Supporting Information for "A relationship between ITCZ organization and subtropical humidity"

Cathy Hohenegger[1] * and Christian Jakob[2,3]

[1]Max Planck Institute for Meteorology, Hamburg, Germany

[2]ARC Centre of Excellence for Climate Extremes, Monash University, Melbourne, Victoria, Australia

[3]School of Earth, Atmosphere and Environment, Monash University, Melbourne, Victoria, Australia

Contents of this file

1. Figures S1 to S8
2. Tables S1 to S3

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*Max Planck Institute for Meteorology,

Bundesstrasse 53, 20146 Hamburg,

Germany

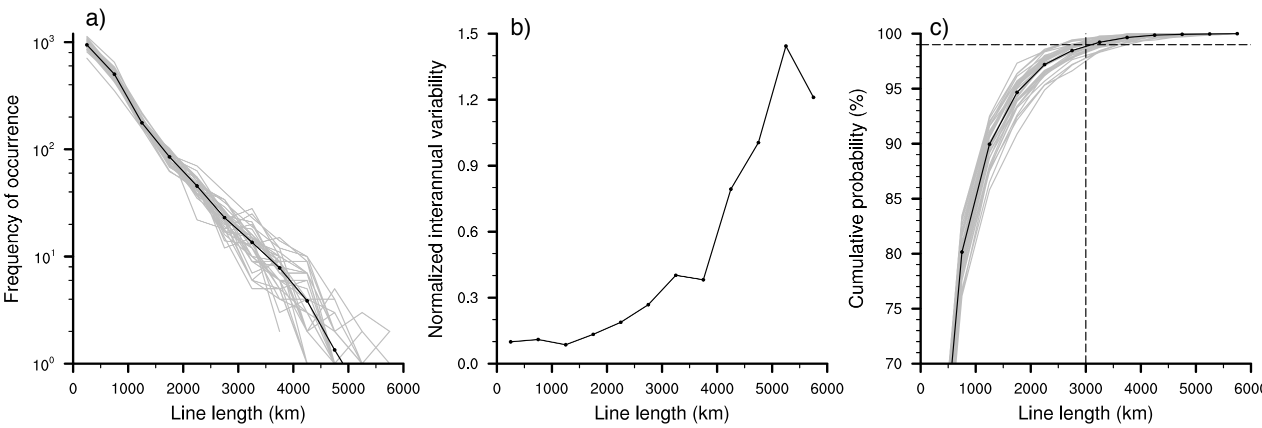

Figure S1. (a) Frequency distribution functions of line length for individual years (grey lines) and their mean (black line with dots), (b) normalized interannual variability in the number of lines computed as the standard deviation over the 35-years divided by the mean number of lines in that category, as well as (c) cumulative probability distribution functions for individual years (grey lines) and their mean (black line with dots). The dashed lines in (c) indicate the 99% percentile and a line length of 3000 km. For all panels, the bins of line length are 500 km and only convergence lines with at least five points are considered. Moreover, results are shown for the month of July only, but are similar for other months.

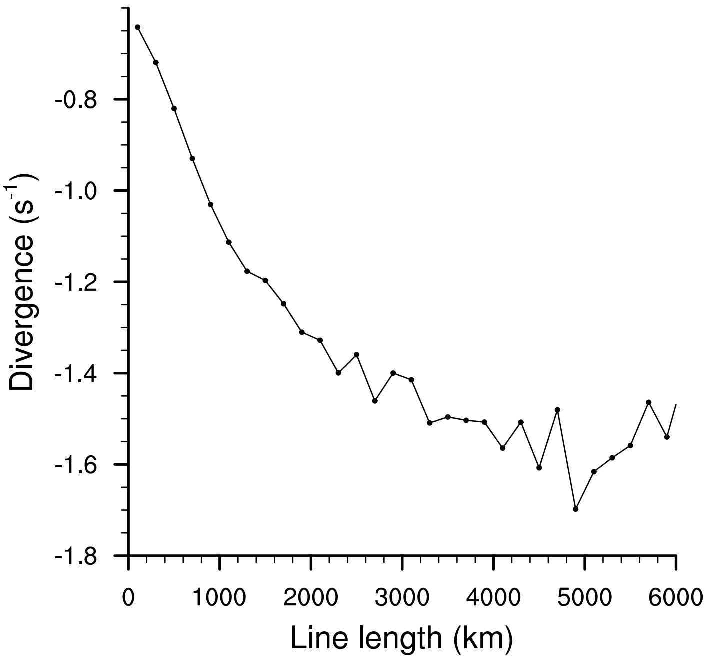

Figure S2. Strength of convergence line (divergence) plotted as a function of line length. The divergence is taken from the data set of Weller et al. (2017). It is the divergence field that is used to detect the convergence lines. The divergence is averaged over bins of line length of 200 km and only convergence lines with at least five points are considered. Results are shown for the month of July only, but are similar for other months.

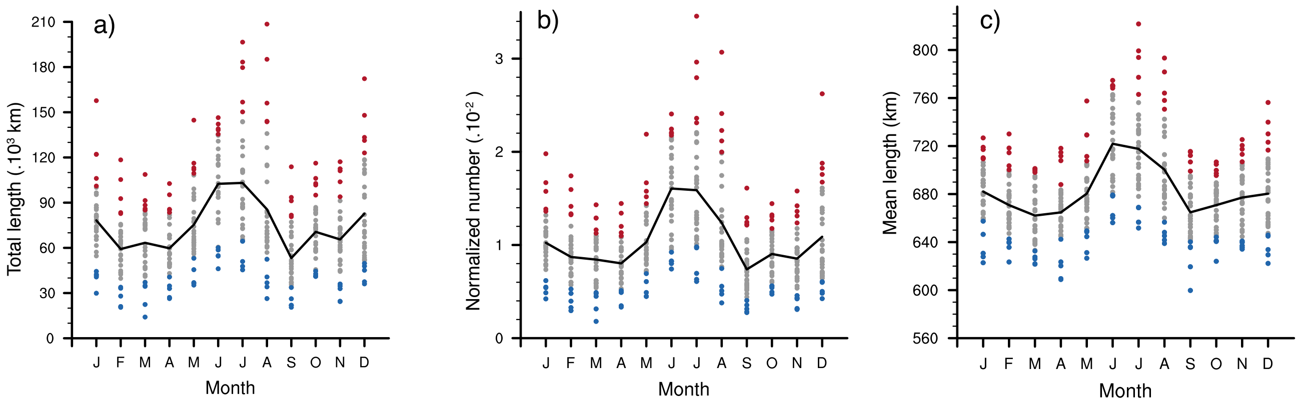

Figure S3. As Fig. 2a of the main manuscript but for (a) the total length of long lines, (b) the number of long lines normalized by the total number of lines and (c) the mean length of lines for a given month. Only lines with at least five points are considered.

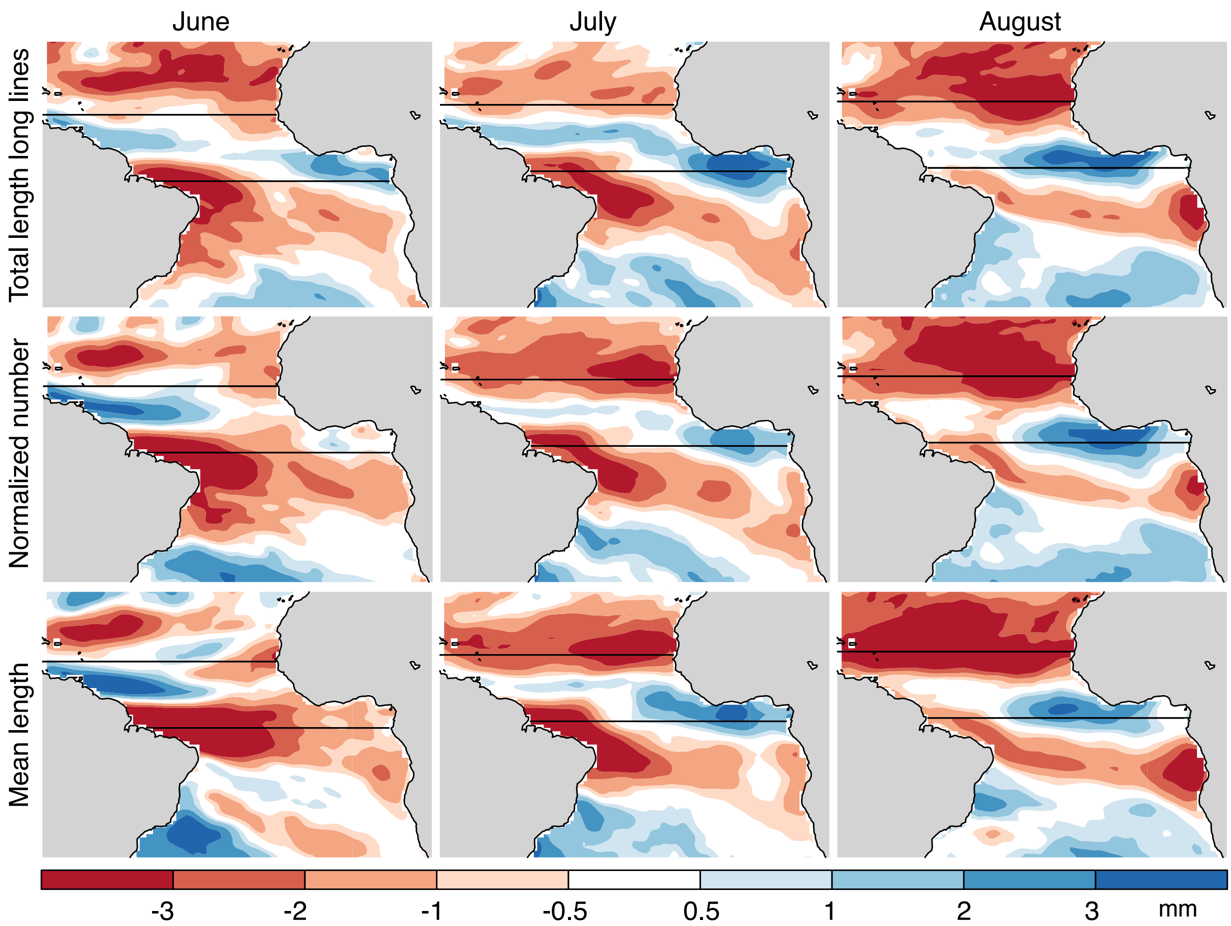

Figure S4. As Fig. 3 of the main manuscript (without significance testing), but composites based on the total length of long lines (top row, red and blue dots in Fig. S3a), the number of long lines normalized by the total number of lines (middle row, red and blue dots in Fig. S3b) and the mean length of lines (bottom row, red and blue dots in Fig. S3c) for a given month. Only JJA are shown.

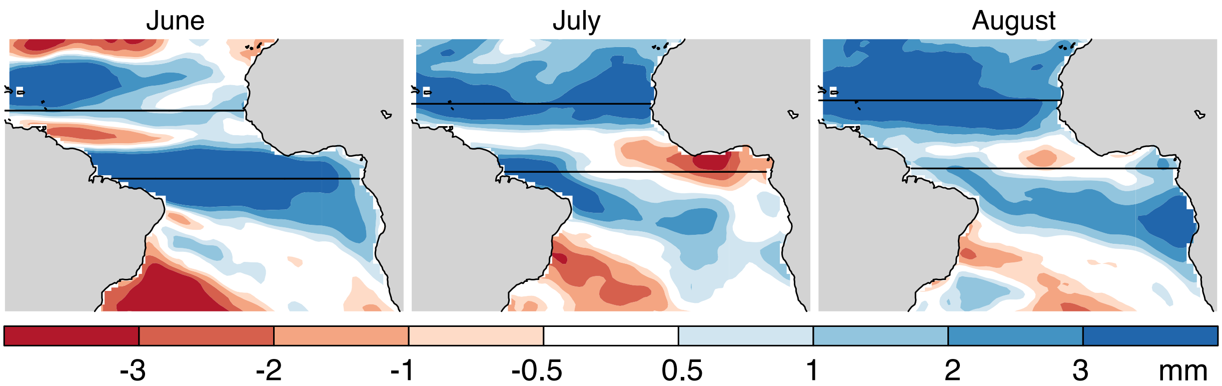

Figure S5. As Fig. 3 in the main manuscript (without significance testing) but based on the number of small lines per month. A small line is a convergence line with a length smaller than 500 km and containing at least 5 points. Only JJA are shown.

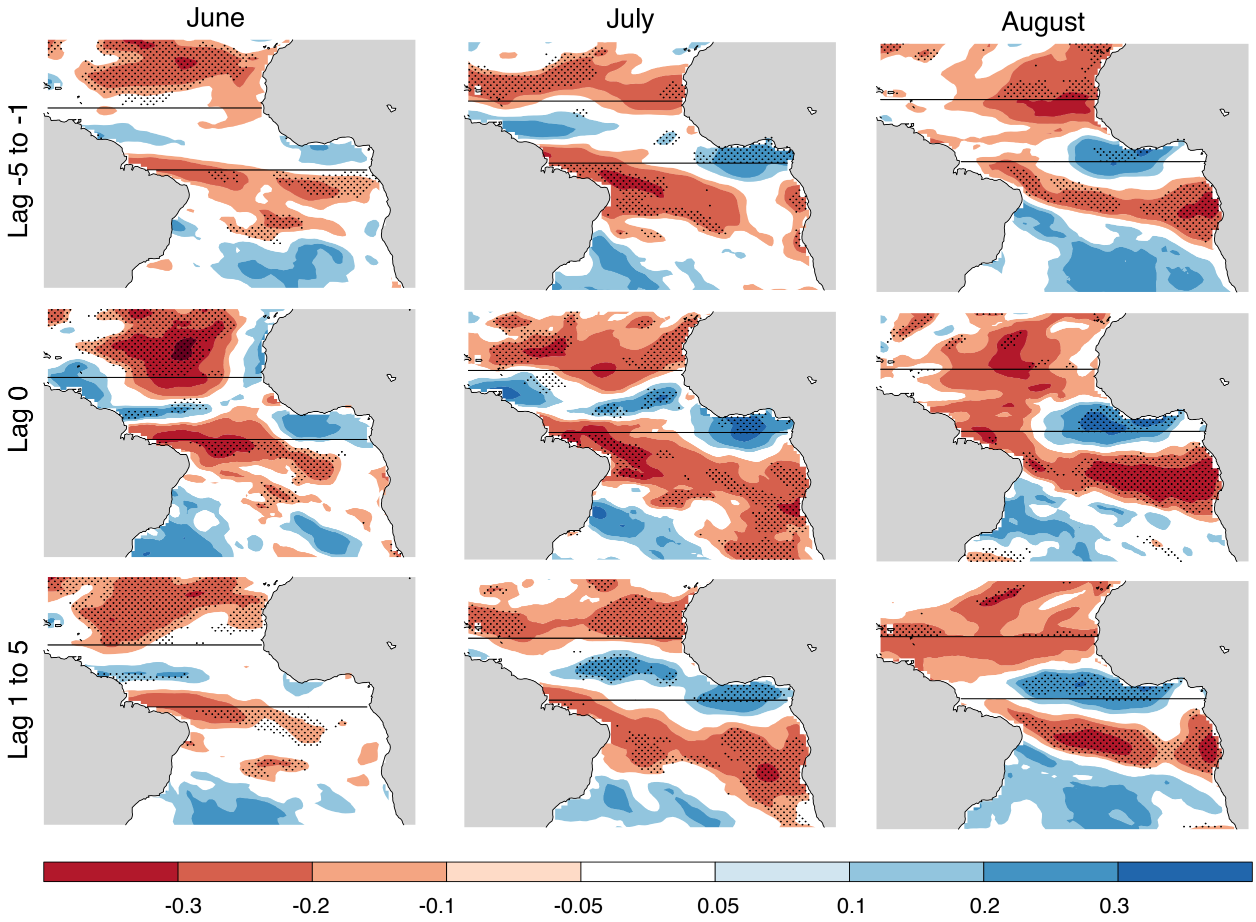

Figure S6. Correlation between the number of long lines on a given day and water vapor path at every grid point at various daily lags (-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5). In analogy to Fig. 3 in the main manuscript, the correlation is computed taking into account only the 10-y composite, and the statistical significance at the 90% level is assessed by randomly drawing thirty times 10 years independently of the number of long lines. The procedure is repeated for every day within a month and the results are averaged over the month. For display purpose, correlations are also averaged over lags -5 to -1, as well as over lag +1 to +5, which explains the smaller values of the correlation as compared to lag 0. Results are only shown for JJA.

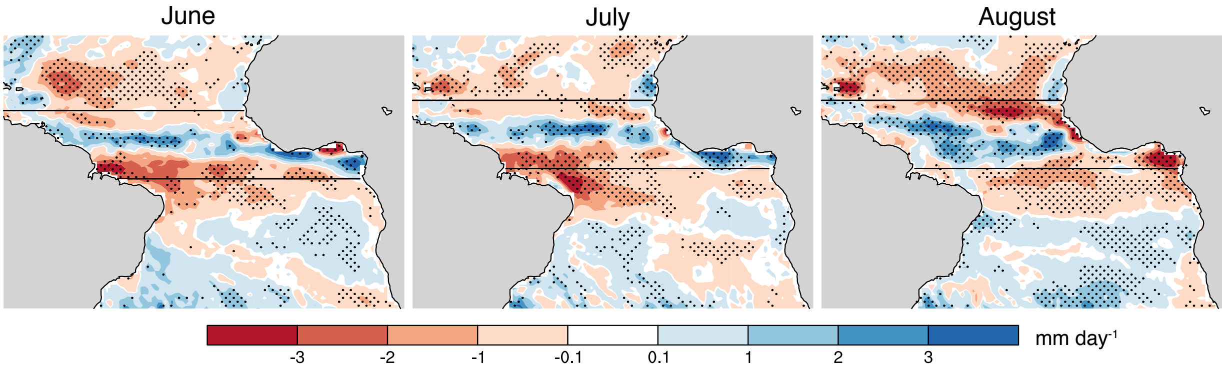

Figure S7. Composite difference in the vertically integrated moisture flux convergence obtained between the 5 years with the largest and the smallest $\mathcal{N}_{\mathrm{long}}$. Stippling indicates a statistically significant difference at the 90% level, where significance is computed by randomly drawing thirty times 10 years. The mean vertically integrated moisture flux convergence is generally negative over the subtropics (i.e. divergence) and positive in the ITCZ region so that red (blue) colors mean enhanced divergence (convergence) with more organization. Averaged over the full tropics, the mean anomaly of the vertically integrated moisture flux convergence is slightly positive, but not significant at the 90% level.

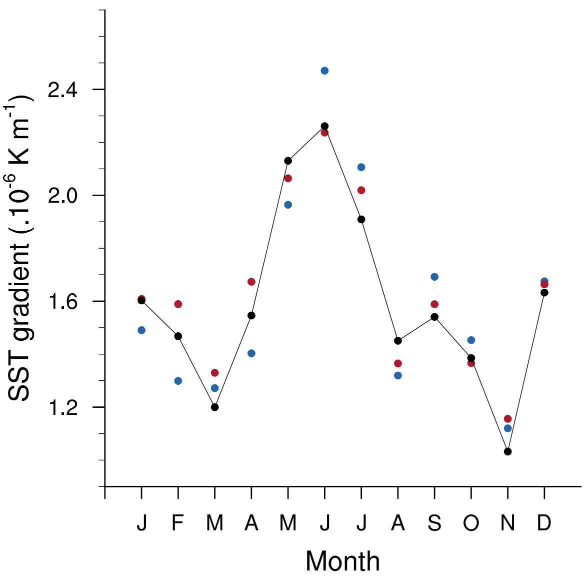

Figure S8. Temporal evolution of SST gradient (black line, red and blue markers). The SST gradient is computed as $0.5\,[\mathrm{SST}(\phi_\mathrm{m}) - \mathrm{SST}(\phi_\mathrm{m} + 5.25) + \mathrm{SST}(\phi_\mathrm{m}) - \mathrm{SST}(\phi_\mathrm{m} - 5.25)]$ with ϕ_m the latitude of the maximum of the zonally averaged SST (over the tropical Atlantic). For the black line, the SST values are first averaged over the whole 35-year time period, for the blue (red) markers, the SST values are first averaged over the 5 years with the smallest (largest) $\mathcal{N}_\mathrm{long}$ (see Fig. 2a in the main manuscript).

Table S1. $\mathcal{N}_{\mathrm{long}}$ as a function of year for June, July and August, the months the sginal is strongest.

	June	July	August		June	July	August
1979	21	24	19	1997	31	34	37
1980	37	33	17	1998	35	30	18
1981	26	30	38	1999	28	20	11
1982	35	31	34	2000	27	18	20
1983	36	48	37	2001	16	18	22
1984	37	41	42	2002	26	27	14
1985	30	25	48	2003	37	21	18
1986	27	29	33	2004	17	42	20
1987	41	52	24	2005	14	14	18
1988	33	25	20	2006	26	19	15
1989	13	24	17	2007	30	23	28
1990	38	29	20	2008	16	19	8
1991	31	35	55	2009	17	19	23
1992	34	37	21	2010	17	13	10
1993	33	39	31	2011	23	23	21
1994	21	48	22	2012	33	23	11
1995	26	23	17	2013	37	12	19
1996	20	30	16				

Table S2. Interannual variability in the ITCZ position (Sdv, in °) as a function of month. The interannual variability is computed as the standard deviation of the location of the maximum of the zonal mean Atlantic precipitation (for the 35 years).

Month	J	F	M	A	M	J	J	A	S	O	N	D
Sdv	1.40	1.37	1.31	1.94	1.48	0.84	0.62	0.55	0.88	1.16	1.08	1.06

Table S3. Composite difference between the 5 years with the largest and the 5 years with the smallest $\mathcal{N}_{\mathrm{long}}$ for vertically integrated moisture flux convergence C, precipitation P, surface evaporation E, and omega at 500 hPa ω_{500}, as averaged over the subtropics for JJA. Stars denote a statistically significant difference at the 90% level, where significance is computed by randomly drawing thirty times 10 years. Units are mm day^{-1} except for ω_{500} (Pa s^{-1}). Over the ITCZ region as well as over the full tropics, none of the differences are statistically significant.

	C	P	E	ω_{500}
Subtropics	-0.21*	-0.27*	-0.13	0.0022*