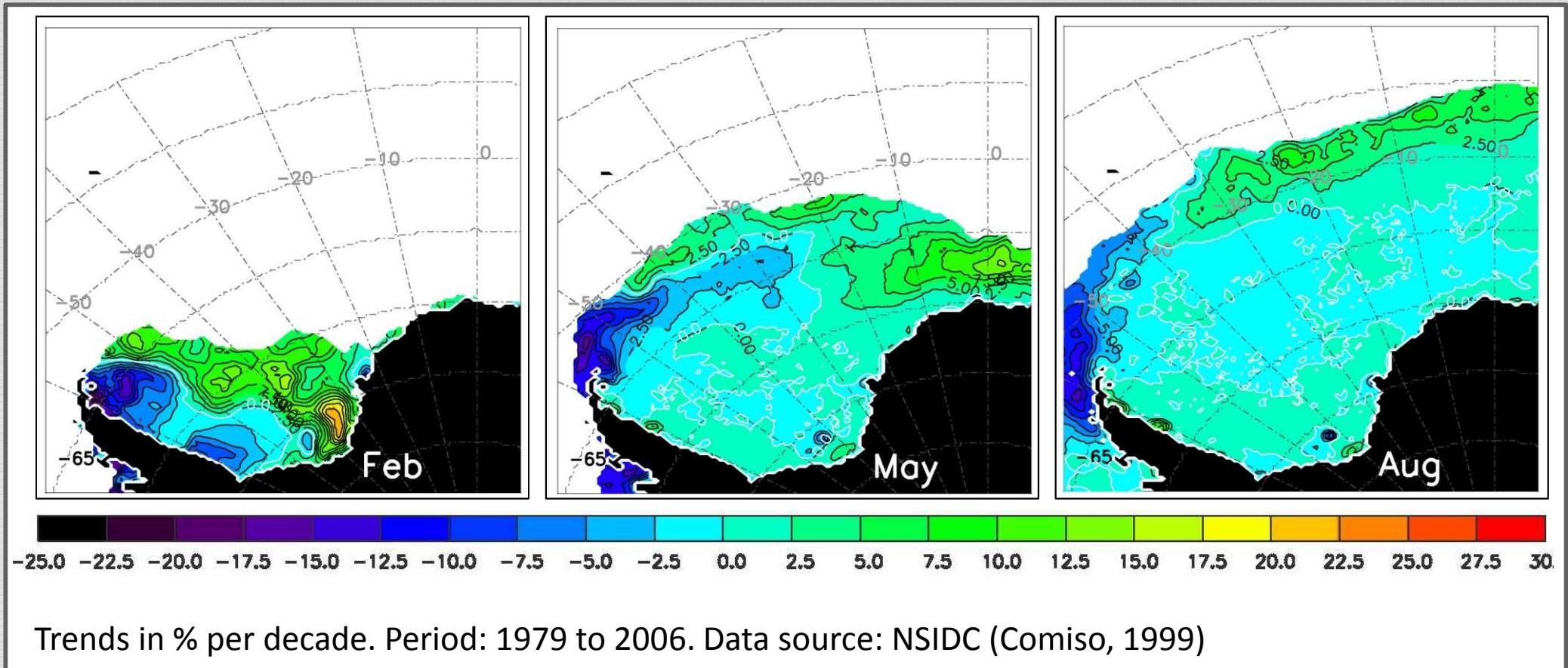


SIC trend



Rel. signif. (95% lev.)

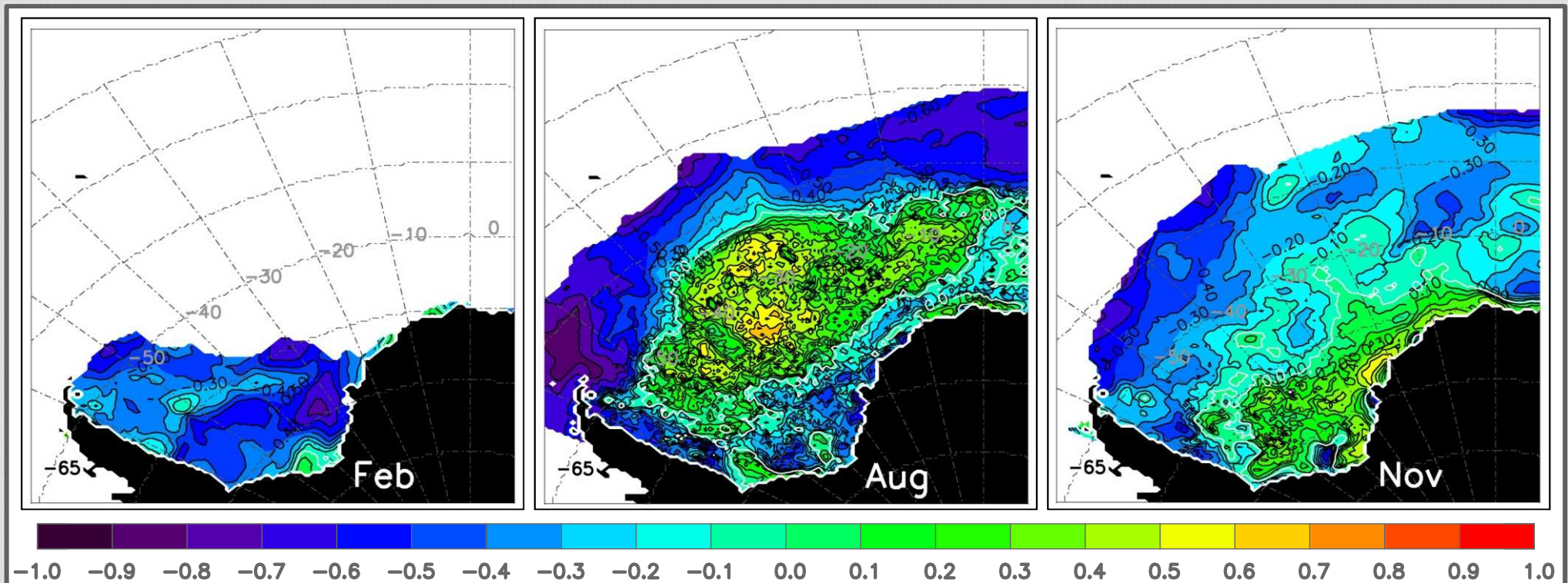




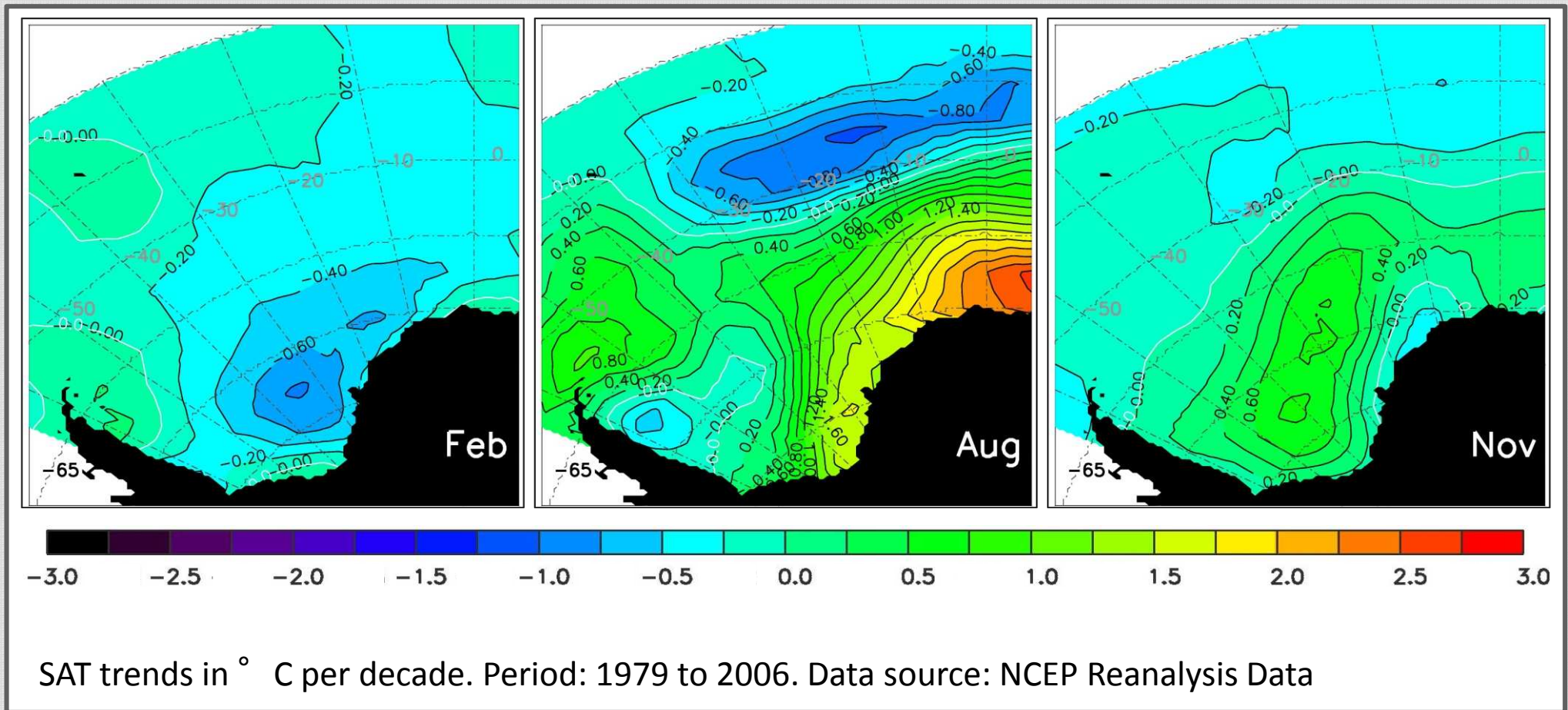
Sea ice concentration (SIC)

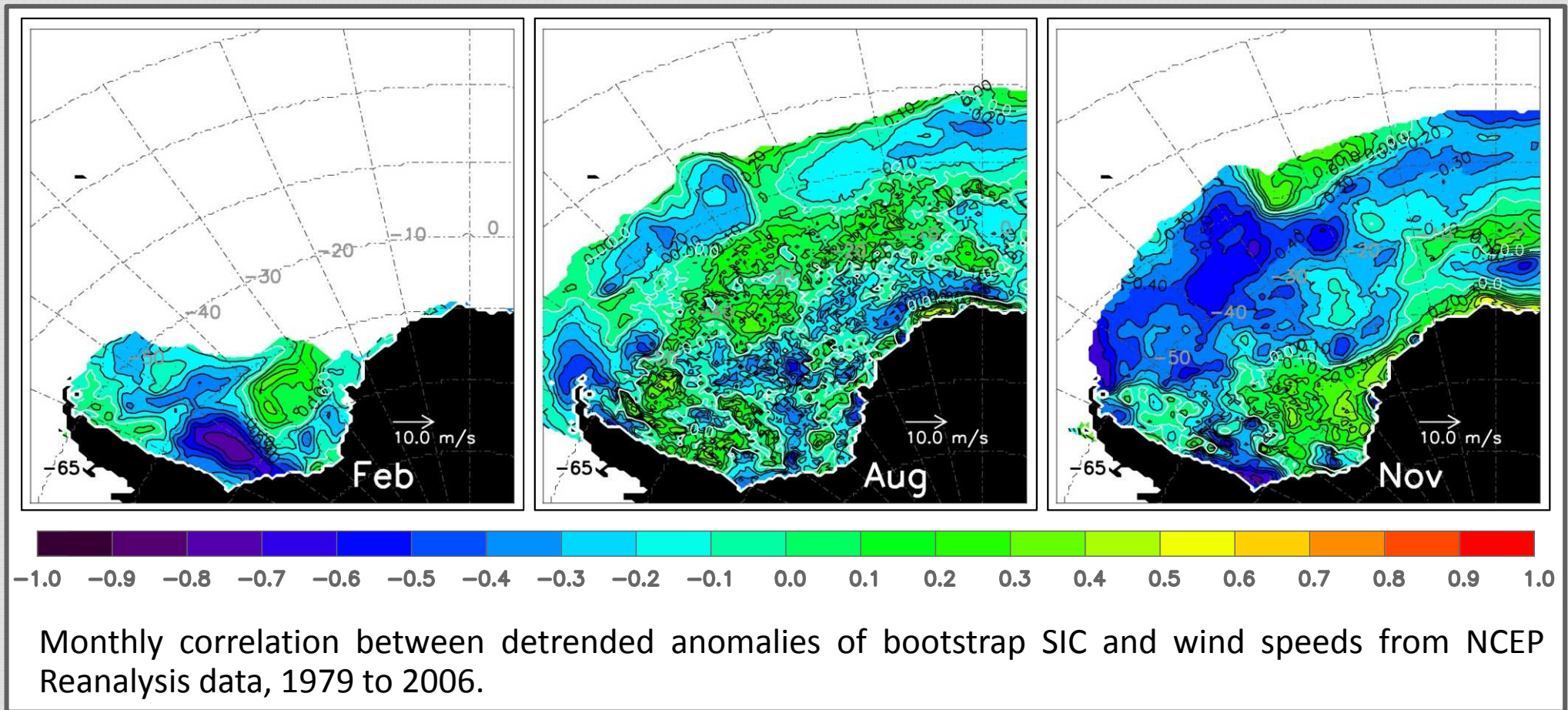
- decreases near the Antarctic Peninsula
- increases in the central and eastern marginal sea ice zone

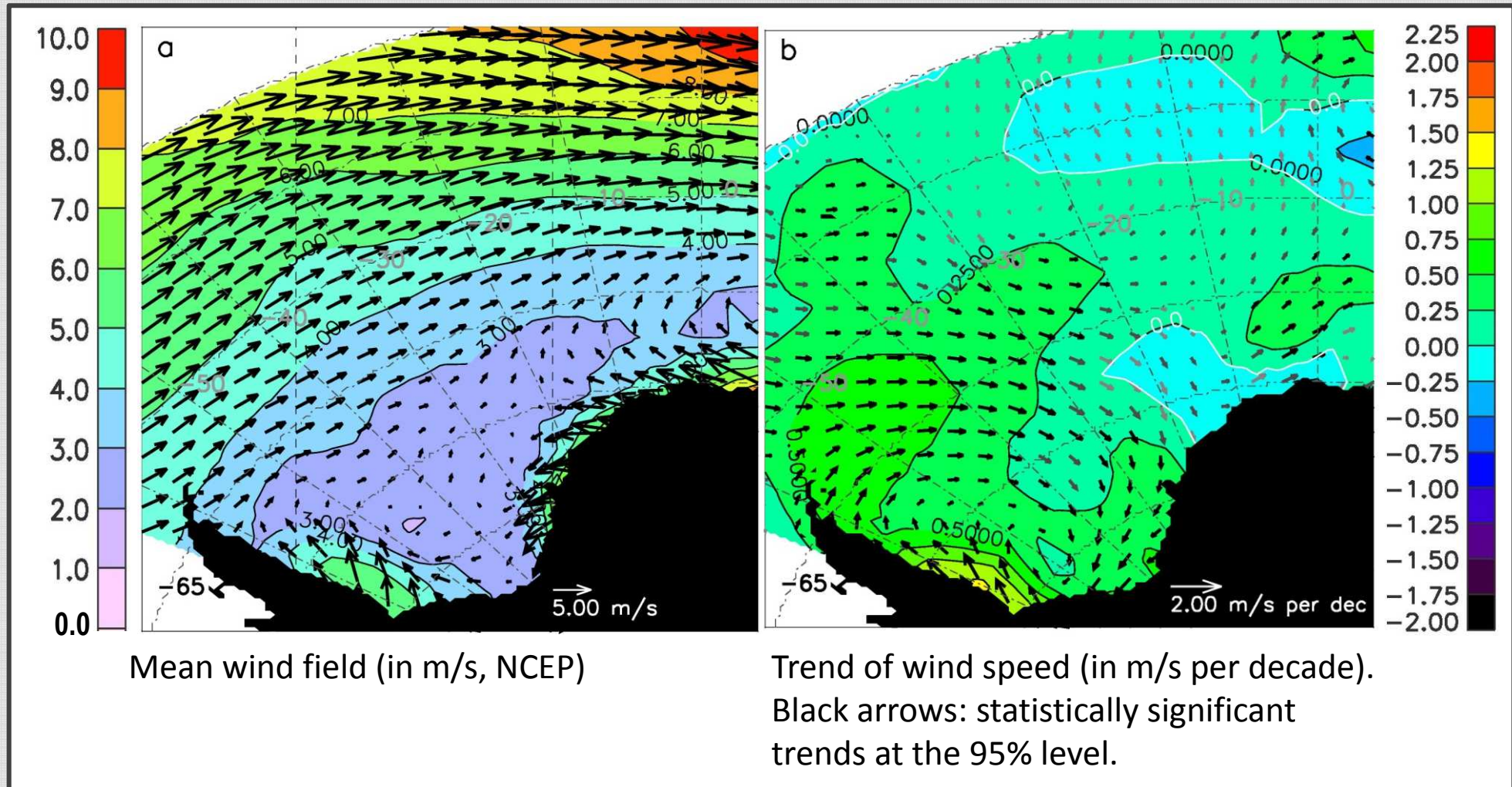
- **Connection between air temperature/ wind forcing and sea ice concentration variability and trends**
- **Do sea ice drift and deformation changes support connections?**
- **Impact on sea ice growth changes**
- **Impact on sea ice volume**

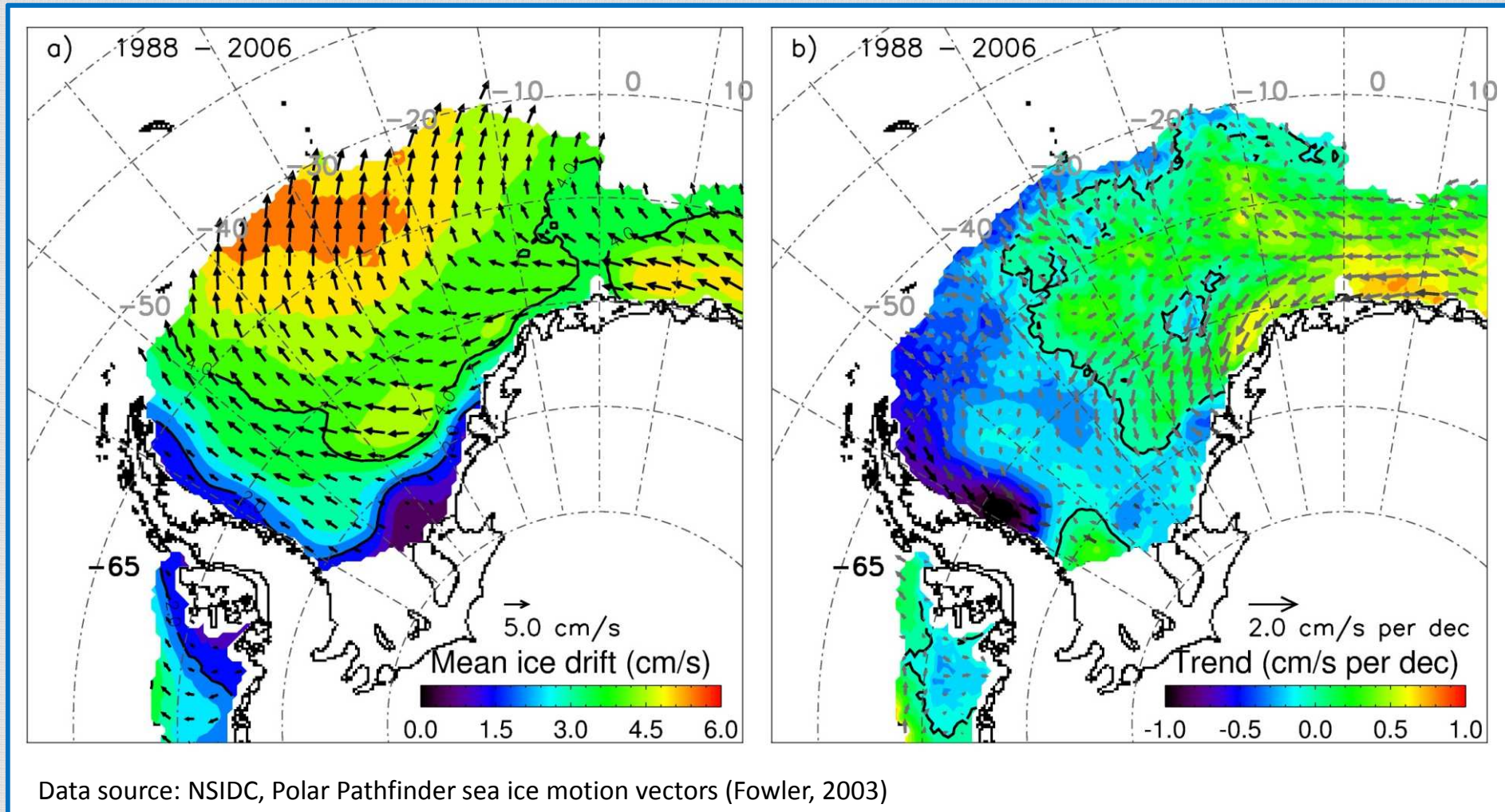


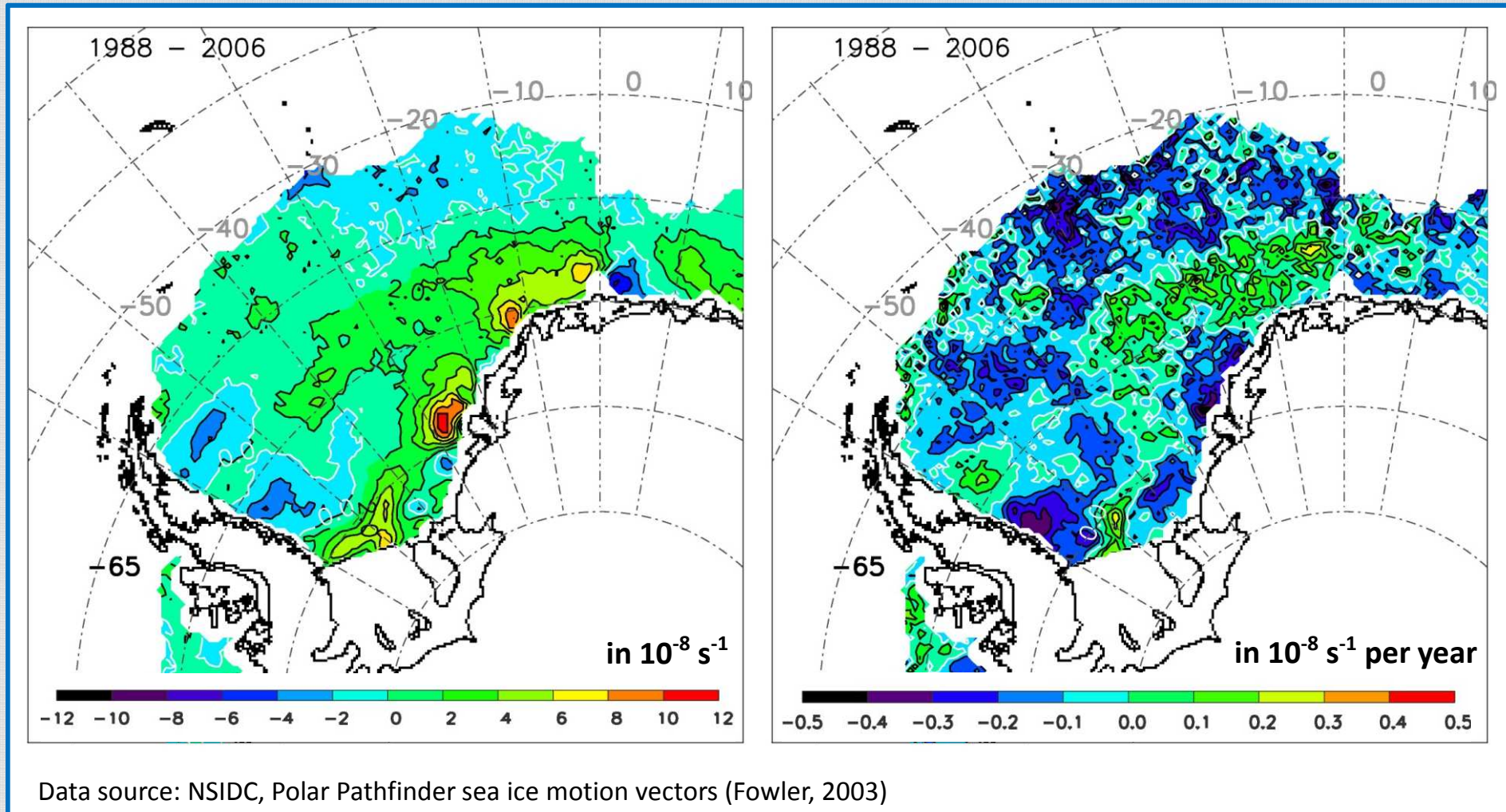
Monthly correlation between detrended anomalies of bootstrap sea ice concentrations (SIC) and surface air temperatures (SAT) from NCEP, from 1979 to 2006.

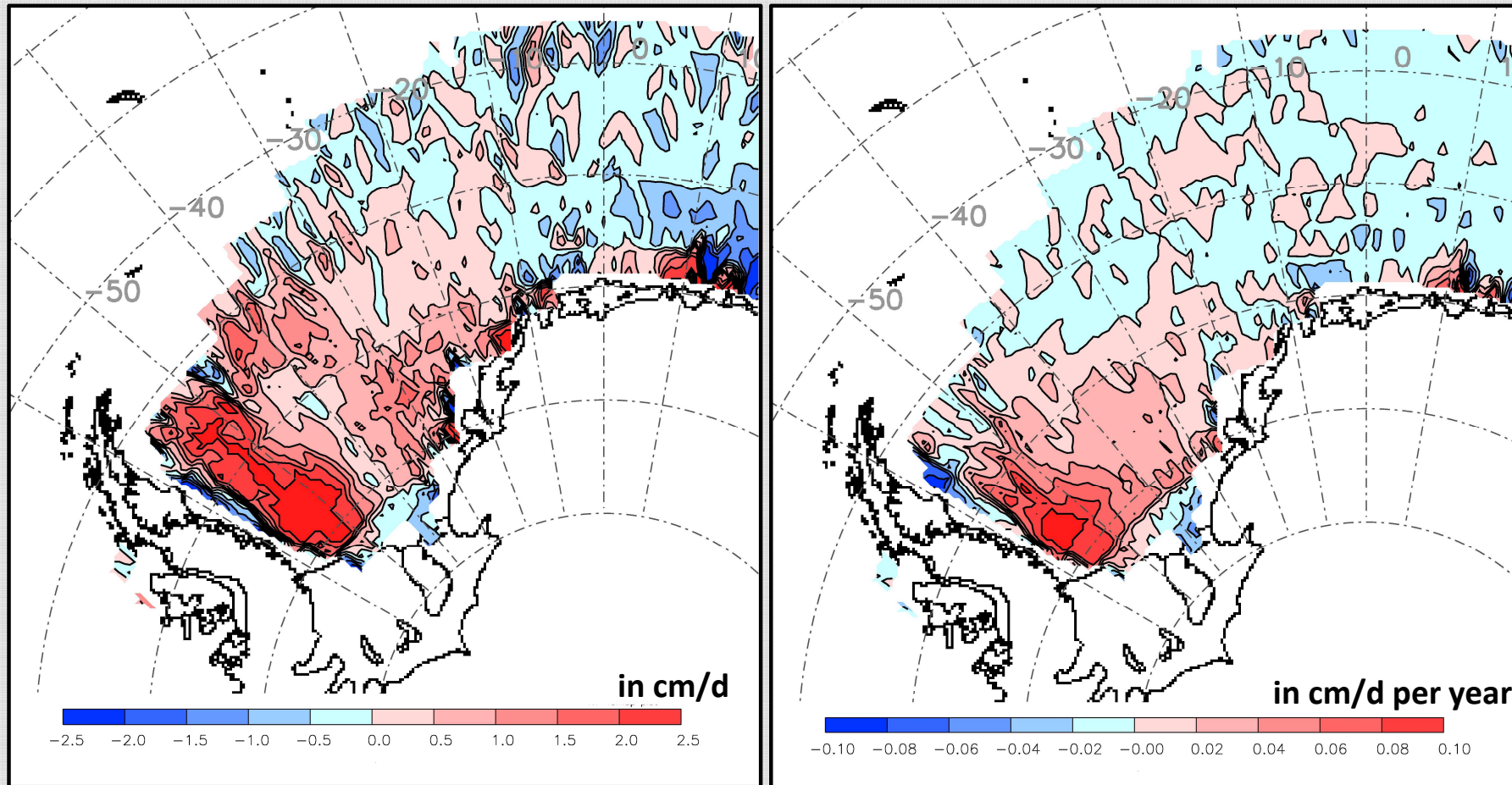




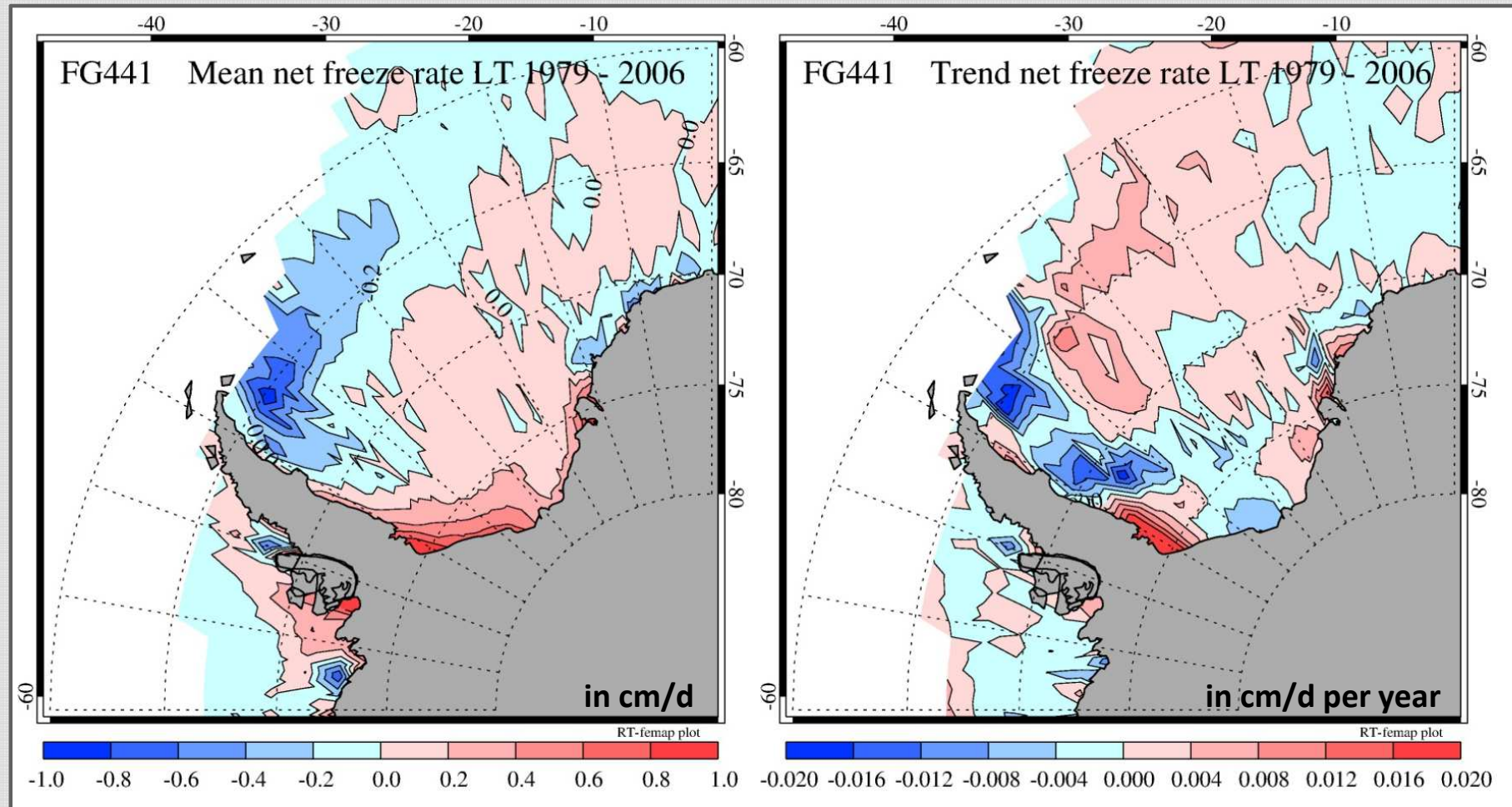




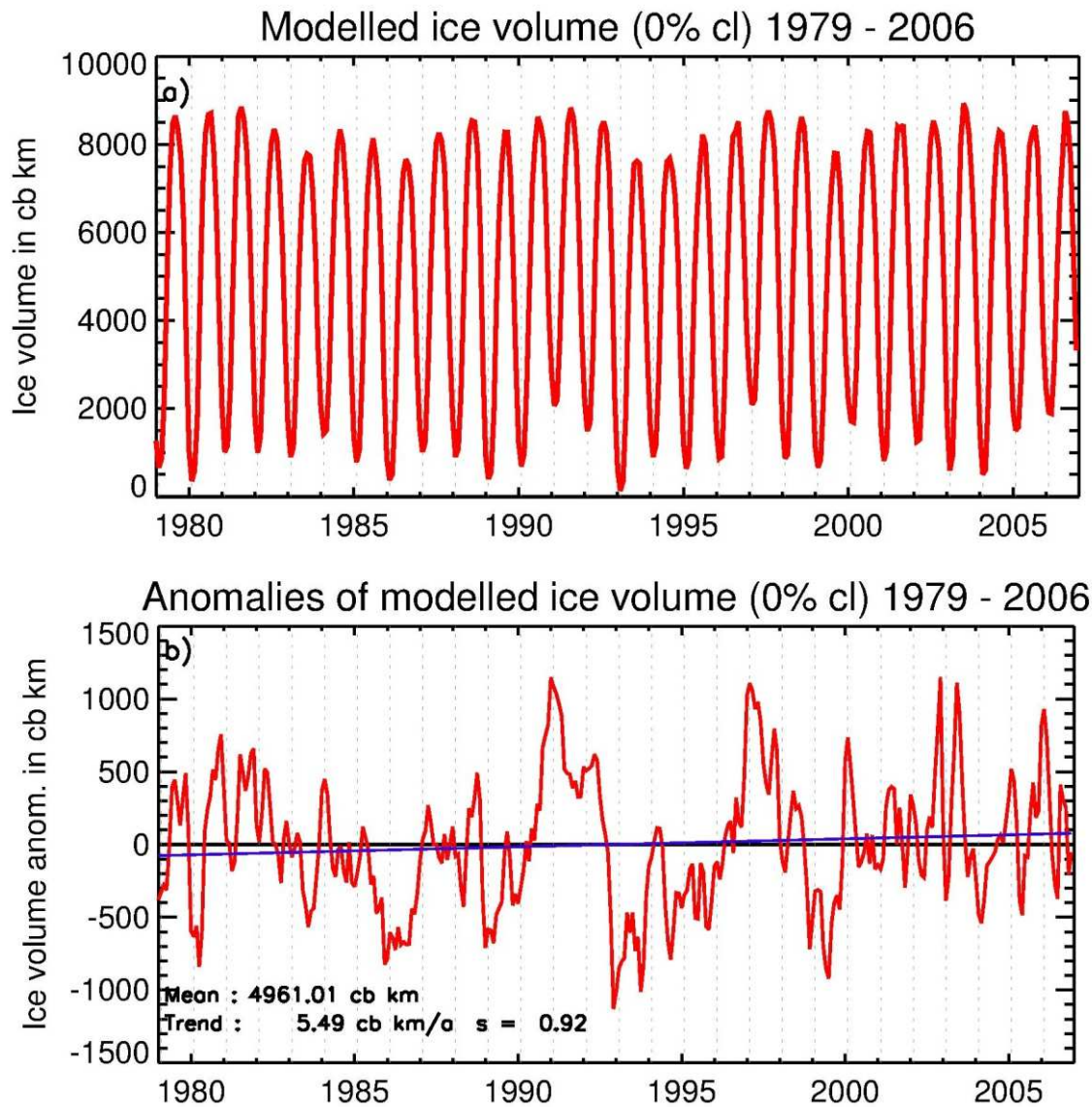




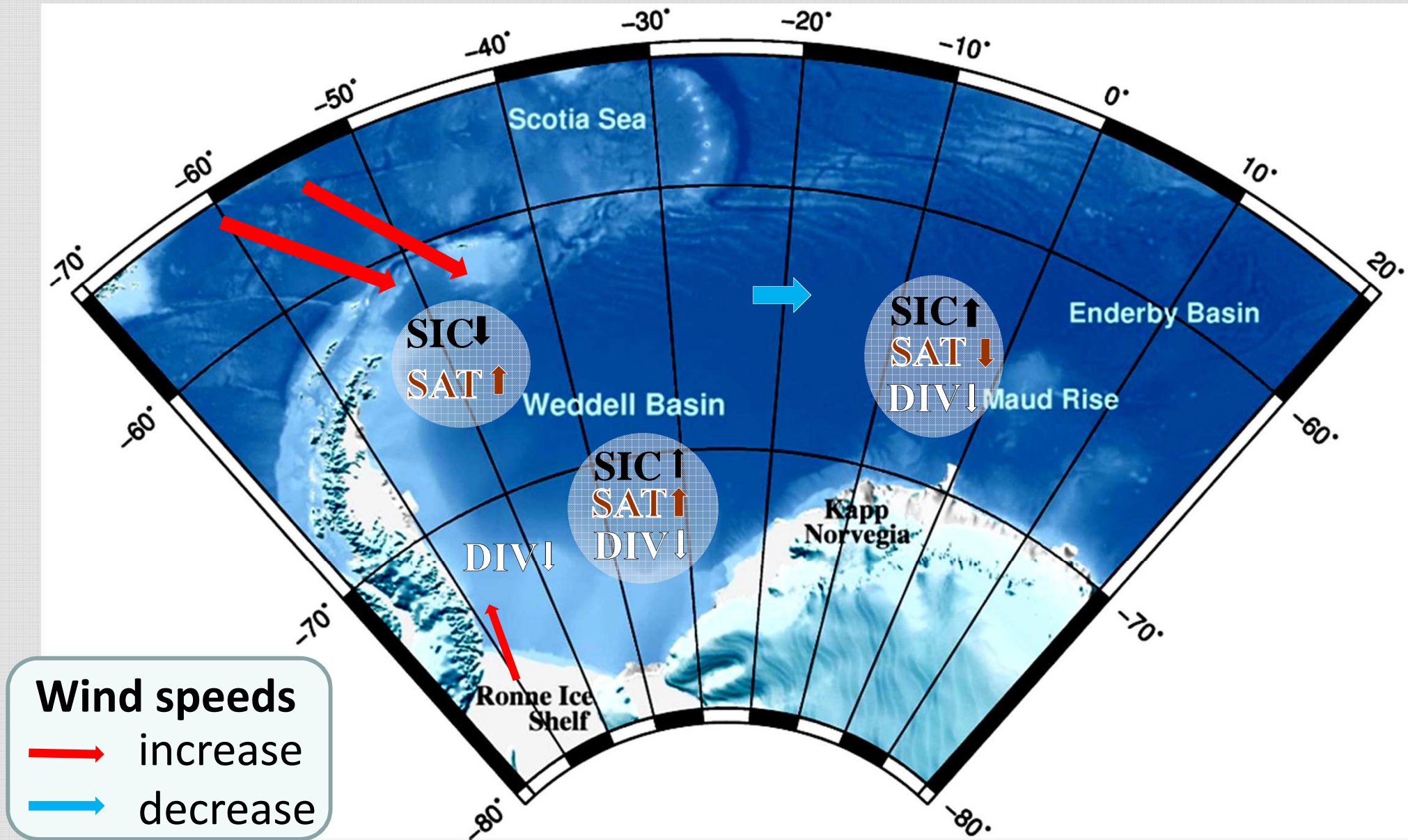
- Sea ice thicknesses influenced by deformation at the Antarctic Peninsula
- Trends indicate increased sea ice growth by deformation in this region



- Reduced freeze rates in the north-western Weddell Sea
- Enhanced freezing in the south-western Weddell Sea



- Increase of modeled sea ice thickness by few cm per decade
- Overall increasing sea ice volume
- Highest trends occur in summer and fall
- High interannual variability



- **Sea ice thickness measurements are needed**
 - In different seasons
 - In different regions
 - **Continuation of ULS measurements in the central Weddell Sea**
 - **Planned sea ice thickness surveys in winter 2013**
- **Refinements of grid resolution in FESOM simulations**
 - Deformation processes might be better resolved
- **Comparison with model runs forced by ECMWF data**
 - Higher resolution of atmospheric forcing