

Southern Hemisphere sea ice response to different flow regimes over the Antarctic Peninsula

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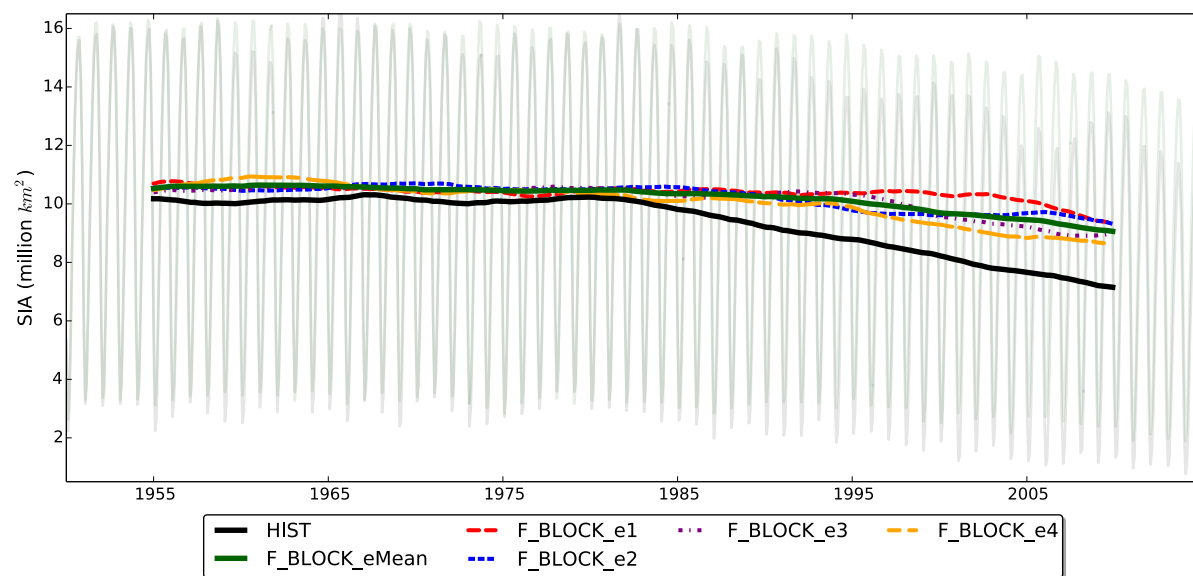


Figure S1 Timeseries of Antarctic sea ice area for HIST (black line), F_BLOCK four ensemble members (red, blue, purple, orange lines) and their ensemble mean (green line). Thin lines are monthly means, thick lines are 120-month running means.

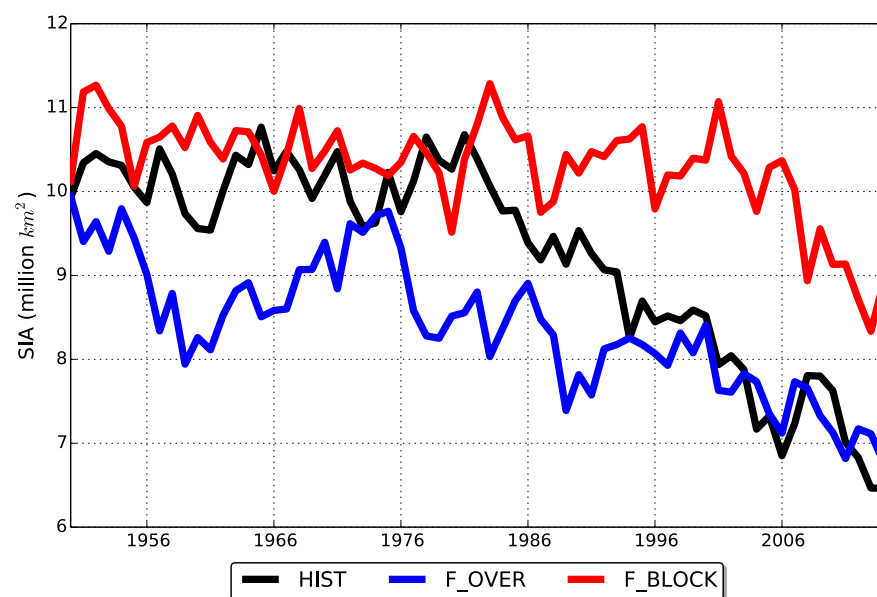


Figure S2 Annual mean timeseries of Antarctic sea ice area for HIST (black line), F_BLOCK (red line) and F_OVER (blue line).

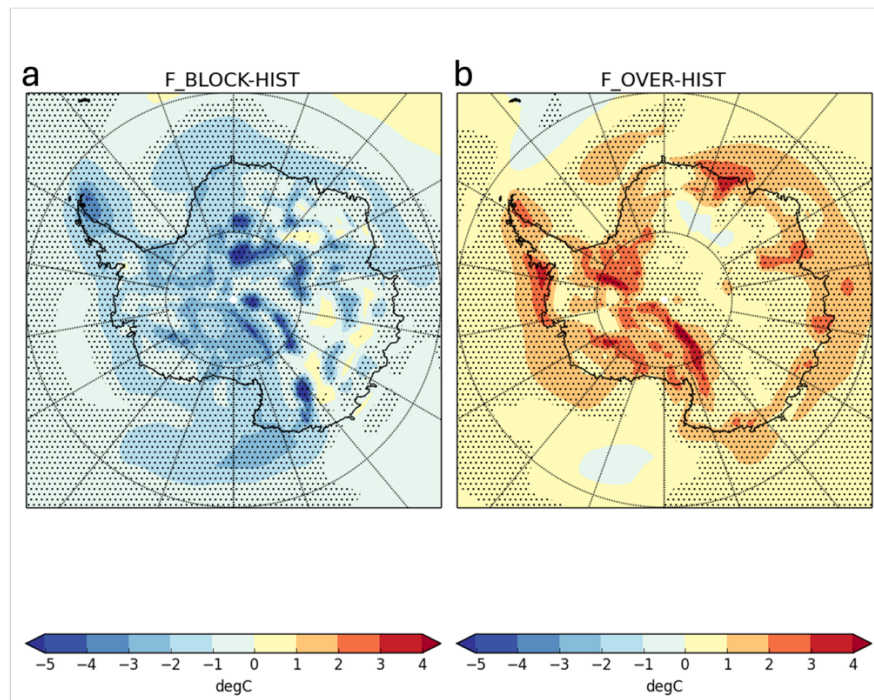


Figure S3 Annual surface air temperature (SAT) F_BLOCK – HIST (a) and F_OVER – HIST (b) anomalies. Dots indicate statistical significance at 95%.

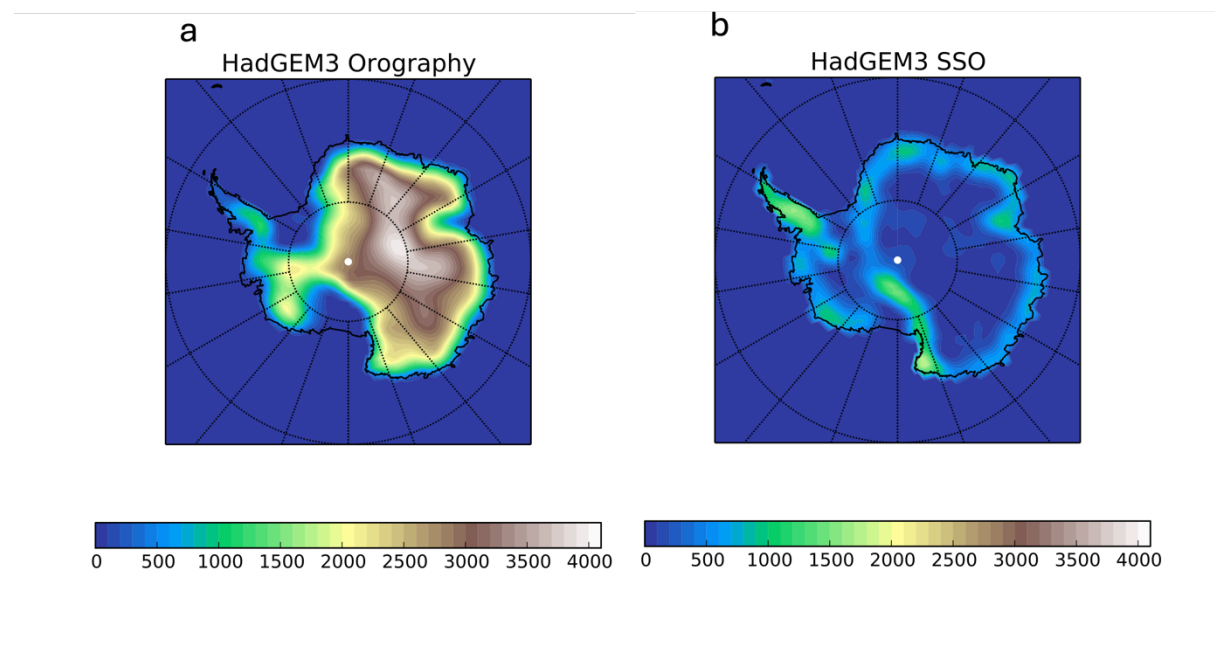


Figure S4 Resolved (a) and sub-grid scale (b) orography in HadGEM3.

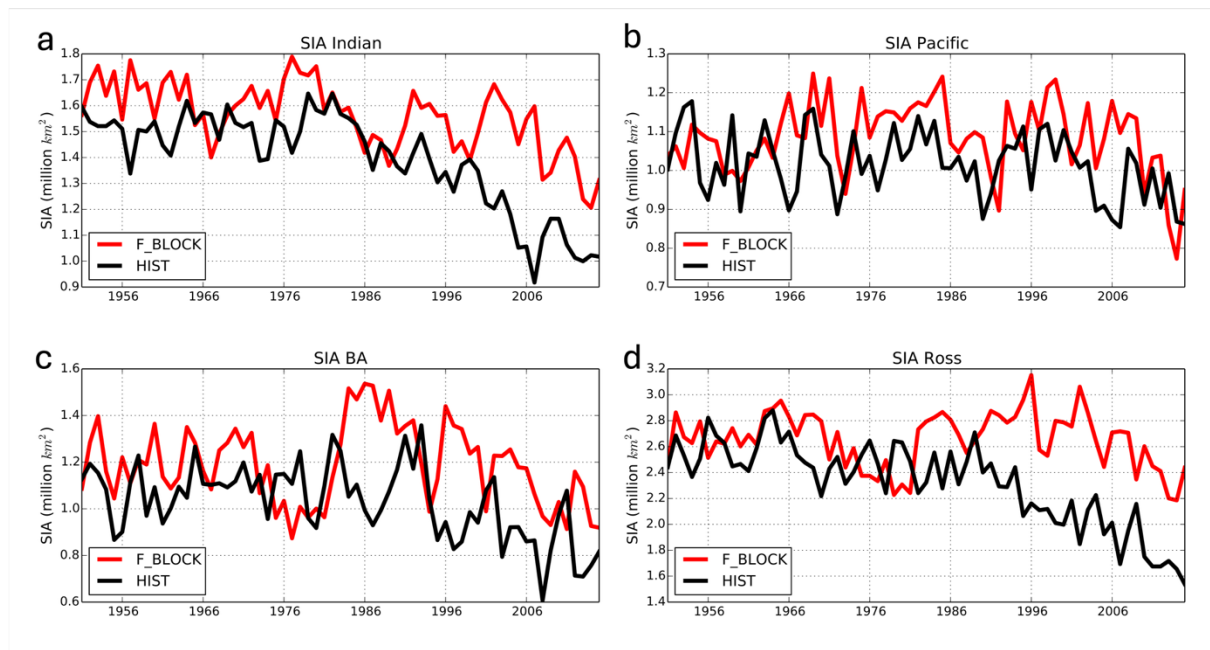


Figure S5 Annual timeseries of sea ice area in the Indian (a), Pacific (b), Ross (c) and BA (d) sectors for F_BLOCK (red line) and HIST (black line).

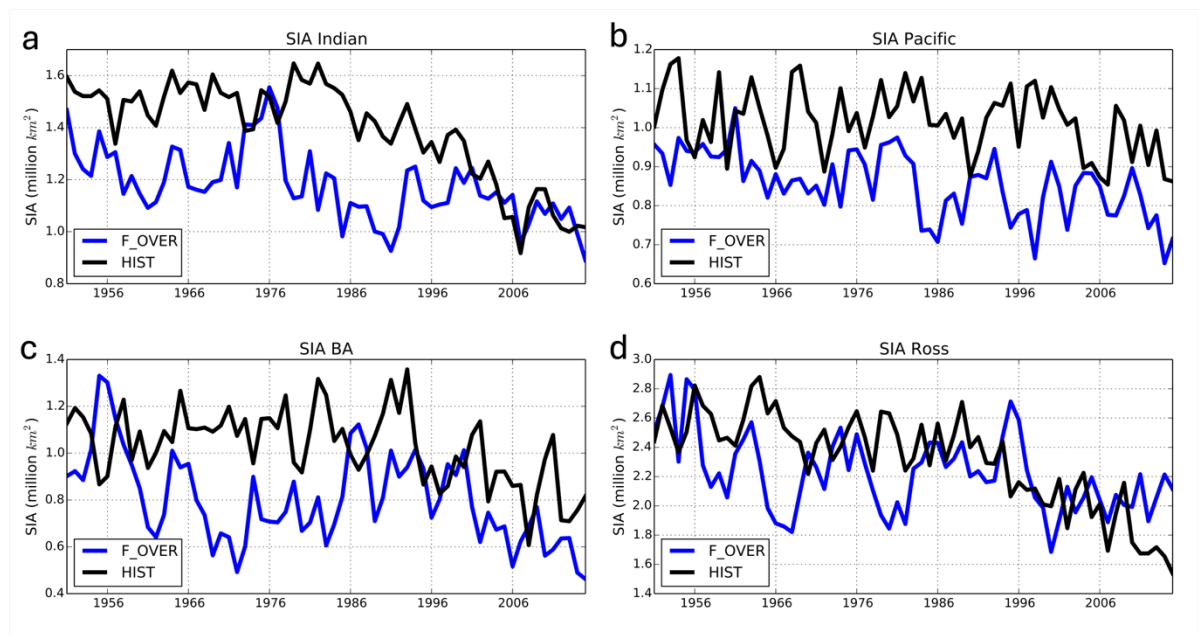


Figure S6 Annual timeseries of sea ice area in the Indian (a), Pacific (b), Ross (c) and BA (d) sectors for F_OVER (blue line) and HIST (black line).

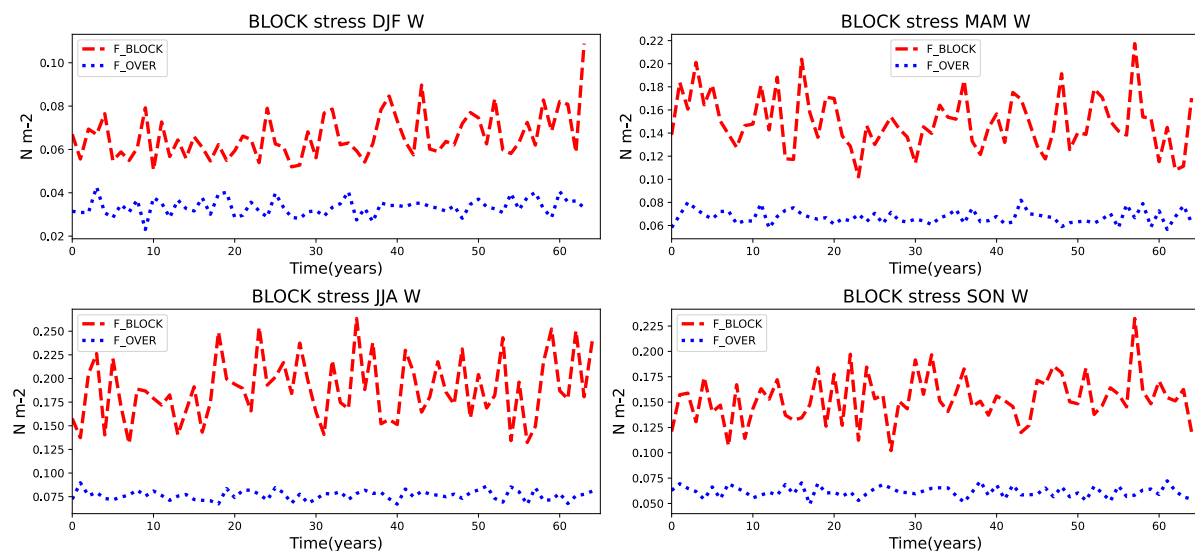


Figure S7 Time-series of flow blocking stress averaged throughout the first 5 km above the ground for West Antarctica.

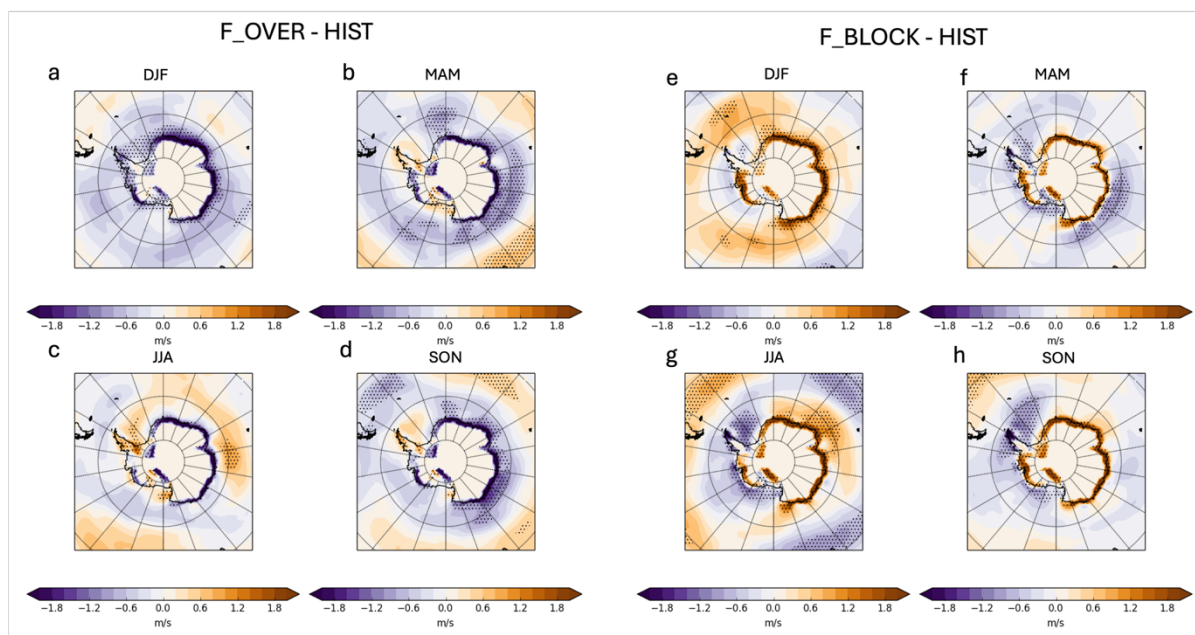


Figure S8 Seasonal anomalies of westerly winds at 850hpa for F_BLOCK-HIST (a-d) and F_OVER-HIST (e-h). Dots indicate statistical significance at 95%.

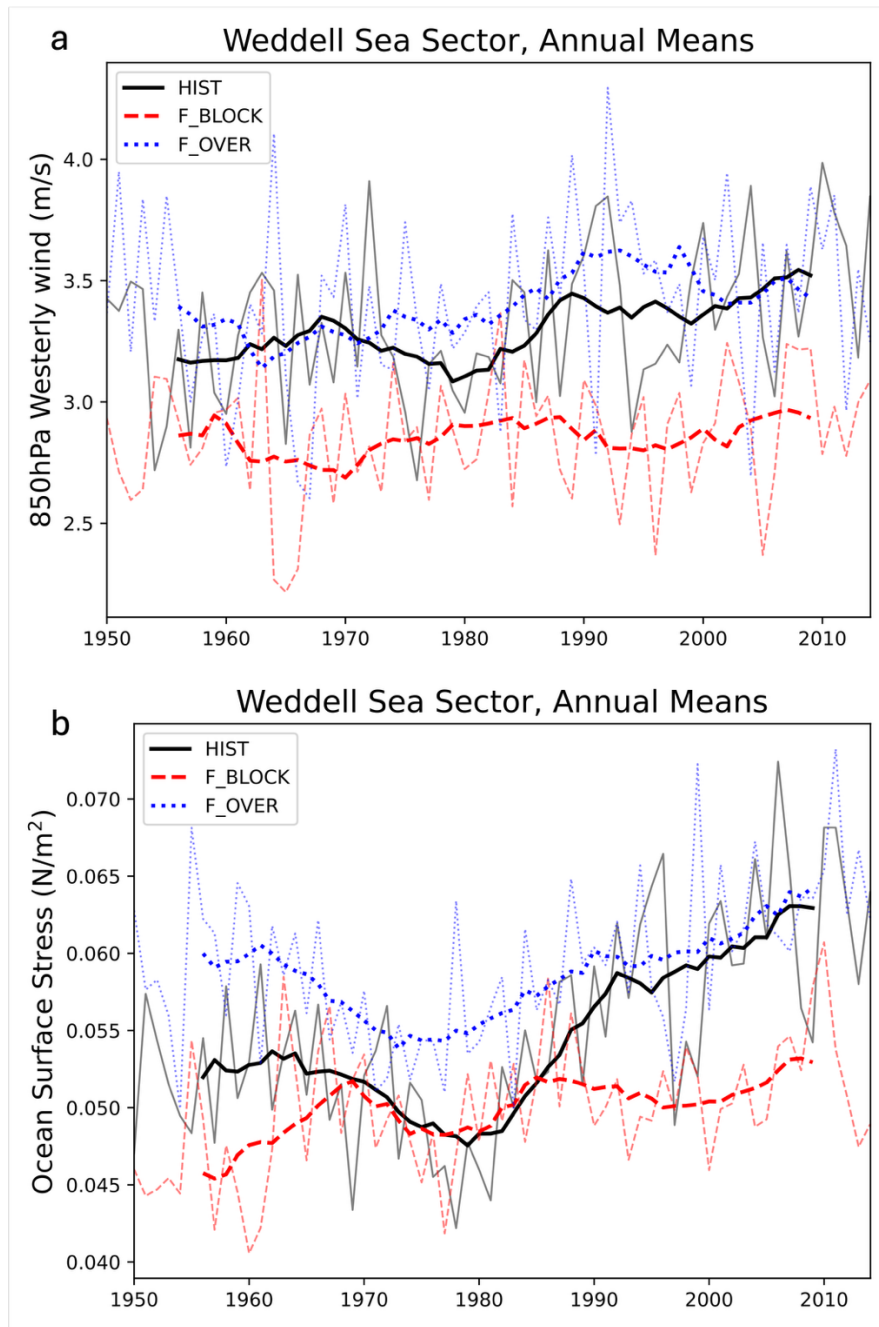


Figure S9 Annual mean timeseries of westerlies winds ($U > 0$) at 850hpa (**a**) and total ocean surface stress (**b**) for HIST (black solid line), F_BLOCK (red dashed line) and F_OVER (blue dotted line) in the Weddell Sea Sector. Thick lines are 10-year running means.

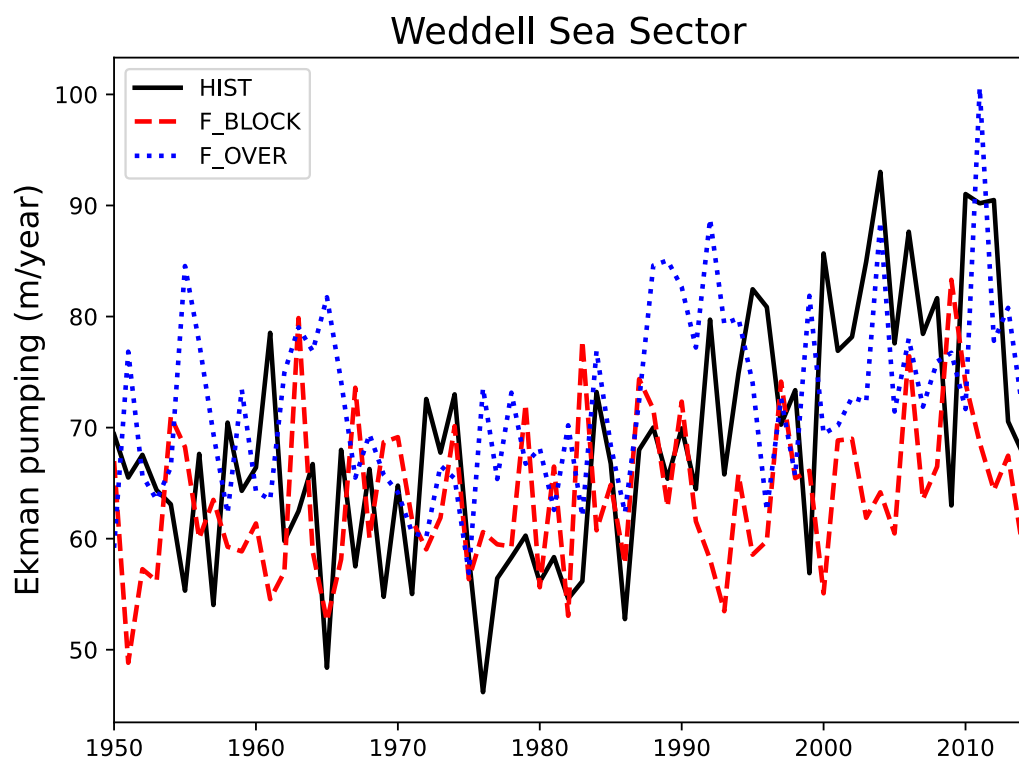


Figure S10 June to November mean time-series for Ekman pumping (m/year) in the Weddell Sea. To compute means, only upwelling (positive) values were considered. Black line is HIST, red dashed line is F_BLOCK, blue dotted line is F_OVER.

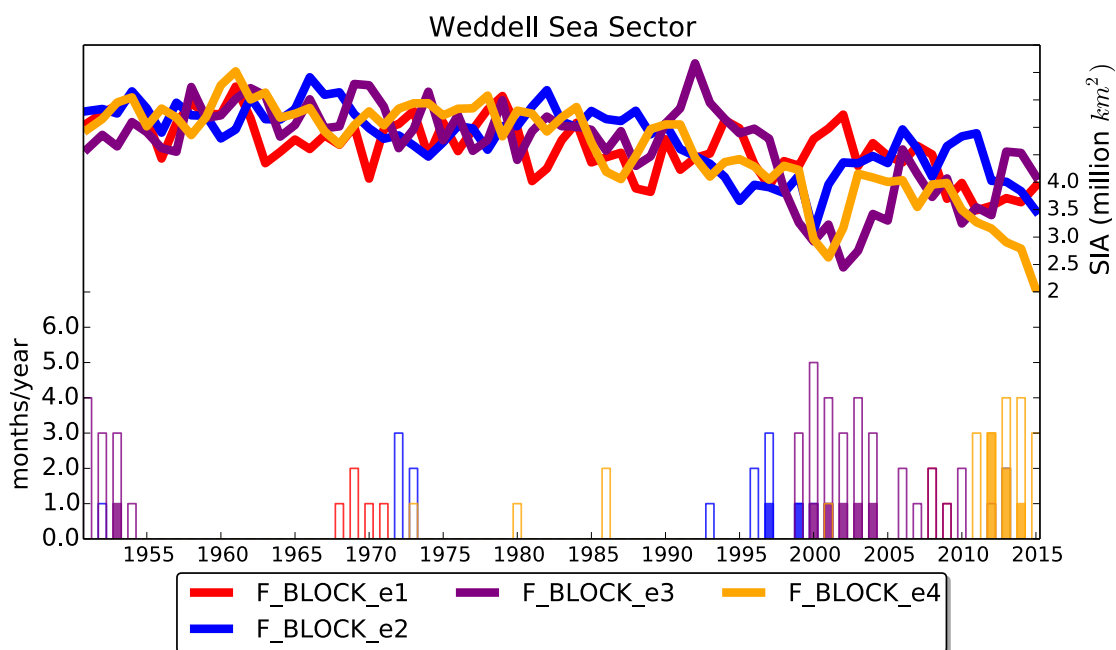


Figure S11 Timeseries of sea ice area (top lines) and frequency in months/year of open ocean deep convection in the Weddell Sea (bottom histogram) for all four F_BLOCK ensemble members. Histogram bars are filled when deep convection area is at least 80,000 km².

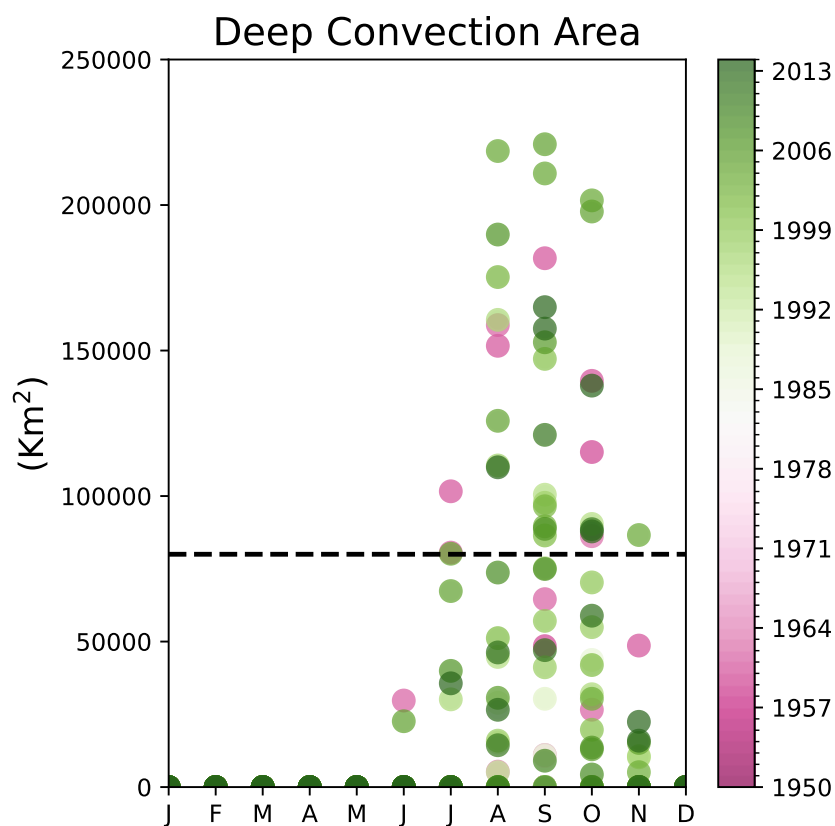


Figure S12 Area of deep convection events in the Weddell Sea as simulated by the HadGEM3 model for each month from January 1950 to December 2014.

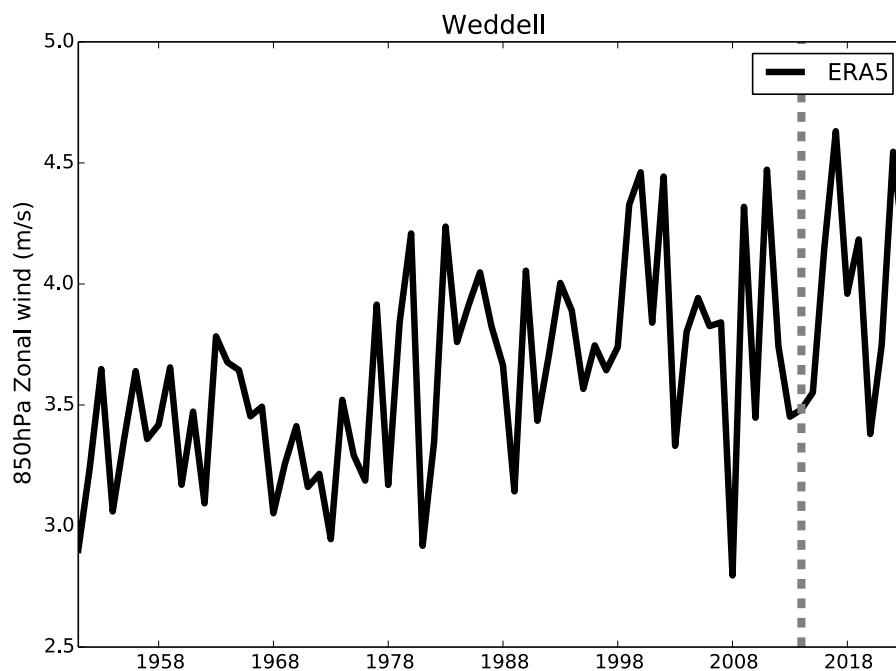


Figure S13 ERA5 annual mean timeseries of westerlies winds ($U > 0$) at 850hpa in the Weddell Sea Sector from 1950 to 2022. The dashed grey line marks the end of the period simulated by HadGEM3 (2014).

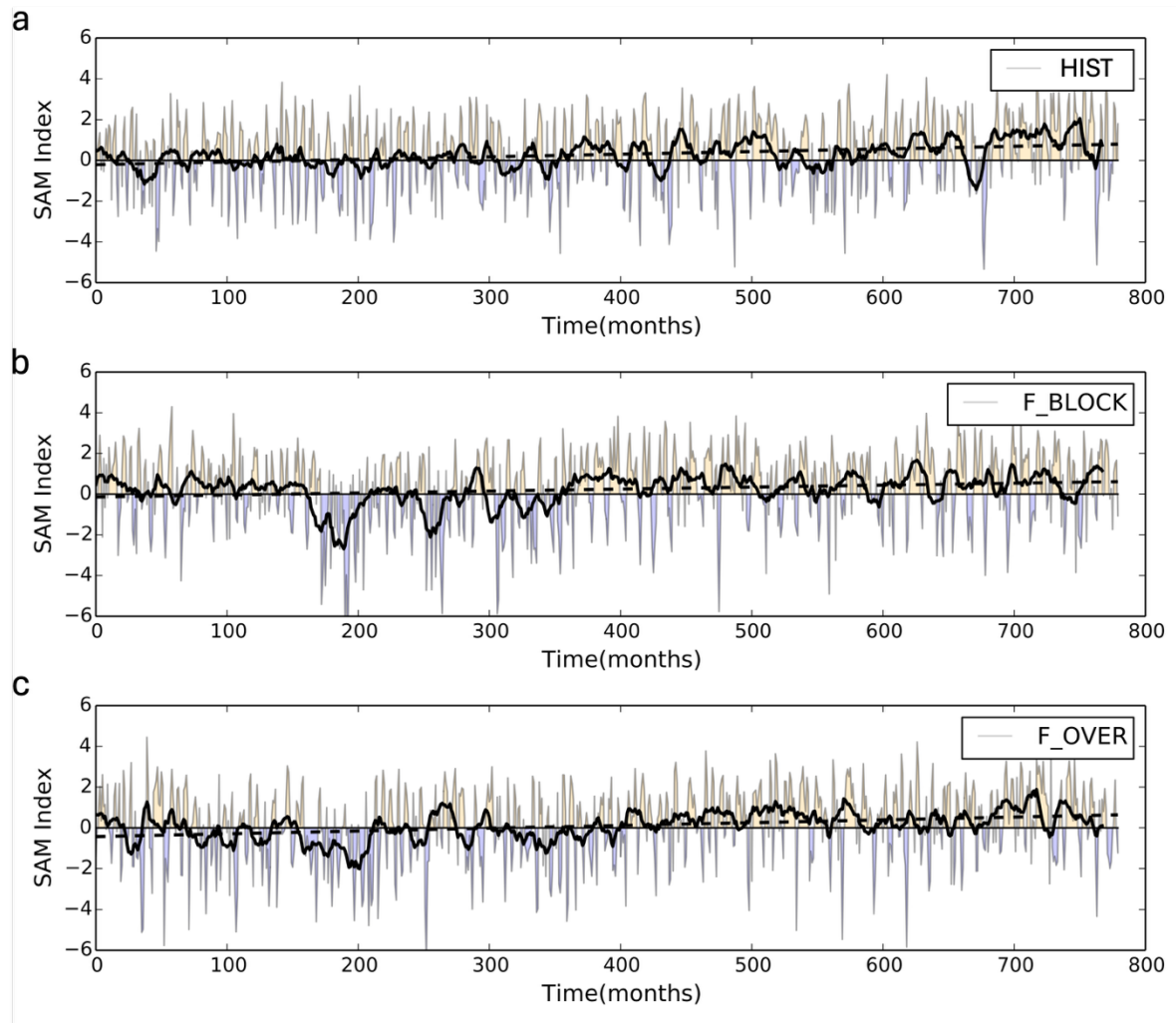


Figure S14 Southern Annular Mode (SAM) index for HIST (a), F_BLOCK (b) and F_OVER (c).