Supplemental Material

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Isolating the Evolving Contributions of Anthropogenic Aerosols and Greenhouse Gases: A New CESM1 Large Ensemble Community Resource
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SUPPLEMENTAL MATERIALS

Isolating the Evolving Contributions of Anthropogenic Aerosols and Greenhouse Gases from Internal Variability: A New CESM1 Large Ensemble Community Resource

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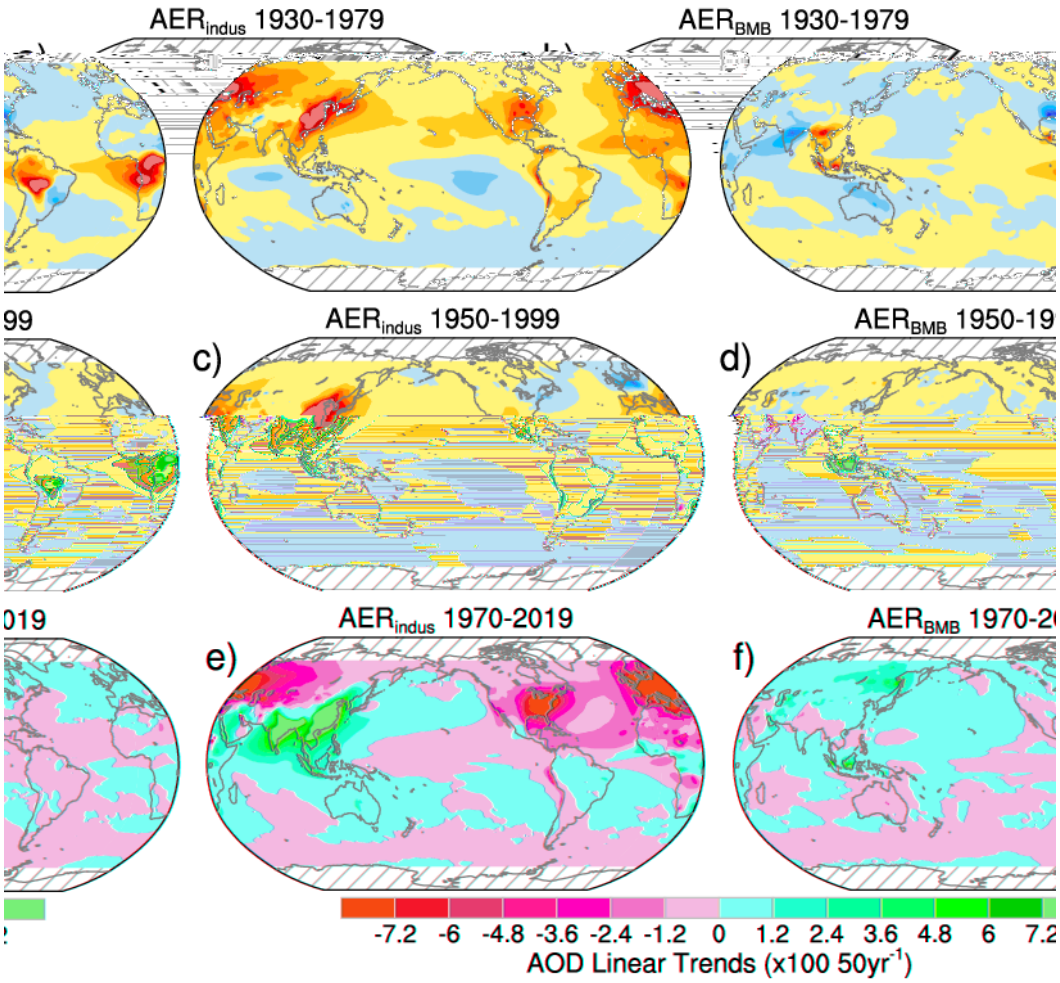

Figure S1. Linear trends in ensemble-mean Aerosol Optical Depth (AOD) at a wavelength of 550nm (per 50 years, multiplied by 100) for: a) AERindus 1930-1979; b) AERindus 1950-1999; and d) AERindus 1970-2019; e) AERbmb 1930-1979; f) AERbmb 1950-1999; and g) AERbmb 1970-2019. AERindus denotes the industrial aerosol ensemble and AERbmb denotes the biomass burning aerosol ensemble. AOD values in polar regions (hatching) are omitted for plotting purposes only.

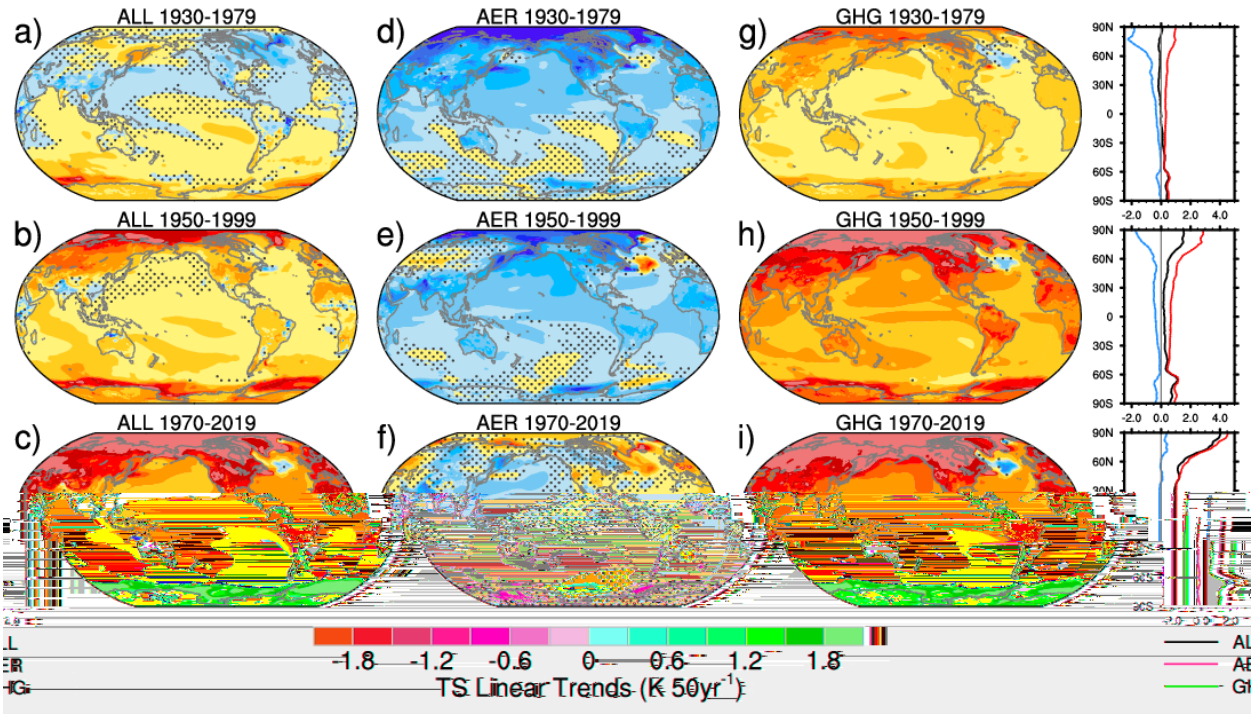

Figure S2. Linear trends in CESM1 ensemble-mean surface temperature (TS; K per 50 years) based on: a) ALL 1930-1979; b) ALL 1950-1999; c) ALL 1970-2019; d) AER 1930-1979; e) AER 1950-1999; f) AER 1970-2019; g) GHG 1930-1979; h) GHG 1950-1999; i) GHG 1970-2019. Stippled regions indicate insignificant values at the 90% confidence level based on a 2-sided t-test. Panels on the right show zonal-mean profiles of the trend maps in each row: ALL (black), AER (blue) and GHG (red).

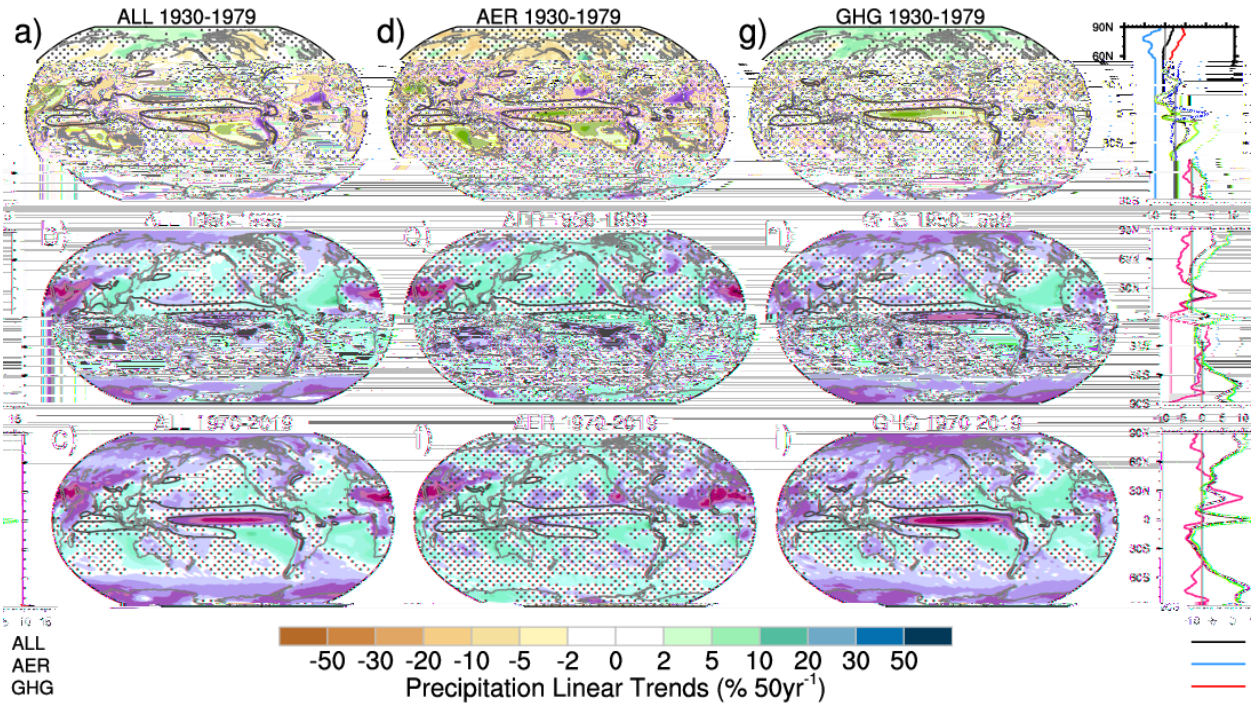

Figure S3. Linear trends in CESM1 ensemble-mean precipitation expressed as a percentage of the ensemble-mean ALL climatology in each period (% per 50 years) for: a) ALL 1930-1979; b) ALL 1950-1999; c) ALL 1970-2019; d) AER 1930-1979; e) AER 1950-1999; f) AER 1970-2019; g) GHG 1930-1979; h) GHG 1950-1999; i) GHG 1970-2019. Stippled regions indicate insignificant values at the 90% confidence level based on a 2-sided t-test. The contours show the 6 mm/day isopleth of the precipitation climatology. Panels on the right show zonal-mean profiles of the trend maps in each row (i.e., zonal means of the % trends at each grid box): ALL (black), AER (blue) and GHG (red).

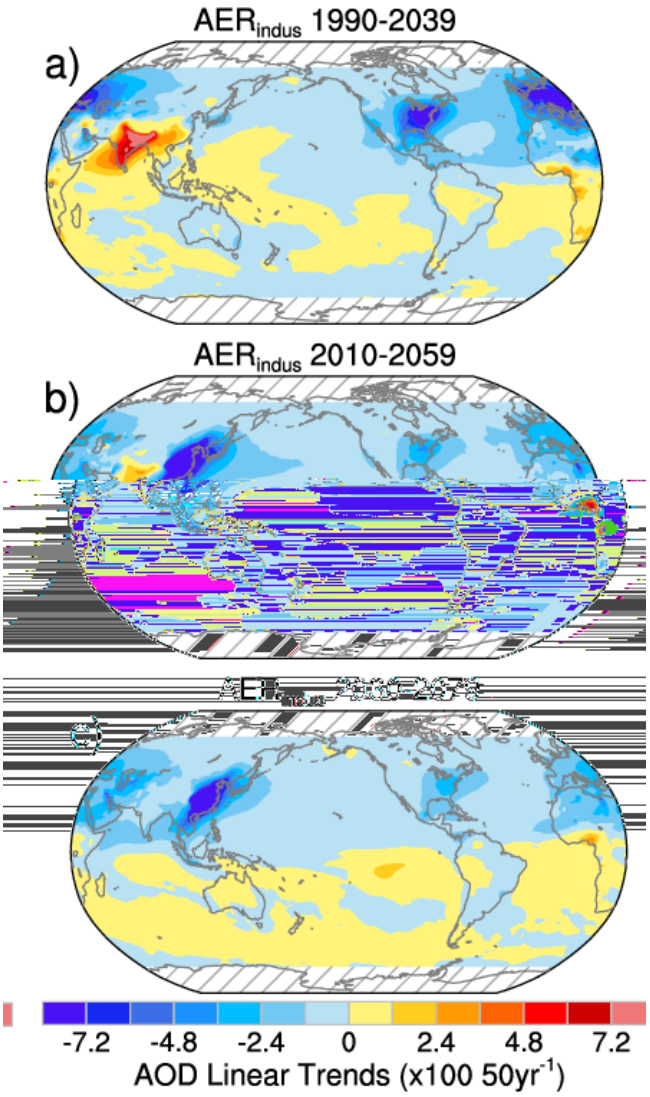

Figure S4. Linear trends in ensemble-mean Aerosol Optical Depth (AOD) at a wavelength of 550nm (per 50 years, multiplied by 100) from AERindus for: a) 1990-2039; b) 2010-2059; and c) 2030-2079. AOD values in polar regions (hatching) are omitted for plotting purposes only.

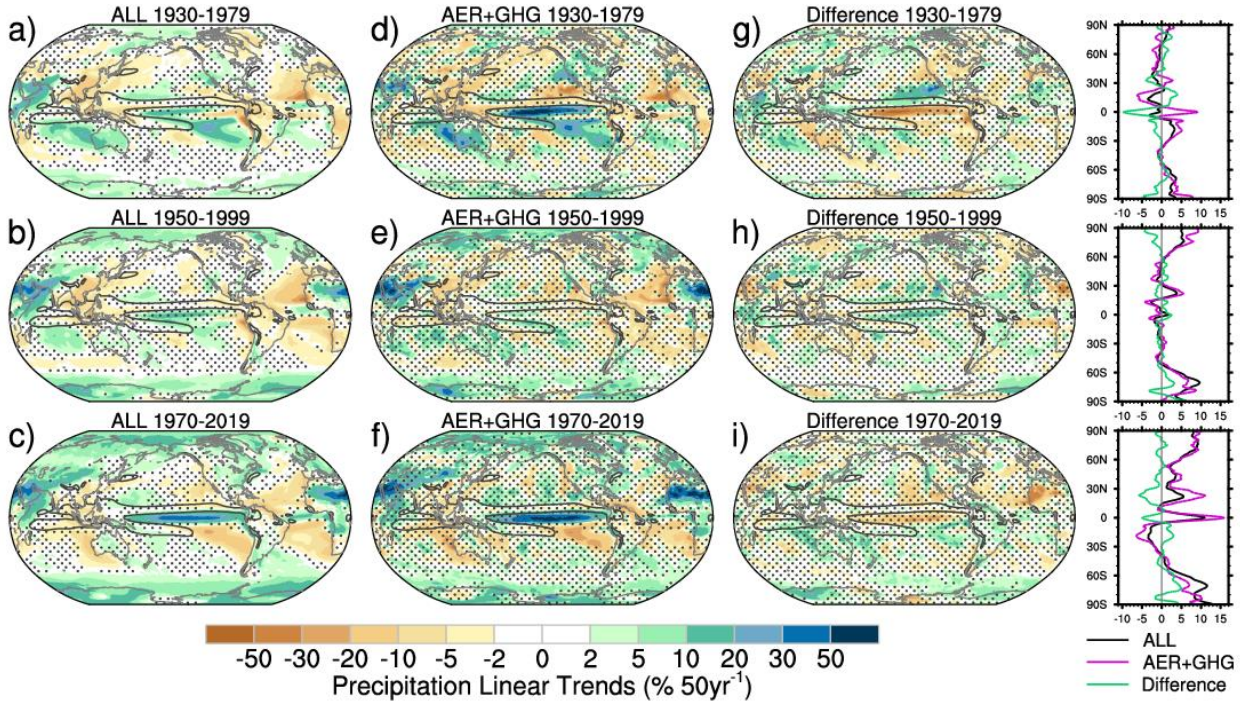

Figure S5. Linear trends in CESM1 ensemble-mean precipitation expressed as a percentage of the ensemble-mean ALL climatology in each period (% per 50 years) for: a) ALL 1930-1979; b) ALL 1950-1999; c) ALL 1970-2019; d) AER+GHG 1930-1979; e) AER+GHG 1950-1999; f) AER+GHG 1970-2019; g) ALL minus AER+GHG 1930-1979; h) ALL minus AER+GHG 1950-1999; i) ALL minus AER+GHG 1970-2019. Stippled regions indicate insignificant values at the 90% confidence level based on a 2-sided t-test. The contours show the 6 mm/day isopleth of the precipitation climatology. Panels on the right show zonal-mean profiles of the trend maps in each row (i.e., zonal means of the % trends at each grid box): ALL (black), AER+GHG (purple) and their difference (green).

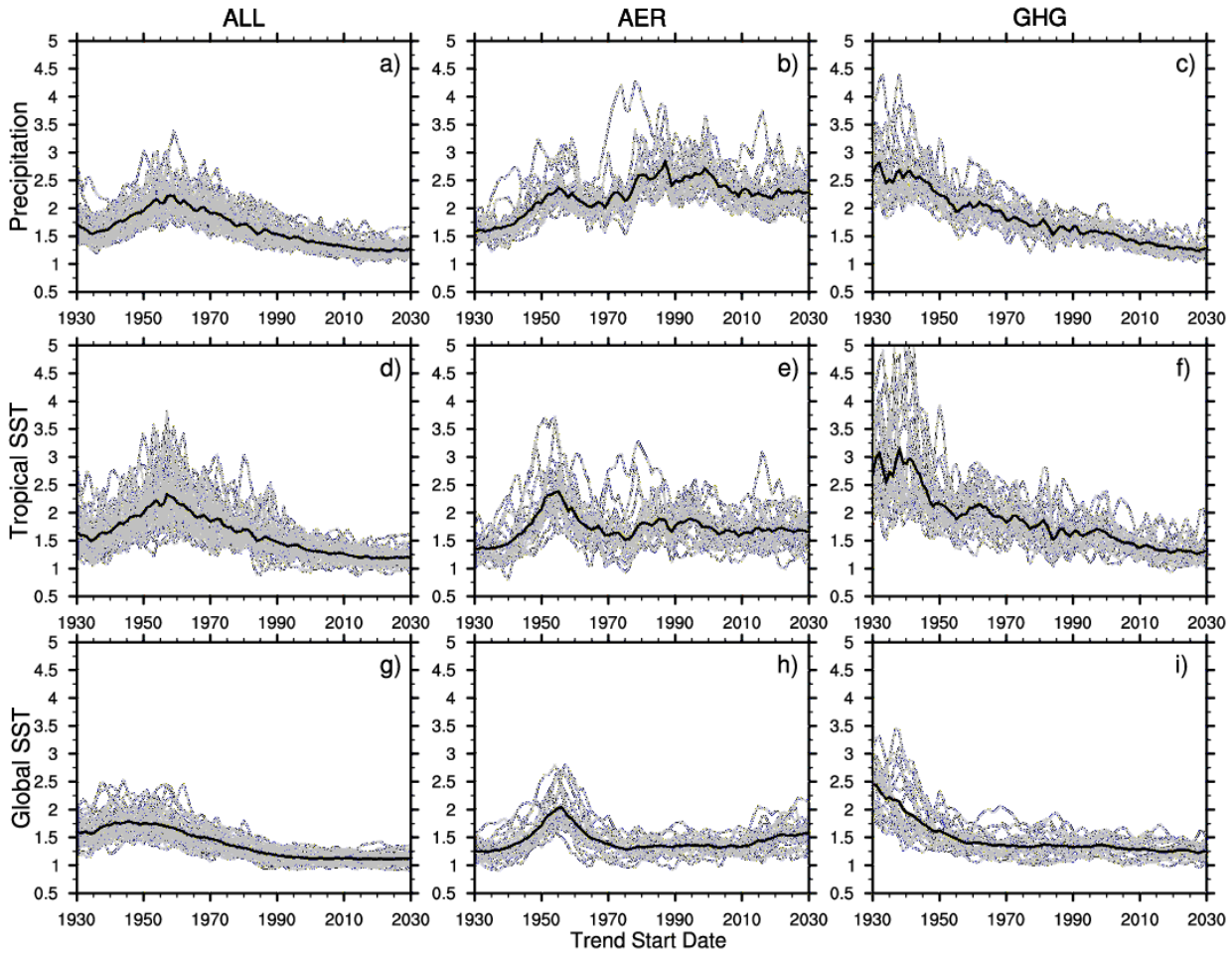

Figure S6. (Gray curves) Spatial RMS of running 50-year trends from each individual ensemble member relative to the ensemble-mean of: a) ALL tropical precipitation; b) AER tropical precipitation; c) GHG tropical precipitation; d) ALL tropical SST*; e) AER tropical SST*; f) GHG tropical SST*; g) ALL global SST*; h) AER global SST*; and i) GHG global SST*. The asterisk denotes that the domain-mean SST trend has been removed before computing the spatial RMS. Thick black curves are the average of the gray curves. The time axis denotes the start year of each 50-year trend. Results for global precipitation are nearly identical to those for tropical precipitation.

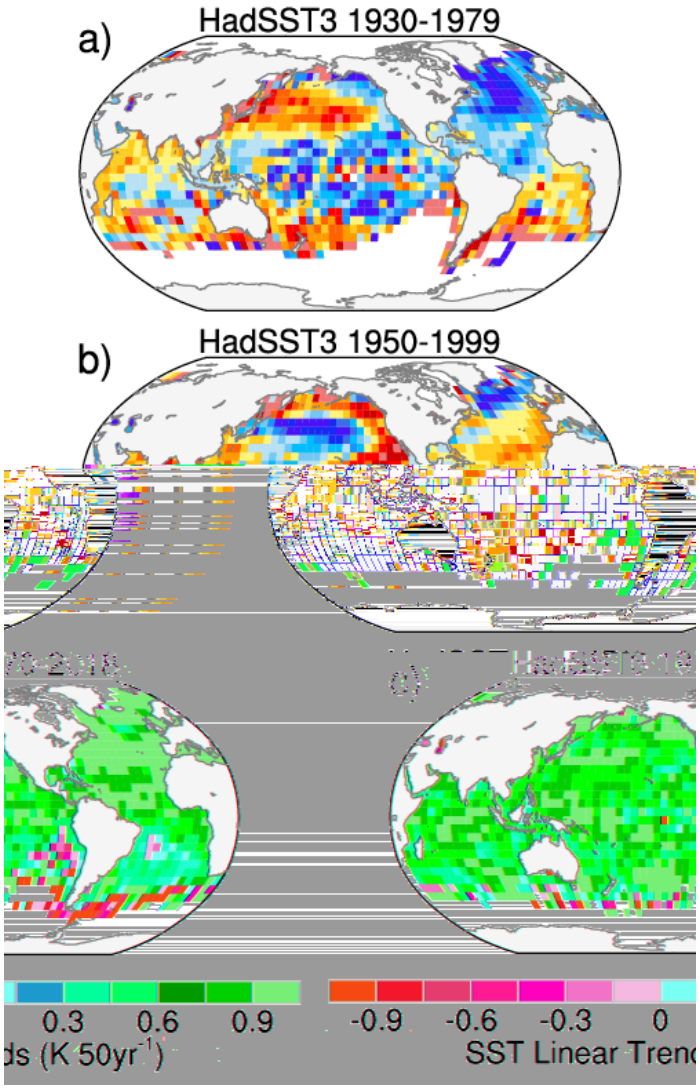

Figure S7. Linear SST trends from HadSST3 (K per 50 years) during: a) 1930-1979; b) 1950-1999; c) 1970-2018. White areas denote missing data.

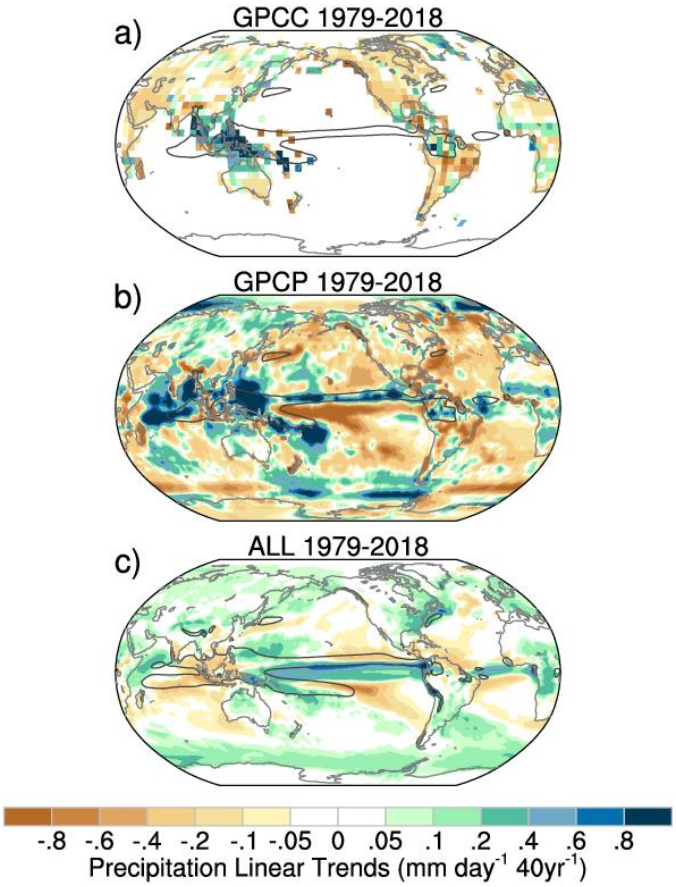

Figure S8. Linear precipitation trends (mm/day per 50 years) during 1979-2018 from: a) GPCC; b) GPCP; and c) ALL ensemble-mean. White areas over ocean in panel a) denote missing data.