Subsurface warming of West Antarctica during El Niño

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- El Niño-Southern Oscillation (**ENSO**) **modulates West Antarctic** shelf water **temperatures** and can cause rapid basal melting of grounded ice shelves, accelerating sea level rise
- However we lack understanding of the oceanic response to ENSO in this region due to **sparse observations**

Idealised El Niño & La Niña simulations

- **ACCESS-OM2-01** Kiss et al. (2020)
  - 1/10° global ocean-sea ice **model** with 75 z* levels
  - **forced** by JRA55-do**,** atmospheric **reanalysis** Tsujino et al. (2018)
  - investigate warming and cooling on the shelf during ENSO

Idealised simulations

- climatological repeat-year forcing[x,y,t] + ENSO anomalies

(time series[t] × spatial pattern[x,y])

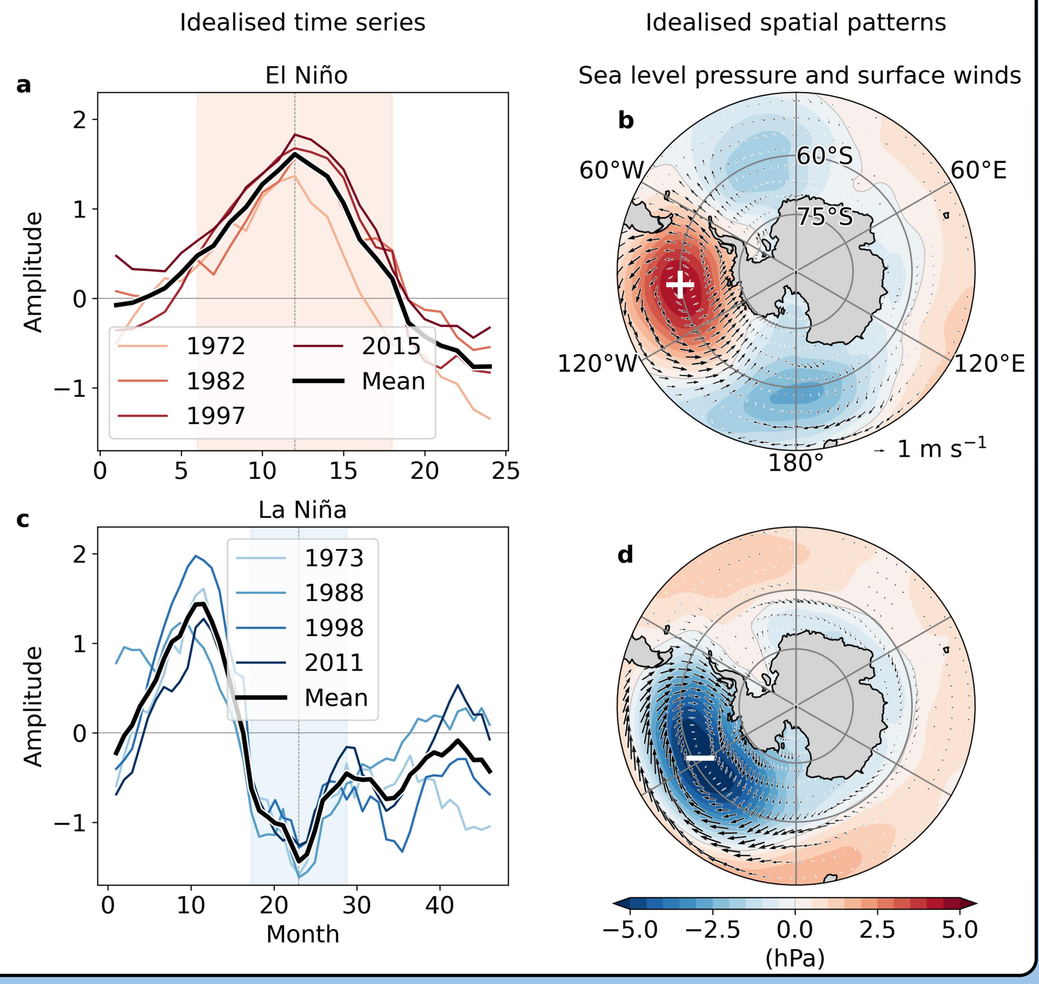
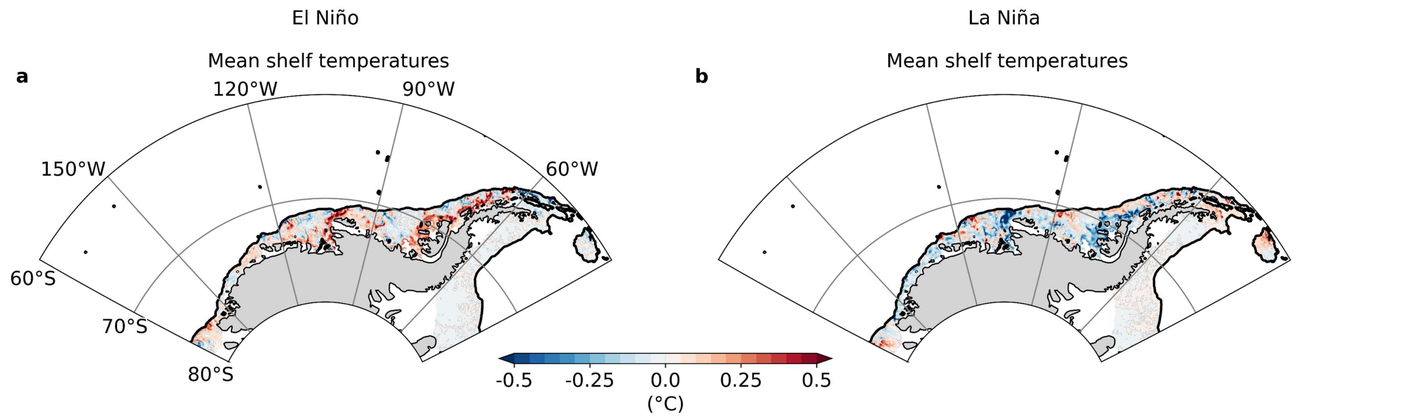


Fig. 1. ***a***, ***c***, *Composite time series associated with ENSO sea surface temperature anomalies based on observed events.* ***b***, ***d***, *Spatial patterns of sea level pressure (hPa) and surface winds (m s^{-1}) during the shaded El Niño (pink) and La Niña (blue) periods in* ***a***, ***c***.

Response of the West Antarctic shelf to El Niño & La Niña

- <u>El Niño</u>: weaker Amundsen Sea Low → more northward Ekman transport & advection of warm Circumpolar Deep Water onto shelf
- <u>La Niña</u>: response inhibited by stronger Amundsen Sea Low & surface easterlies



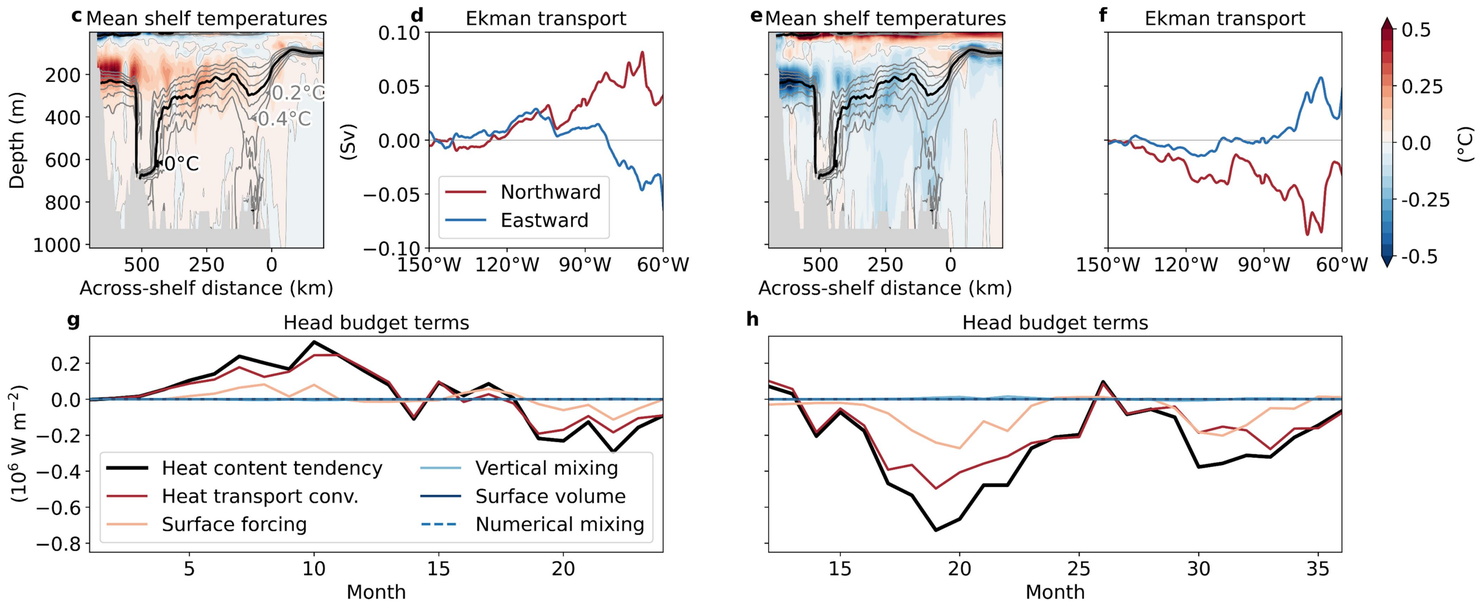


Fig. 2. ***a***, ***b***, *Peak event 100-1000 m mean temperature response (°C).* ***c, d,*** *Mean across-shelf temperature responses 150°W-60°W (°C).* ***e, f,*** *Mean Ekman transport velocities (m^{-3} s^{-1}).* ***g***, ***h***, *Eulerian heat budget anomalies (10^{6} W m^{-2}) throughout the simulations.*

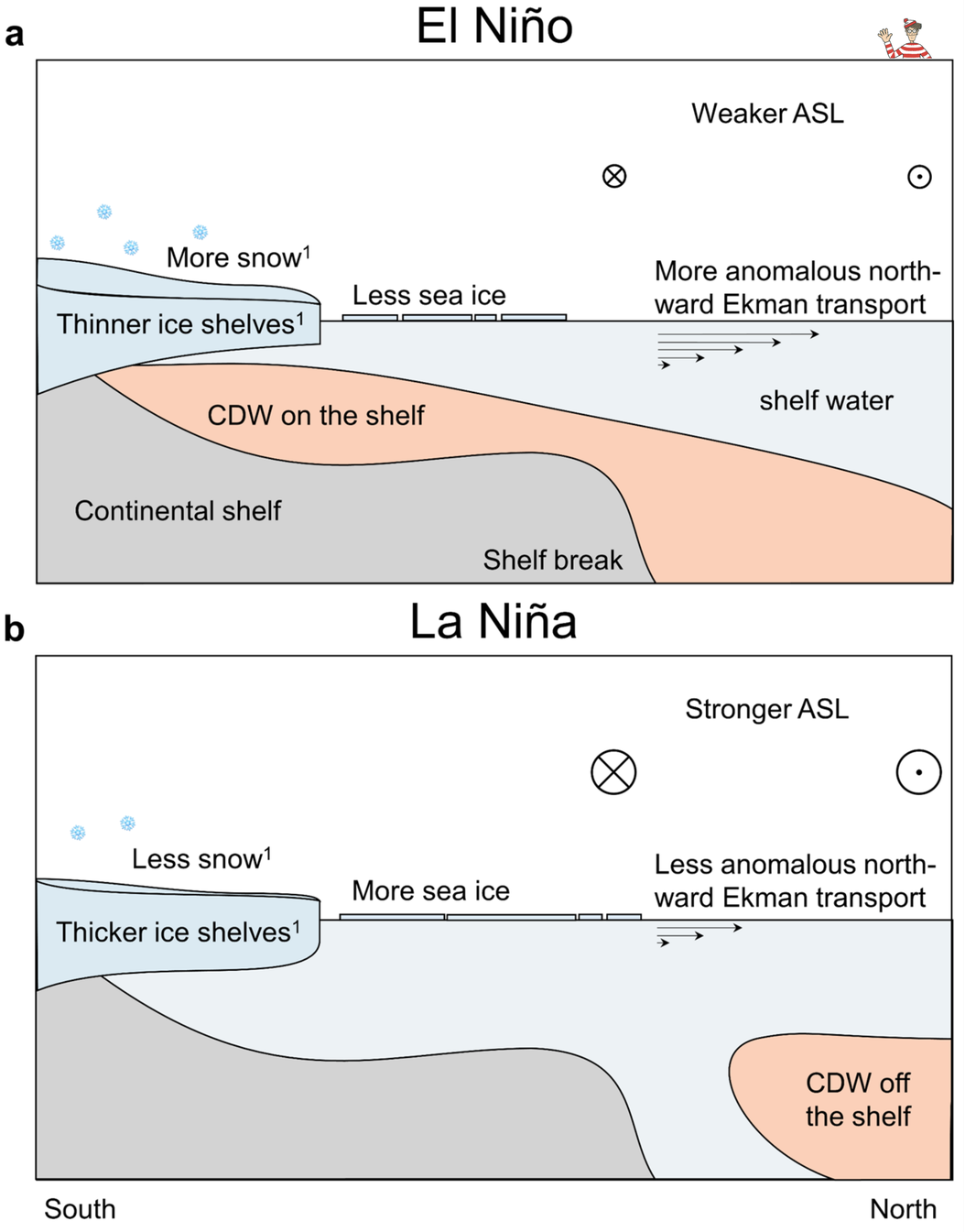


Fig. 3. ***a***, ***b***, *Schematic of anomalous physical processes on the West Antarctic shelf during El Niño and La Niña. [1] = key findings in Paolo et al. (2018).*