

Strengthening Wet Anomalies over the Maritime Continent during El Niño in Boreal Winter

Rizma Dwinanda Prawira¹, Muhammad Rais Abdillah^{2,3}

¹Meteorology Study Program, Faculty of Earth Sciences and Technology, Institut Teknologi Bandung, Bandung, 40132, Indonesia

²Atmospheric Science Research Group, Faculty of Earth Sciences and Technology, Institut Teknologi Bandung, Bandung, 40132, Indonesia

³Center for Climate Change, Institut Teknologi Bandung, Bandung, 40132, Indonesia

Correspondence to: Muhammad Rais Abdillah (m.raais@itb.ac.id)

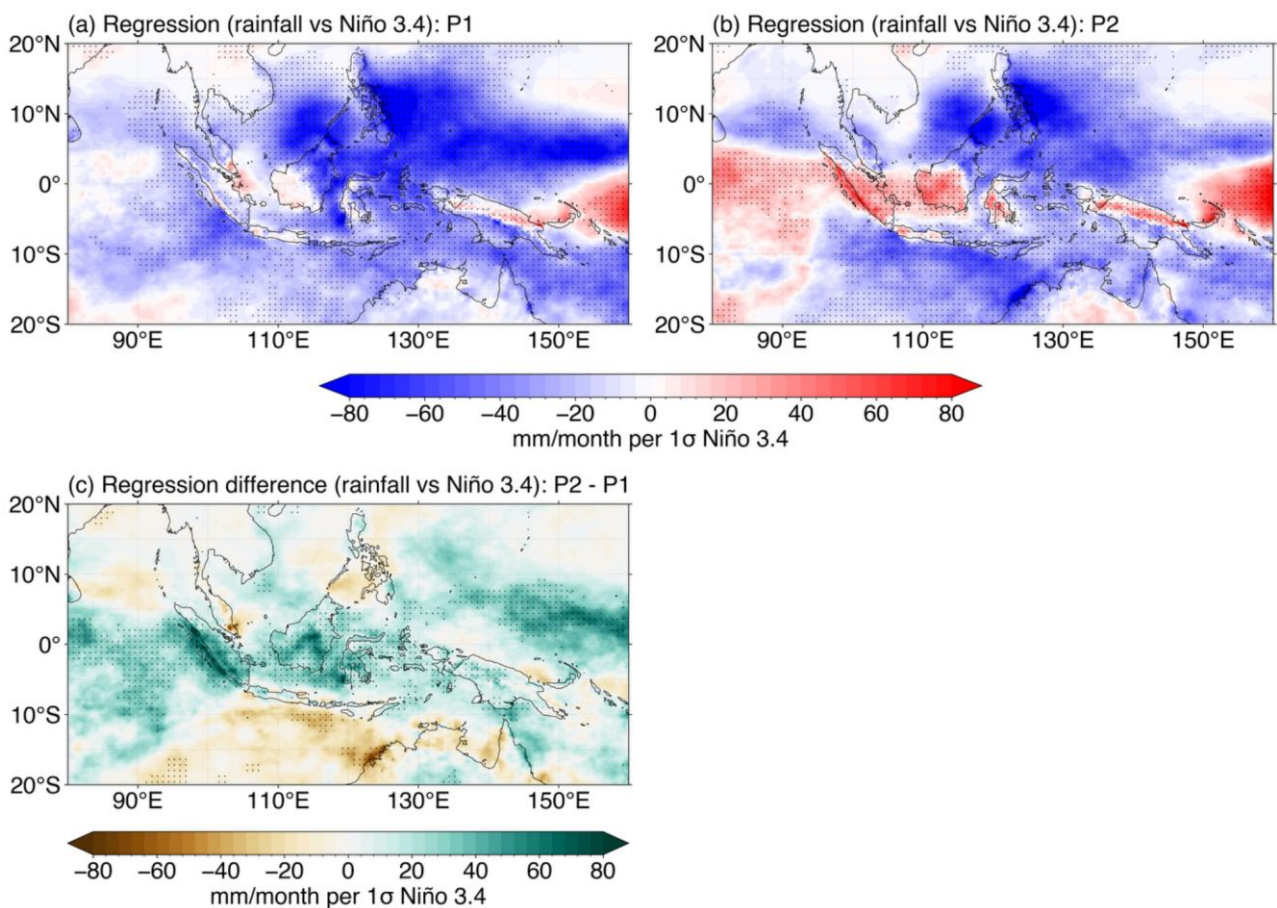


Figure S1. DJF rainfall regression (mm month⁻¹ per 1σ Niño 3.4) for (a) P1 (1981–2006), (b) P2 (2007–2025), and (c) the P2 - P1 difference. Black stippling indicates statistical significance at the 95% confidence level.

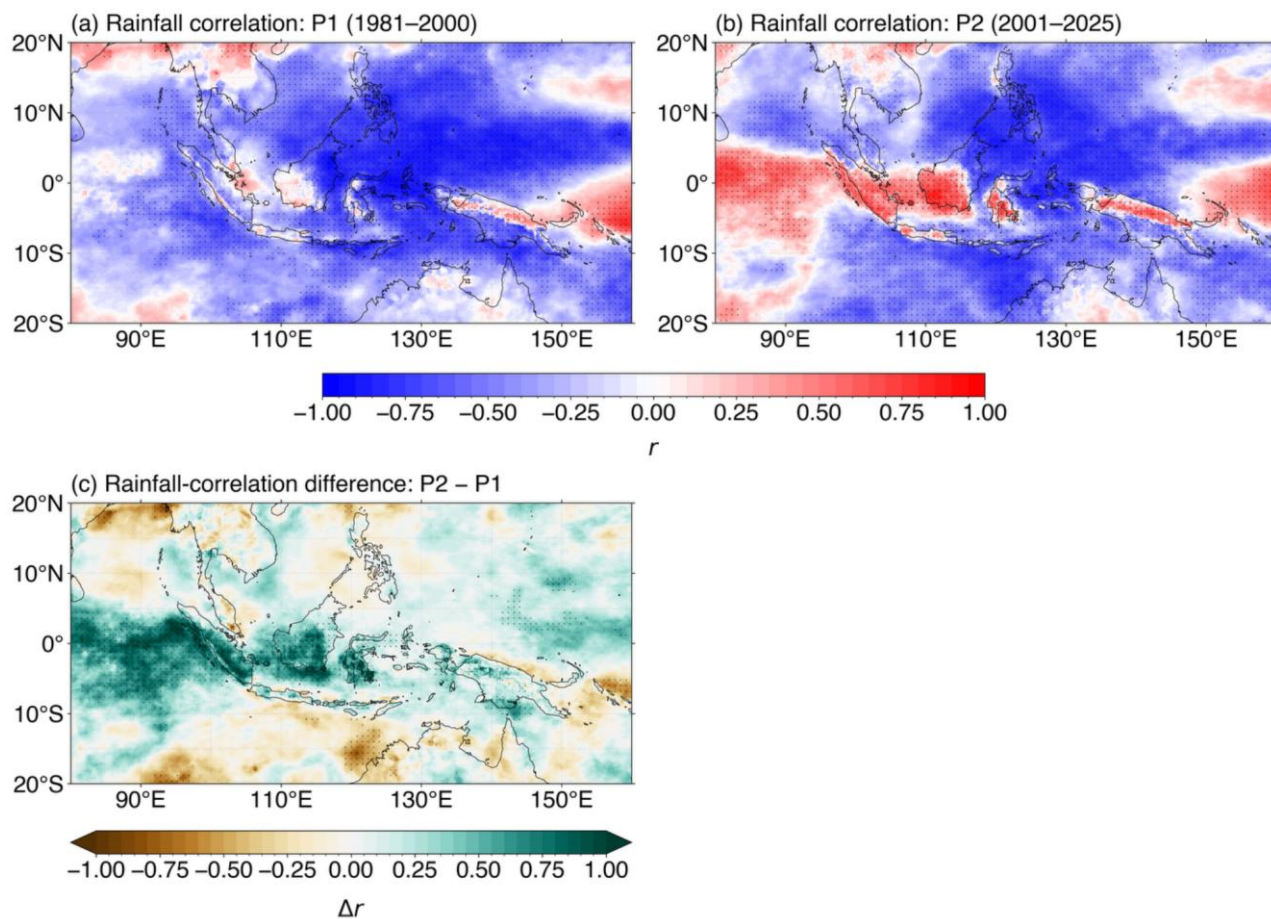


Figure S2. Correlation between DJF Niño 3.4 and rainfall for an alternative period separation: (a) P1 (1981–2000), (b) P2 (2001–2025), and (c) the P2 – P1 difference. In (a) and (b), black stippling indicates grid points where the correlation is significantly different from zero at the 95% confidence level; in (c), stippling indicates grid points where the interperiod correlation difference is significant at the 95% confidence level.

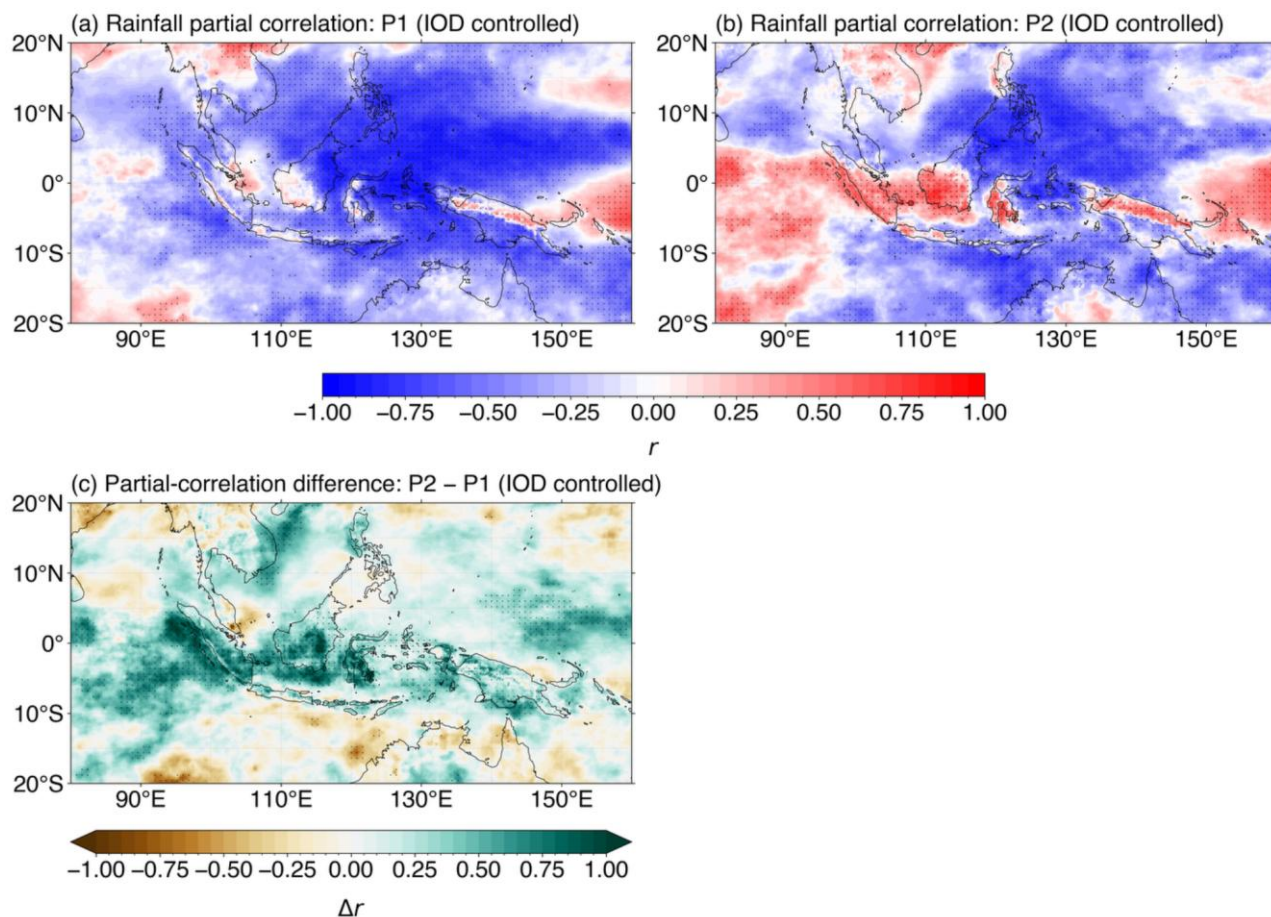


Figure S3. Partial correlation between DJF rainfall and Niño 3.4 after linearly removing the effects of Indian Ocean Dipole by using Dipole Mode Index (DMI) in (a) P1 (1981–2006), (b) P2 (2007–2025), and (c) the P2 – P1 difference. Black stippling indicates statistical significance at the 95% confidence level.

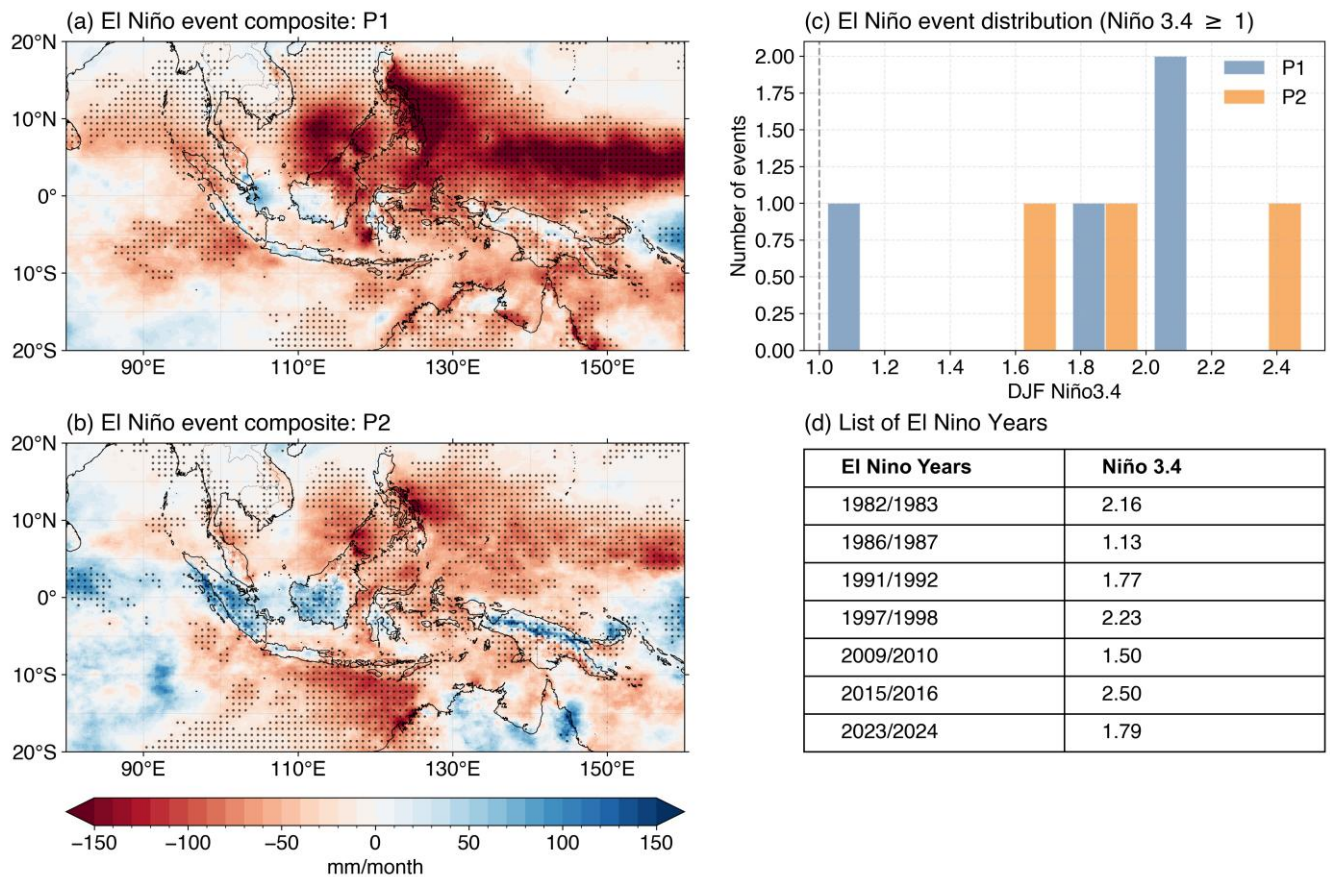


Figure S4. Composite DJF rainfall anomalies (mm month^{-1}) during El Niño events for (a) P1 (1981–2006) and (b) P2 (2007–2025), together with (c) the distribution of DJF Niño 3.4 amplitudes for events with Niño 3.4 ≥ 1 , and (d) List of the El Niño events included in the composites and their corresponding DJF Niño 3.4 values. Black stippling in (a) and (b) maps denotes statistically significant rainfall anomalies at the 95% confidence level.

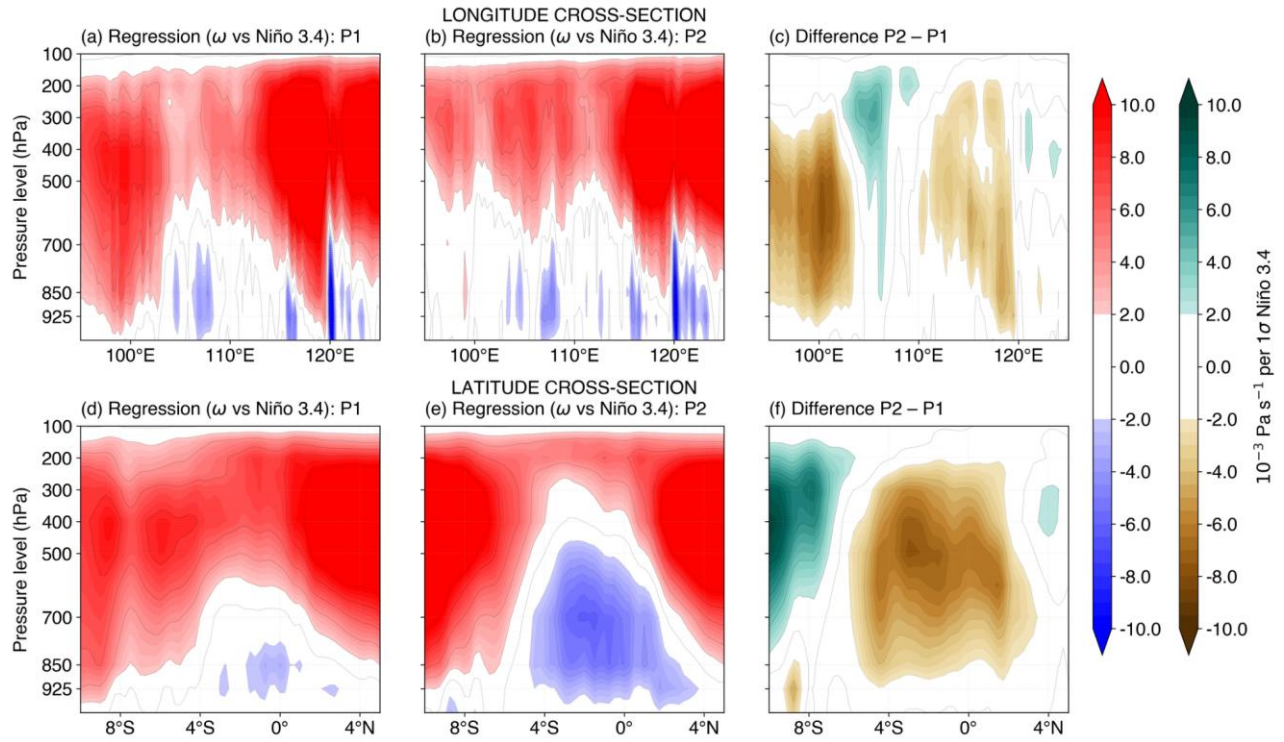


Figure S5. Vertical cross-sections of omega regression (shading, $10^{-3} \text{ Pa s}^{-1}$ per 1σ Niño 3.4) for (a, d) P1 (1981–2006), (b, e) P2 (2007–2025), and (c, f) the P2 – P1 difference. The upper row shows longitude–pressure cross-sections averaged over 10°S – 5°N , and the lower row shows latitude–pressure cross-sections averaged over 95° – 125°E .

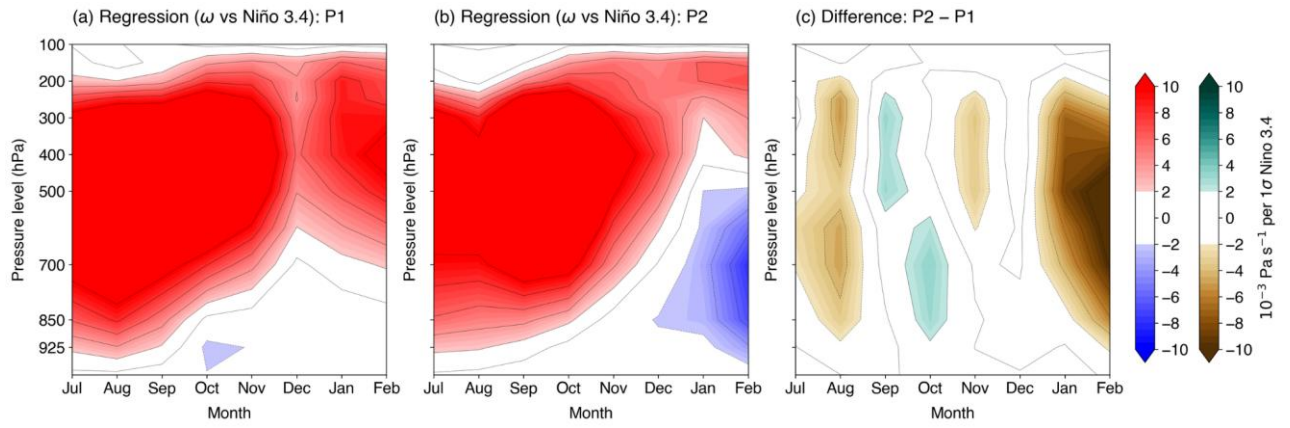


Figure S6. Time-lag vertical cross-section of omega regression ($10^{-3} \text{ Pa s}^{-1}$ per 1σ Niño 3.4), averaged over 95° – 125°E and 6°S – 2°N , for (a) P1 (1981–2006), (b) P2 (2007–2025), and (c) the P2 – P1 difference.

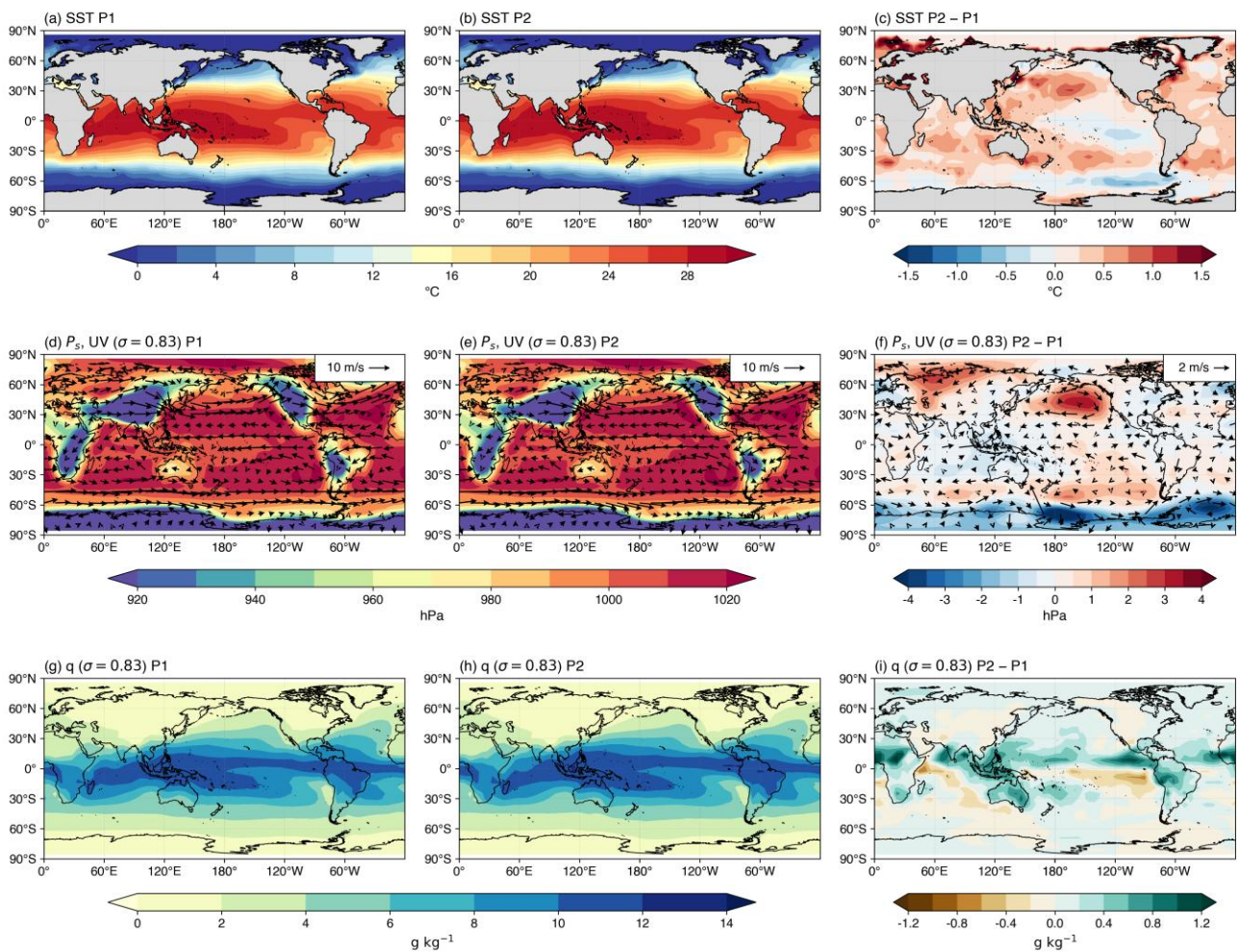


Figure S7. Basic states for Period 1 (P1; 1981–2006), Period 2 (P2; 2007–2025), and their difference (P2 – P1). (a–c) Sea surface temperature (SST; °C), (d–f) surface pressure (P_s ; hPa) and horizontal wind at $\sigma = 0.83$ (~850 hPa) (vectors; m s⁻¹), and (g–i) specific humidity at $\sigma = 0.83$ (q ; g kg⁻¹). The left and middle columns show the P1 and P2 climatologies, respectively, while the right column shows the P2 – P1 difference.