

Subsurface warming of West Antarctica during El Niño

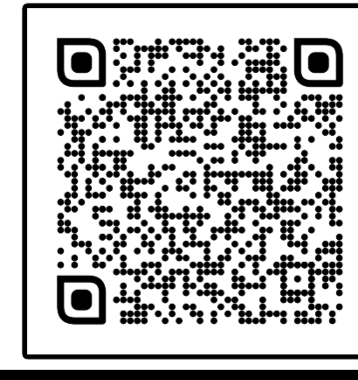
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- El Niño-Southern Oscillation (ENSO) modulates West Antarctic shelf water temperatures and can cause rapid basal melting of grounded ice shelves, accelerating sea level rise
- However we lack understanding of the oceanic ENSO response in this region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

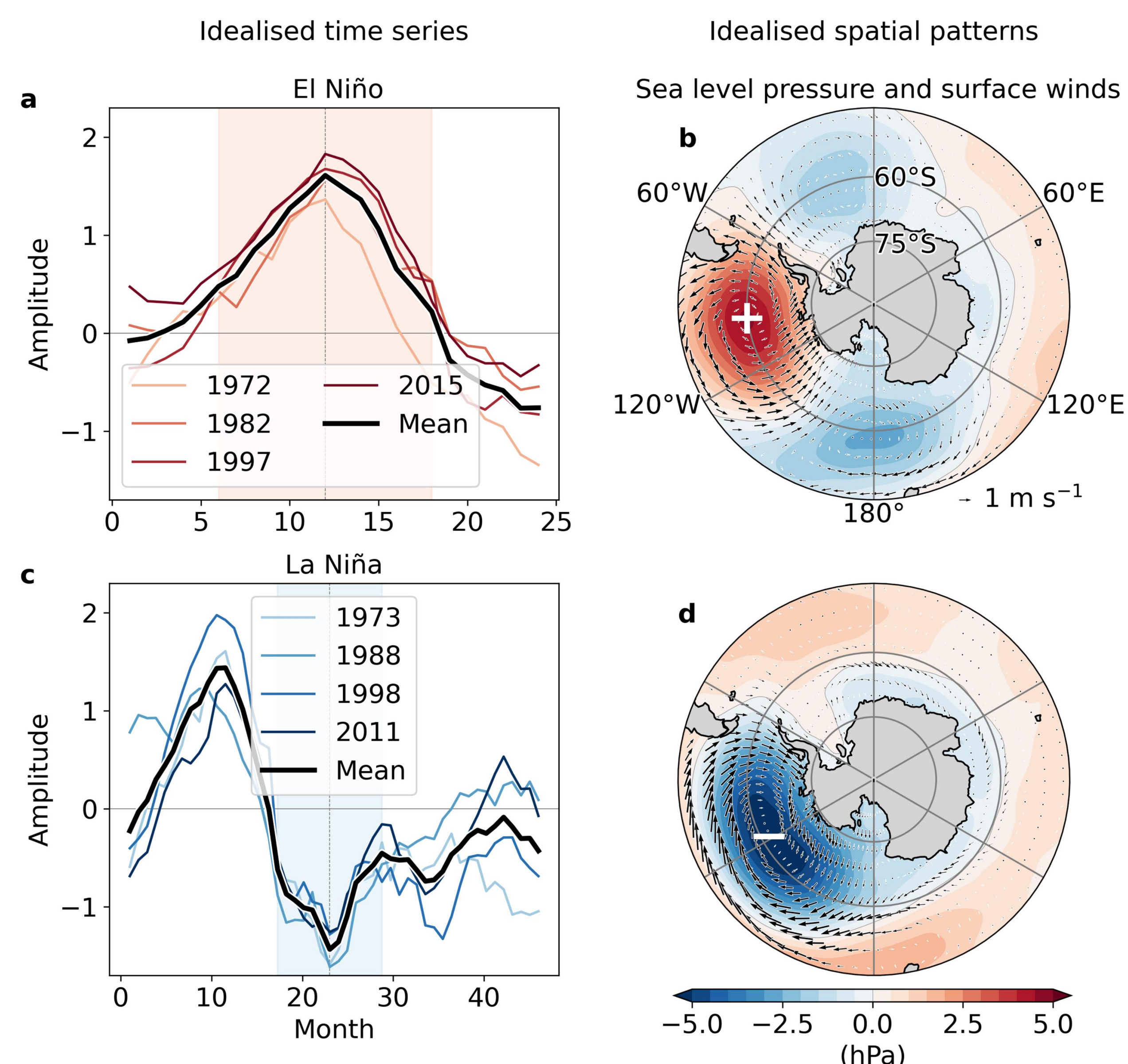
Idealised El Niño & La Niña simulations

- **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 (°C). b, d, Spatial patterns of sea level pressure (hPa) and surface winds (m² s⁻¹) during the shaded (pink) El Niño and (blue) La Niña periods in a, c.



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

- El Niño: weaker coastal westerlies → increased Ekman transport north and advection of warm Circumpolar Deep Water onto shelf
- La Niña: response inhibited by stronger westerlies

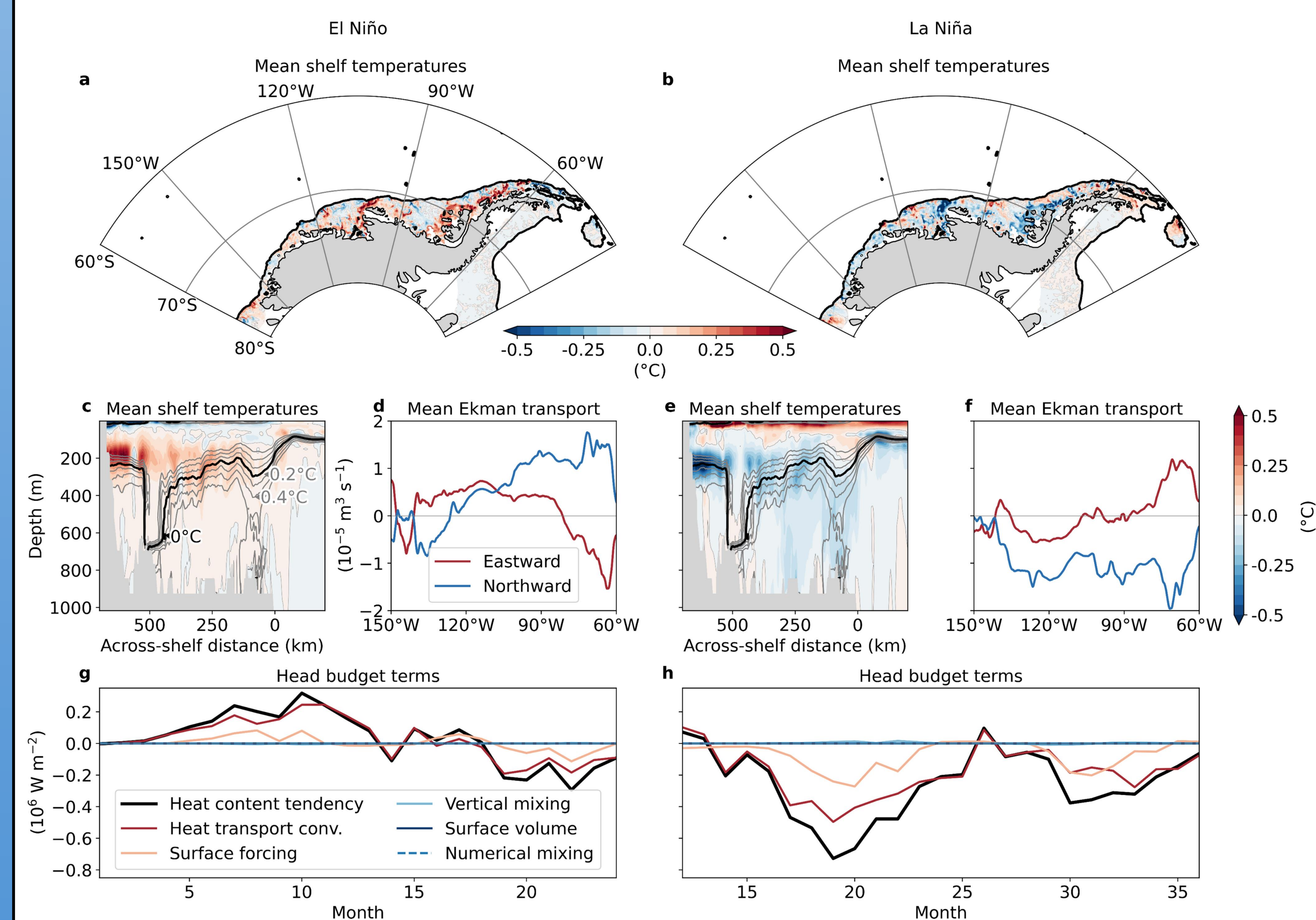


Fig. 2. a, b, Peak event 100-1000 m mean temperature response (°C). c, d, Mean across-shelf temperature responses 150°W-60°W (°C) as in a, b. e, f, Mean Ekman transport velocities (m³ s⁻¹). g, h, Eulerian heat budget terms (10⁶ W m⁻²) throughout the simulations.

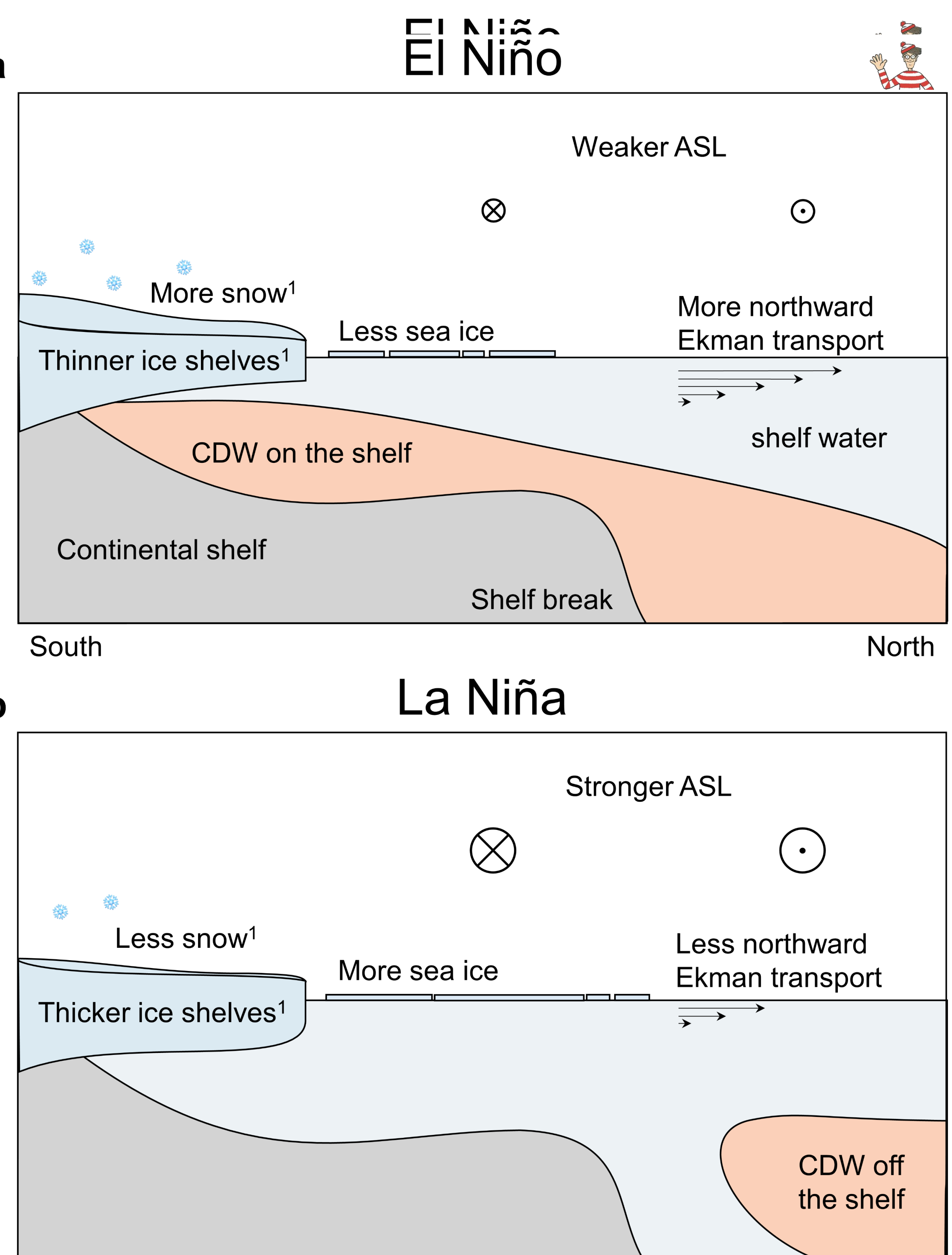


Fig. 3. a, b, Schematic of anomalous physical processes on the West Antarctic shelf during El Niño and La Niña. ¹ = key findings in Paolo et al. (2018).