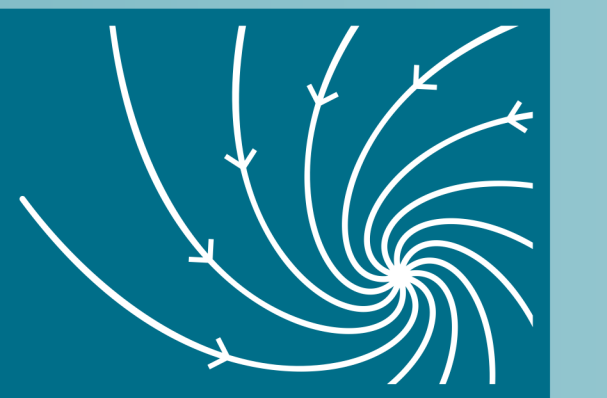# The Atlantic Niño of 2021

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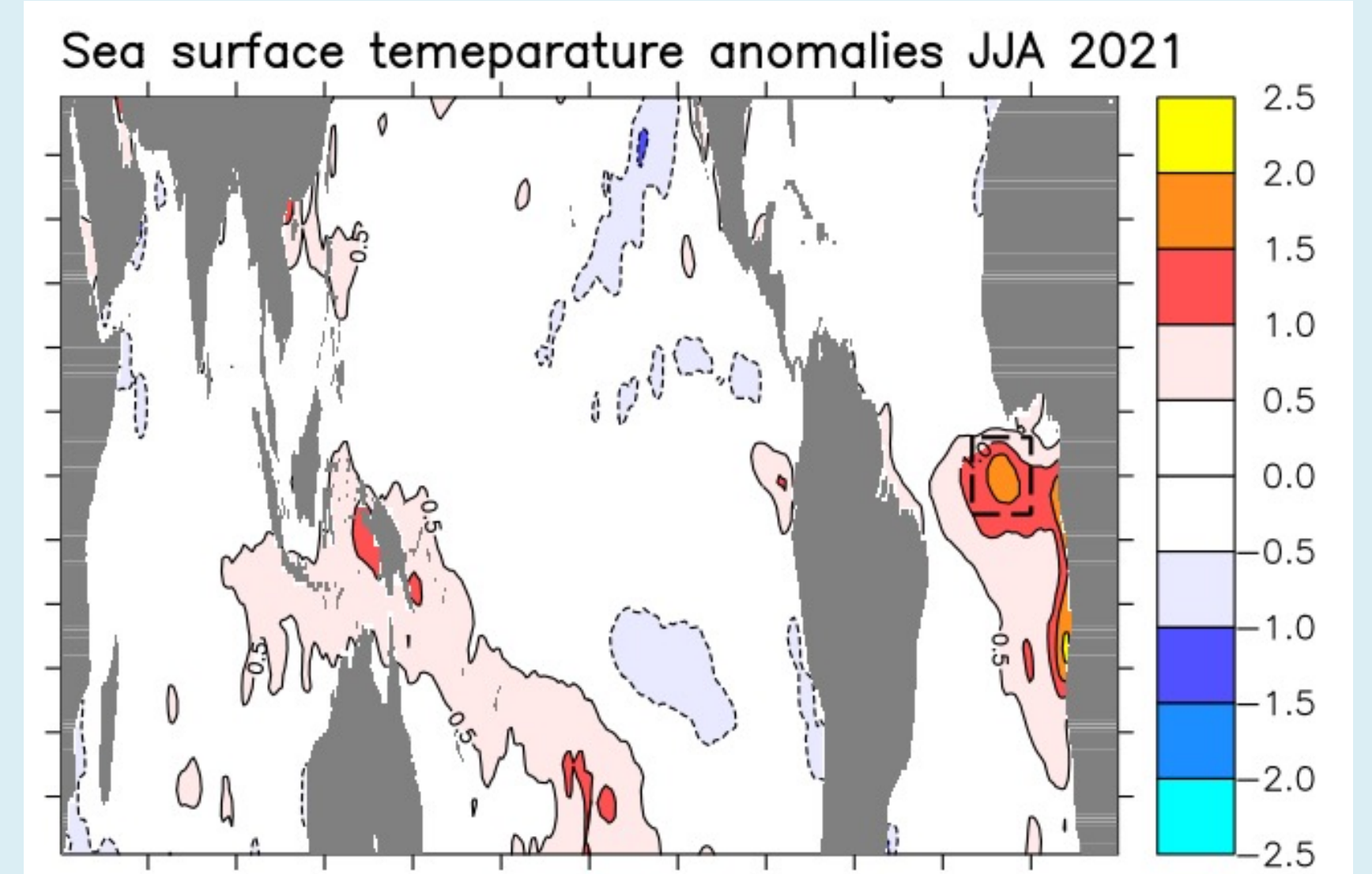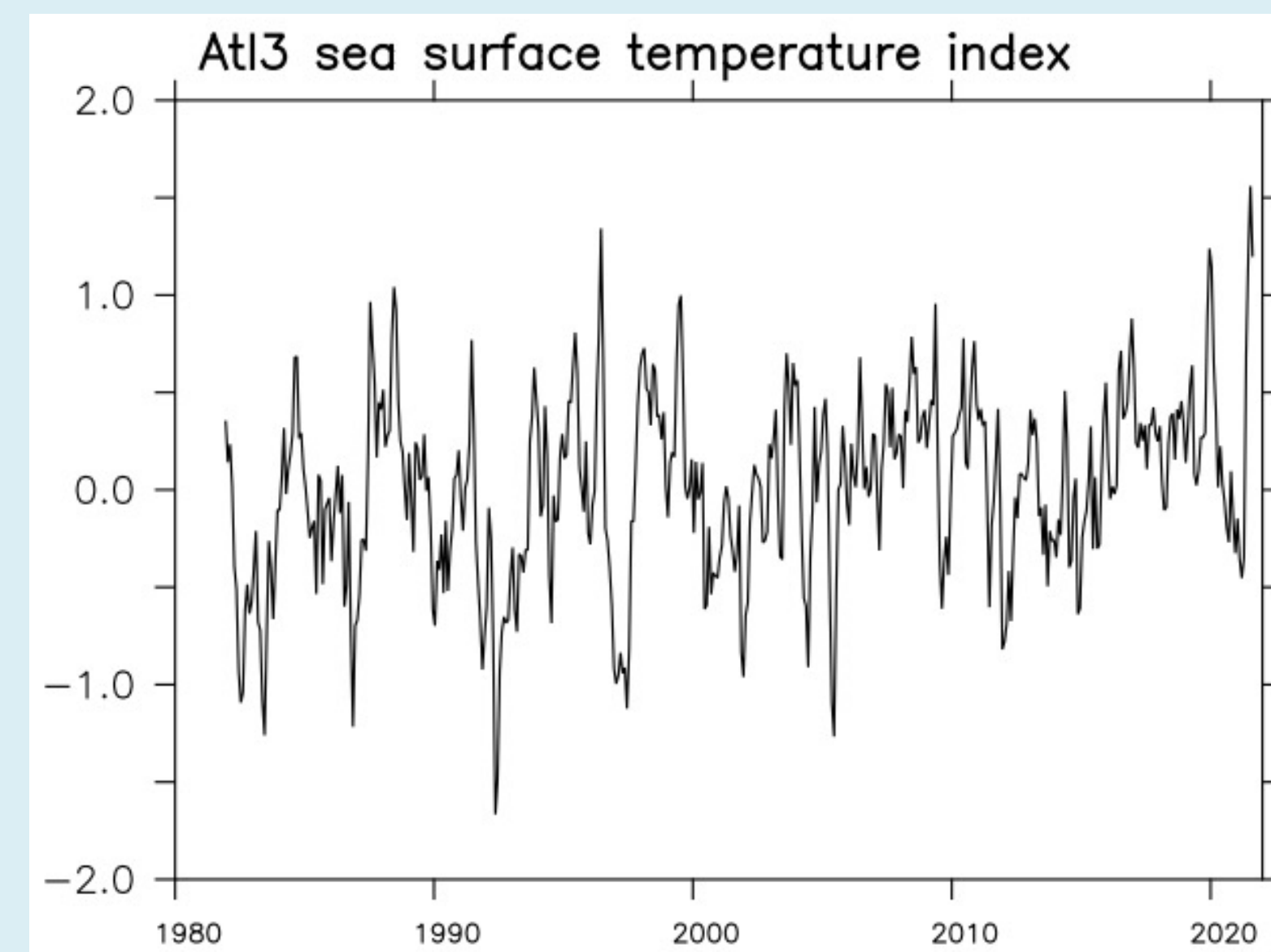
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Abstract: There was an exceptionally strong Atlantic Niño this year—stronger than the last major event in 1996. Positive SST anomalies developed in May and peaked in June–August. There was a build up of heat content in the spring in the western north Atlantic that could be related to local wind stress curl anomalies. The event appears to have been triggered by zonal wind anomalies in April and May in the western equatorial Atlantic, when strong rainfall anomalies were also observed along the equator. The rainfall anomalies have since shifted northward, suggesting the termination of equatorial coupled ocean–atmosphere feedbacks and the termination of the event. Interestingly, there was also a strong Benguela Niño that developed already in April and has persisted into boreal summer.

Tropical Atlantic exhibited the most pronounced sea surface temperature (SST) anomalies across the tropics in boreal summer 2021. The Atl3 SST anomalies were the strongest observed in the last 40 years.
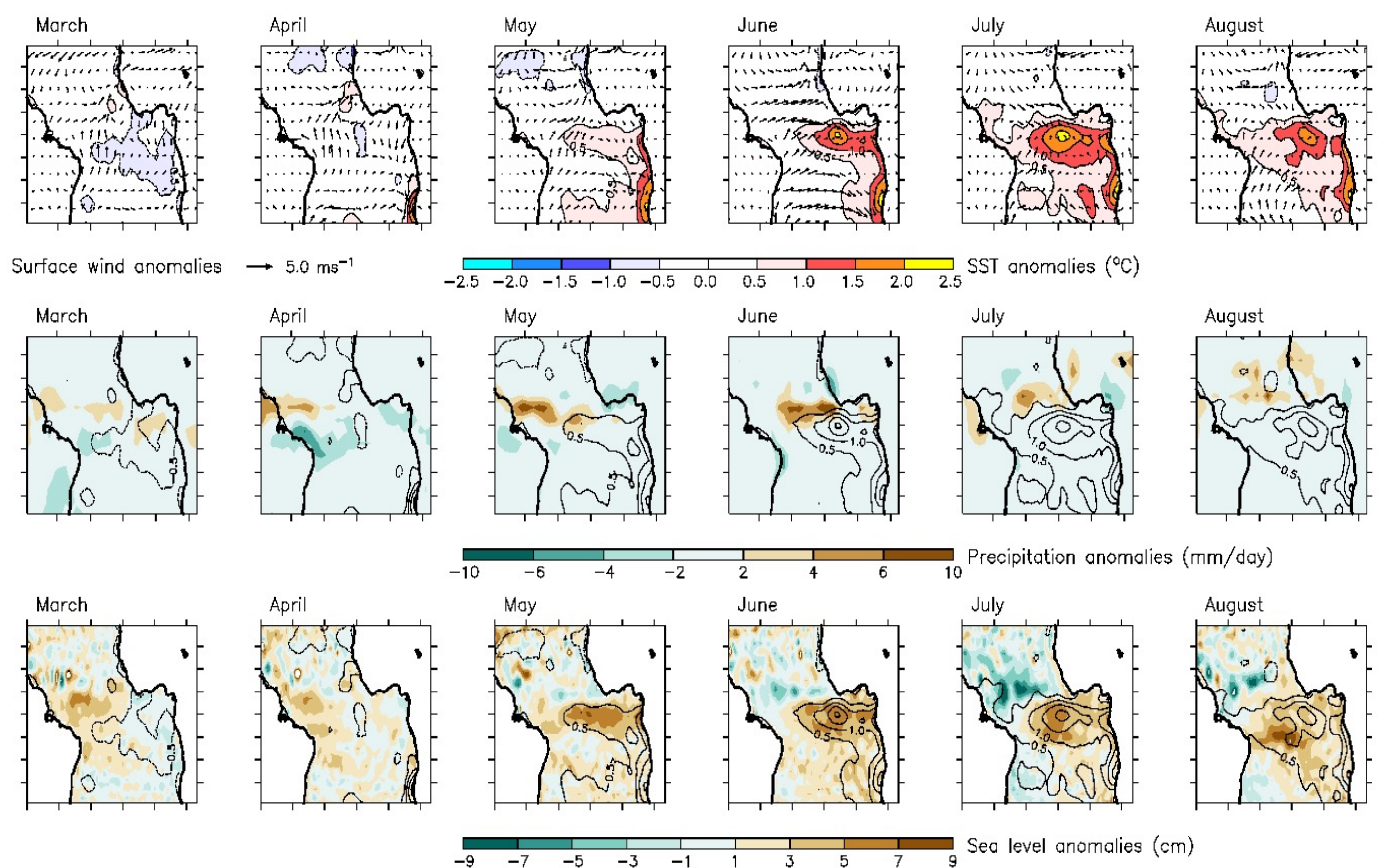

Atl3 sea surface temperature index

Sea surface temperature anomalies JJA 2021

Development of the Atlantic Nino in 2021

Event develops in May

SST and surface wind anomalies

March · April · May · June · July · August

Surface wind anomalies → 5.0 ms⁻¹   SST anomalies (°C)
−2.5 −2.0 −1.5 −1.0 −0.5 0.0 0.5 1.0 1.5 2.0 2.5

Precipitation and SST anomalies

March · April · May · June · July · August

Precipitation anomalies (mm/day)
−10 −6 −4 −2 2 4 6 10

Sea level and SST anomalies

March · April · May · June · July · August

Sea level anomalies (cm)
−9 −7 −5 −3 −1 1 3 5 7 9

Five-Day anomalies along the equator from PIRATA moorings
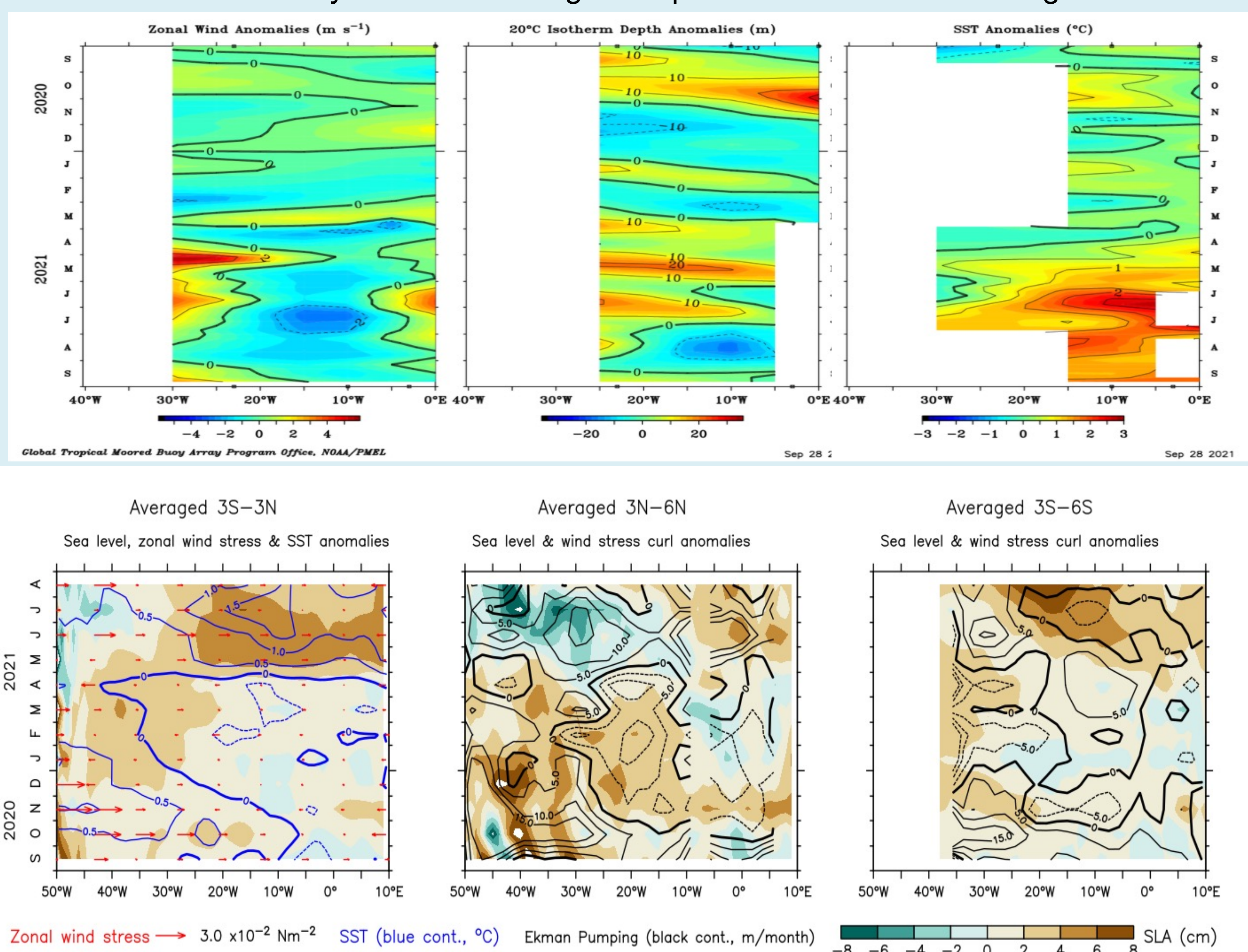
Mechanism

Zonal wind burst

Zonal Wind Anomalies (m s⁻¹) · 20°C Isotherm Depth Anomalies (m) · SST Anomalies (°C)

Global Tropical Moored Buoy Array Program Office, NOAA/PMEL

Build up of heat content (SLA) in west and north

Averaged 3S–3N — Sea level, zonal wind stress & SST anomalies
Averaged 3N–6N — Sea level & wind stress curl anomalies
Averaged 3S–6S — Sea level & wind stress curl anomalies

Zonal wind stress → 3.0 x10⁻² Nm⁻²   SST (blue cont., °C)   Ekman Pumping (black cont., m/month)
SLA (cm) −8 −6 −4 −2 0 2 4 6 8

Discussion points

- Why was this event so strong?
- What is the role of background state changes or global warming?
- What were the impacts of the event?
- The event was not properly captured by in-situ data
- Seasonal predictions failed

Data

NOAA OI SST; NCEP/NCAR reanalysis; GPCP2.3; CMEMS; PIRATA