

RECENT MULTIDECADAL STRENGTHENING OF THE WALKER CIRCULATION
ACROSS THE TROPICAL PACIFIC

SI Guide

(1) Supplementary Figures.pdf

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Supplementary Fig. 1. Identical to Figure 1, except SLP trends are shown for 1979-2011 for (a) Indonesia (110°E-160°E, 10°S-10°N) and (b) the eastern Pacific Ocean (130°W-80°W, 10°S-10°N).

Supplementary Fig. 2. Hovmoller diagram of monthly ICOADS data coverage (in percent) across the Indo-Pacific Ocean between 10°S-10°N. The x-axis is longitude and the y-axis displays the year.

Supplementary Fig. 3. Percent of available data coverage used in four ICOADS linear trend estimates of sea level pressure for 10, 20, 30, and 40 year moving windows from January 1900 to December 2011. (a) The coverage for trend estimates of SLP over Indonesia. (b) The coverage for trend estimates of SLP over the eastern Pacific. Four different estimates of the trend were computed only for grid boxes that fulfilled certain criteria (see “ICOADS trend estimate” in Methods). The dark vertical line is drawn at the first year when the average coverage in each region was greater than 50%. The x-axis displays the initial year of the trend and the y-axis shows the percentage of grid boxes used for the trend analysis in each region.

Supplementary Fig. 4. Signal to Noise (S/N) ratio and ICOADS coverage (in %) across the Indo-Pacific Ocean. (a) S/N ratio averaged between 10°S-10°N for 1960-2011 (dashed line) and the average percent of ICOADS data coverage between 10°S-10°N (solid line). (b) Map view of S/N ratio for 1960-2011. (c) and (d) are the same as (a) and (b) except for 1900-1959.

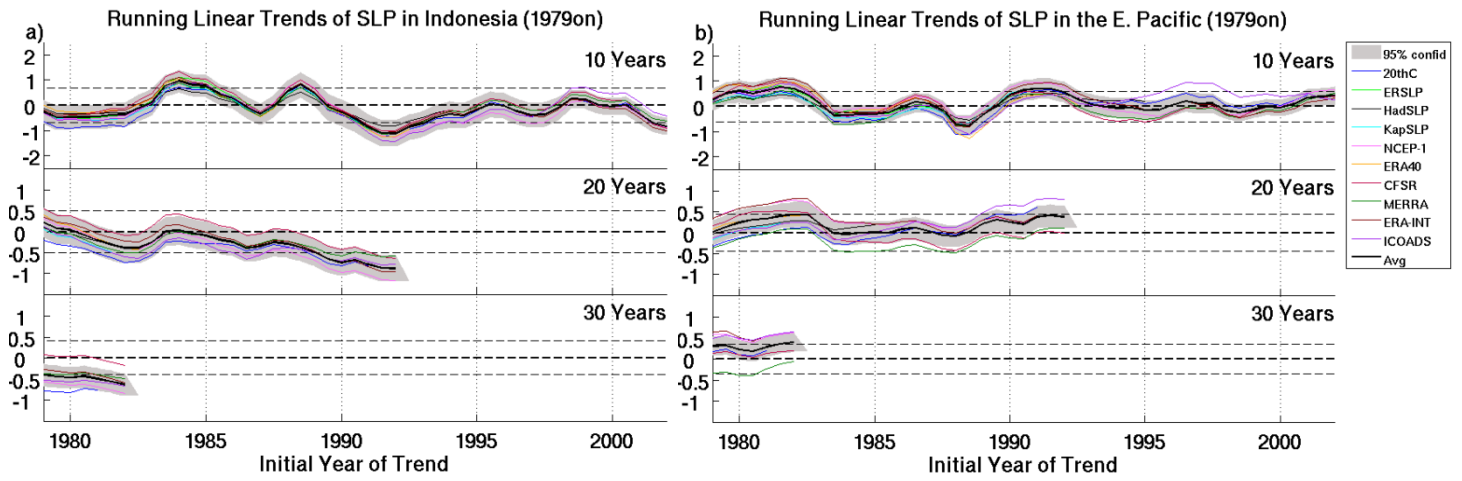
Supplementary Fig. 5. Hovmoller diagram of 30-year moving sea level pressure (SLP) linear trends (averaged between 10°S-10°N) with Niño-3.4 linearly removed. SLP is expressed as the change, in hPa, over the 30-year window. The x-axis is longitude and the y-axis is the initial year of the trend.

Supplementary Fig. 6. From the 56 members of the 20th Century Reanalysis, sea level pressure linear trends for 10, 20, 30, and 40 year moving windows for January 1900 - December 2010. (a) Trends for the region over Indonesia (110°E-160°E, 10°S-10°N) and (b) for the region over the Eastern Pacific Ocean (130°W-80°W, 10°S-10°N). SLP is expressed as the change (hPa) over the window length. The green lines indicate the trends for each of the 56 members, while the black line is the trend of the ensemble average. The x-axis displays the initial year of the trend (for 10 year windows, 1950 denotes the 1950-1959 trend).

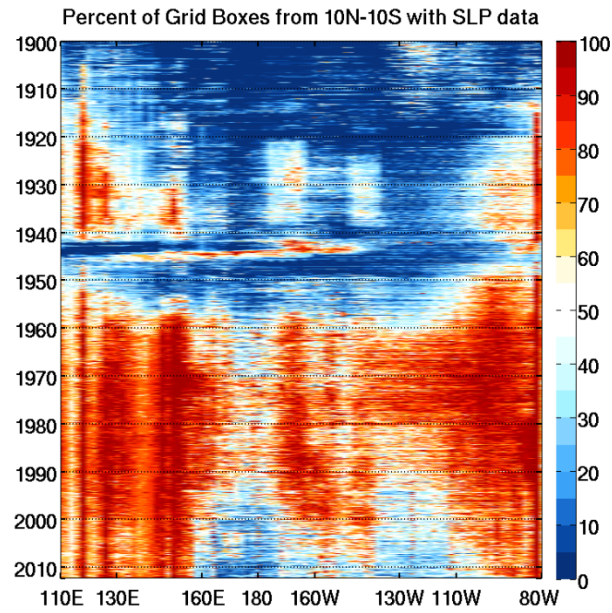
(2) Supplementary Methods.pdf

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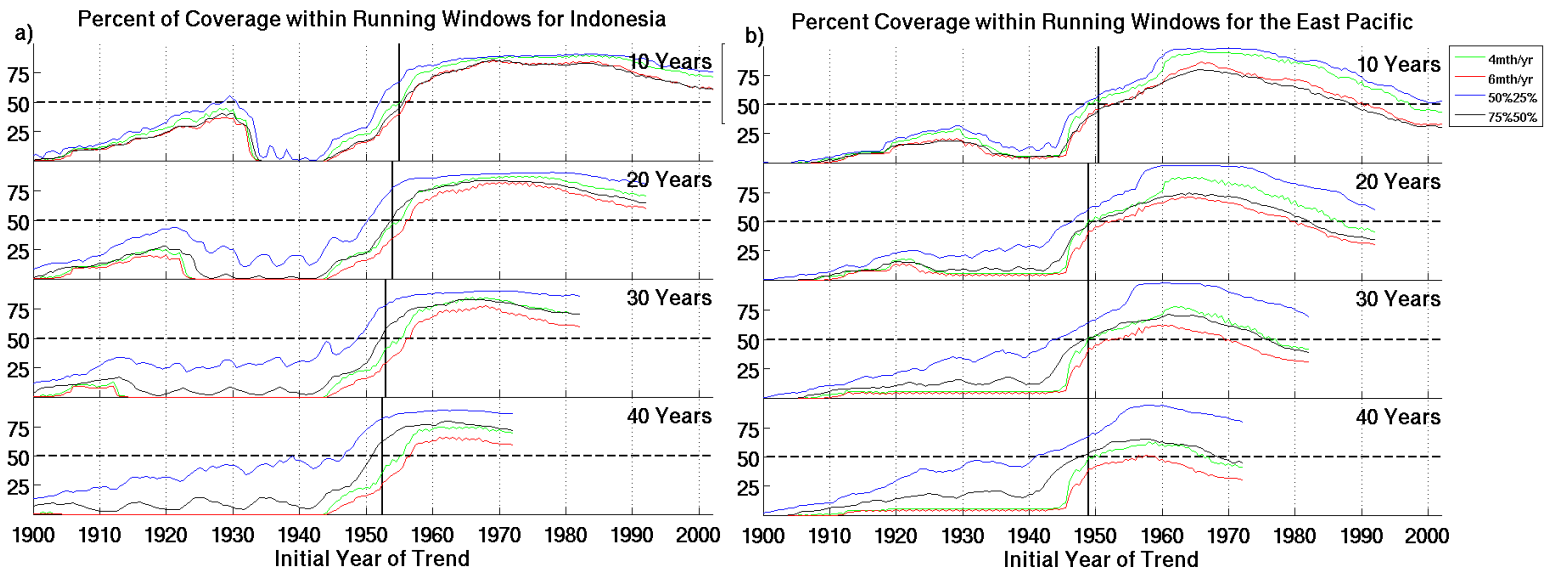
List of references associated with each dataset used in this study.



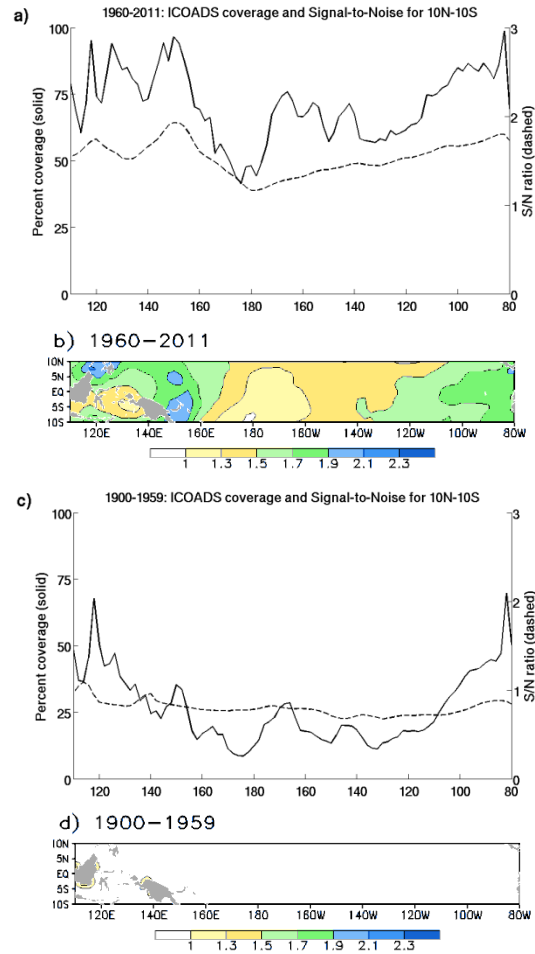
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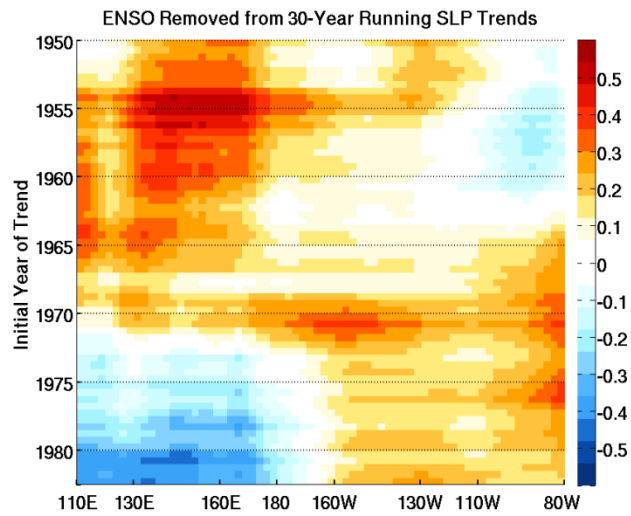
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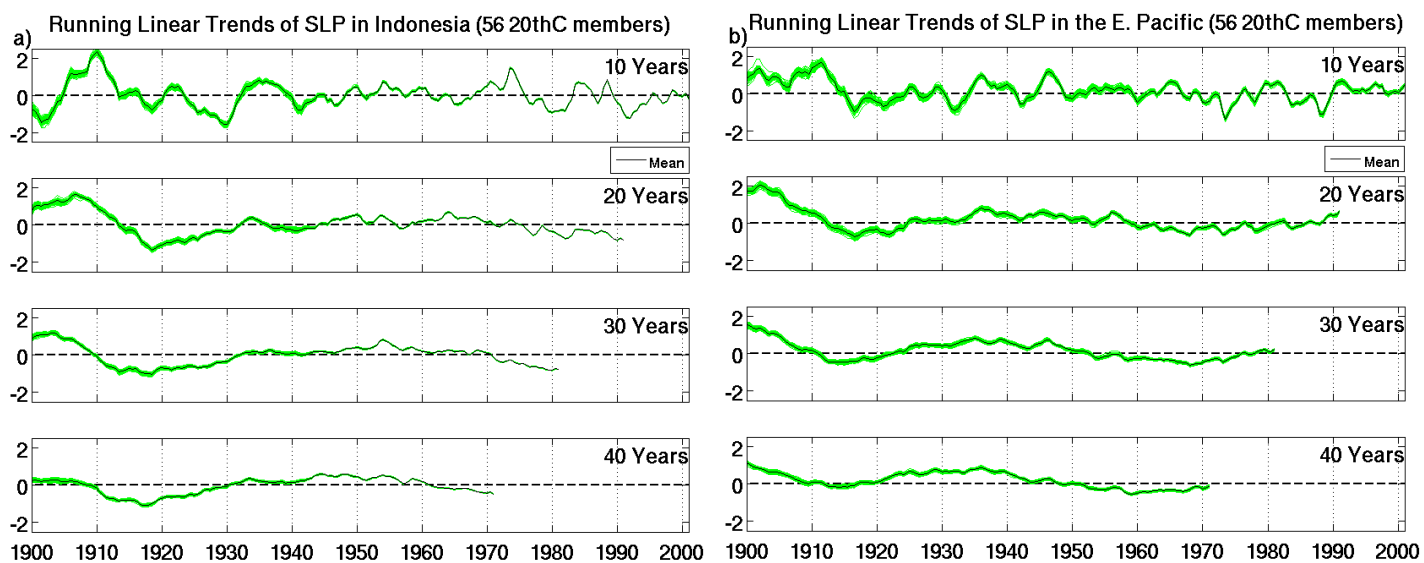
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Supplementary Methods

Information on Sea Level Pressure datasets used in this study:

CFSR: Saha, S. & co-authors. The NCEP Climate Forecast System Reanalysis. *Bull. Am. Meteorol. Soc.* 91, 1015-1057 (2010).

NCEP-1: Kalnay E. & co-authors. The NCEP/NCAR 40-year Reanalysis Project. *Bull. Am. Meteorol. Soc.* 77, 437-470 (1996).

MERRA: Rienecker, M.M. & co-authors. MERRA-NASA's Modern-Era Retrospective Analysis for Research and Applications. *J. Climate.* 24, 3624-3648 (2011).

ERA40: Uppala, S.M., & co-authors. The ERA-40 re-analysis. *Quart. J. R. Meteorol. Soc.* 131, 2961-3012 (2005).

ERA-INT: Dee, D.P., & co-authors. The ERA-Interim reanalysis: Configuration and Performance of the Data Assimilation System. *Quart. J. R. Meteorol. Soc.* 137, 553-597 (2011).

20thC: Compo, G.P. & co-authors. The Twentieth Century Reanalysis Project. *Quart. J. R. Meteorol. Soc.* 137, 1-28 (2011).

HadSLP: Allan, R., & Ansell, T. A New Globally Complete Monthly Historical Gridded Mean Sea Level Pressure Dataset (HadSLP2): 1850-2004. *J. Climate.* 19, 5816-5842 (2006).

KapSLP: Kaplan, A., Kushnir, Y., & Cane, M.A. Reduced space optimal interpolation of historical marine sea level pressure. *J. Climate,* 13, 2987-3002 (2000).

ERSLP: Smith, T.M., & Reynolds, R.W. Reconstruction of Monthly Mean Oceanic Sea Level Pressure Based on COADS and Station Data (1854-1997). *J. Oceanic Atmos. Tech.* 21, 1272-1282 (2004).

ICOADS: Woodruff, S.D., & co-authors. ICOADS Release 2.5: Extensions and enhancements to the surface marine meteorological archive. *Int. J. Climatol.* 31, 951-967 (2011).

Information on Sea Surface Temperature datasets used in this study:

ERSSTv3b: Smith, T.M., Reynolds, R.W., Peterson, T.C., & Lawrimore, J. Improvements to NOAA's Historical Merged Land-Ocean Surface Temperature Analysis (1880-2006). *J. Climate*. 21, 2283-2296 (2008).

HadISST: Rayner N.A., & co-authors. Global Analyses of Sea Surface Temperature, Sea Ice, and Night Marine Air Temperature since the late Nineteenth Century. *J. Geophys. Res.* 108, 4407 (2003).

Information on Global Temperature datasets used in this study:

GISTEMP: Hansen, J., Ruedy, R., Sato, M., & Lo, K. Global surface temperature change. *Rev. Geophys.*, 48, RG4004 (2010).

GHCN-M: Smith, T.M., Reynolds, R.W., Peterson, T.C., & Lawrimore, J. Improvements to NOAA's Historical Merged Land-Ocean Surface Temperature Analysis (1880-2006). *J. Climate*. 21, 2283-2296 (2008).