Supplementary Material

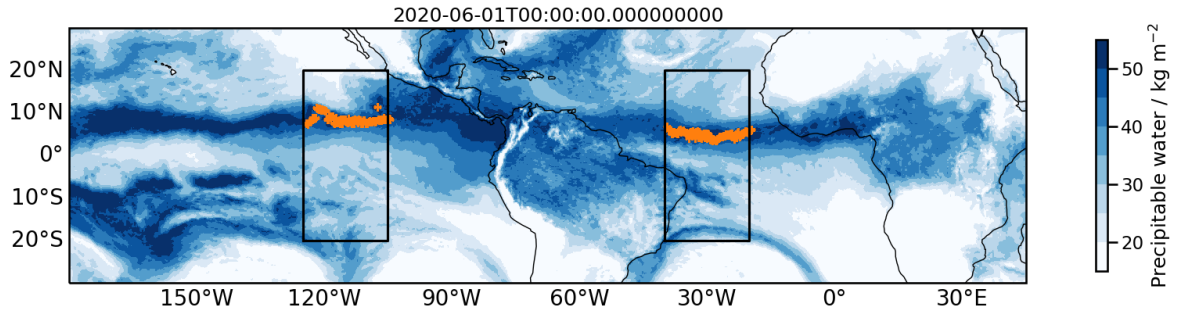


Figure S1: Contours of instantaneous precipitable water on 2020-06-01 at 00:00 UTC, with boxes identifying the regions of East Pacific and Atlantic basins analysed in this study. The maximum in precipitable water in $[0°, 20°\text{N}]$ for this timestep are shown using orange plus symbols.

1 Sensitivity of the zonal mean ITCZ position to the bin size

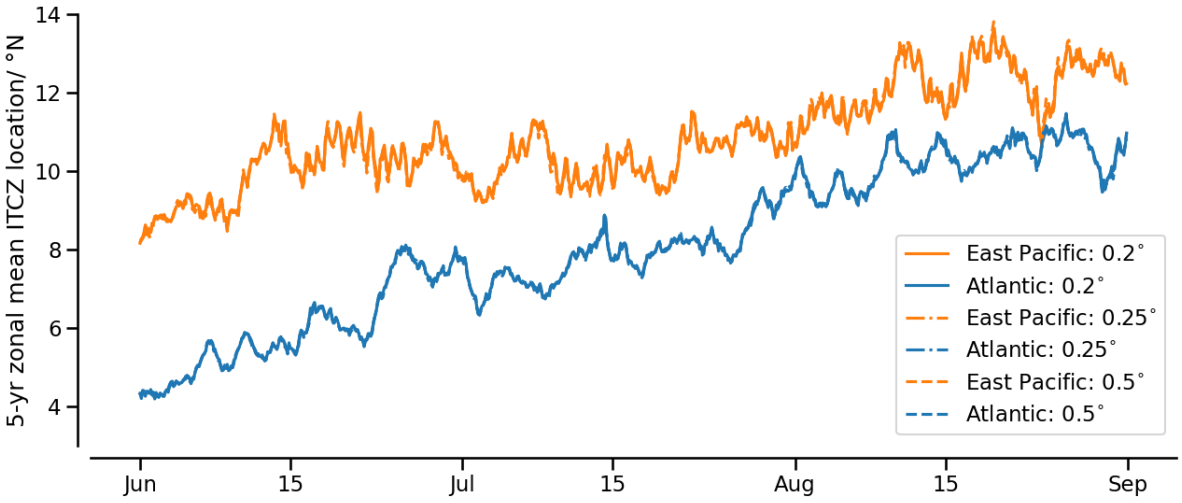


Figure S2: Sensitivity of the mean meridional migration of the East Pacific and Atlantic ITCZ to the size of the longitudinal bins. The meridional migration of the ITCZ is nearly identical in both basins for the bin sizes of $0.2°, 0.25°$ and $0.5°$ that are considered.

2 Comparison of the Boreal Summer ITCZ latitude with ERA5

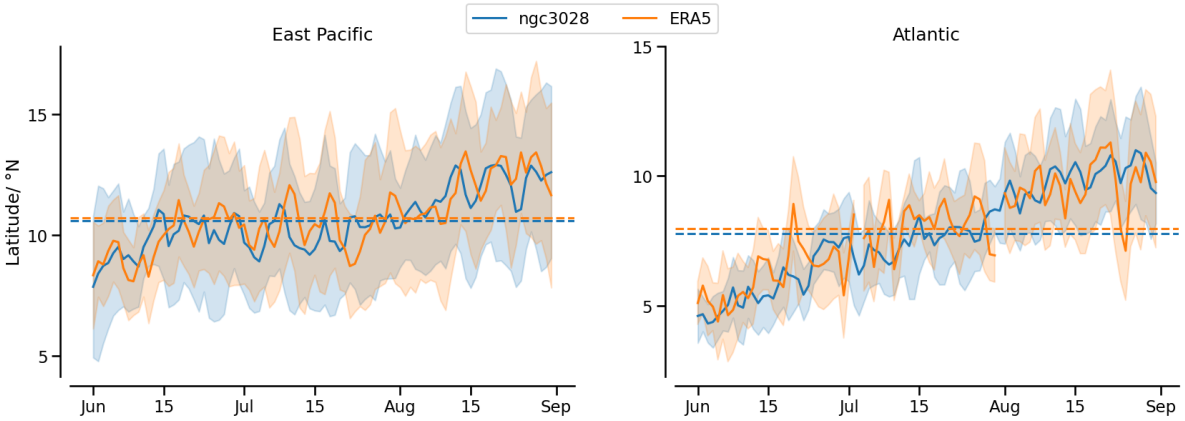


Figure S3: A comparision of the mean meridional migration of the East Pacific and Atlantic ITCZ in `ngc3028` and ERA5. In both datasets, precipitable water (PW) is used to identify the ITCZ and a bin size of 0.5° is considered.

Fig. S3 compares the meridional migration of the ITCZ in East Pacific and Atlantic basins between ERA5 and `ngc3028`. East Pacific and Atlantic basins, as shown in Fig. S1 are discretized into 40 longitudinal bins of 0.5° width. Both ERA5 and `ngc3028` use daily PW data from the boreal summer months (June-August) in 2020-2024 (5 years) to determine the ITCZ latitude. The 5-year, zonal mean ITCZ latitude for a given day in June, July and August (depicted by solid lines in Fig. S3) shows a good agreement between ERA5 and `ngc3028` in both basins. The interannual standard deviation (shaded regions) in the ITCZ latitude is also of similar magnitudes in both datasets. The season mean ITCZ latitudes depicted by the dashed lines are nearly identical in both datasets.

3 Precipitation vs precipitable water maximum as an index for ITCZ latitude

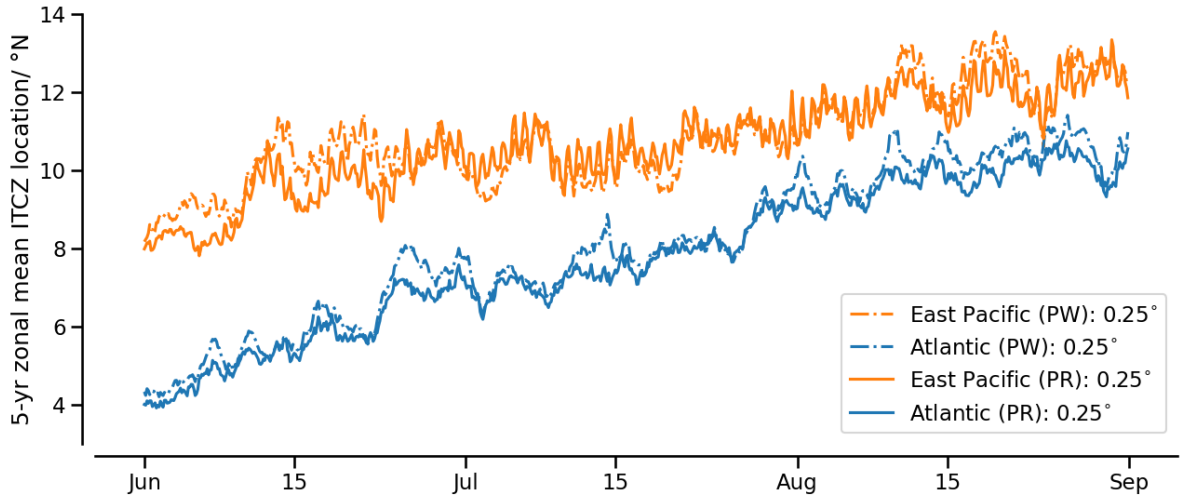
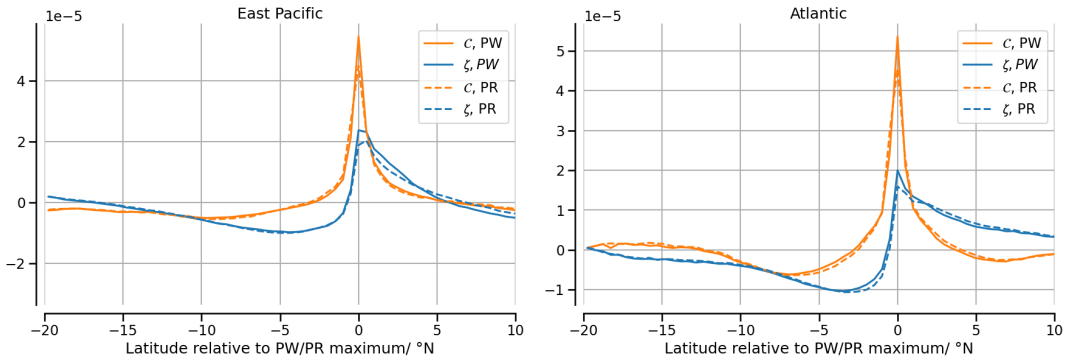


Figure S4: Five-year mean of zonal mean meridional migration of the East Pacific and Atlantic ITCZ determined using precipitable water (PW) and precipitation (PR) indices. A longitudinal bin size of 0.25° is considered. In East Pacific basin the PR-based index exhibits finer-scale oscillations. In both basins, the ITCZ latitude determined using precipitation index is slightly south of the PW index. This is slightly more pronounced in the Atlantic basin.

4 Sensitivity of the composites to the index used to determine ITCZ latitude



(a) (b)

Figure S5: Composites of vorticity and convergence at 311m in East Pacific (a) and Atlantic (b) basins computed from ITCZ latitudes determined using precipitation (dashed) and precipitable water (solid) indices. The structure of relative vertical vorticity and convergence composites determined using precipitation and precipitable water indices is nearly identical in both basins.

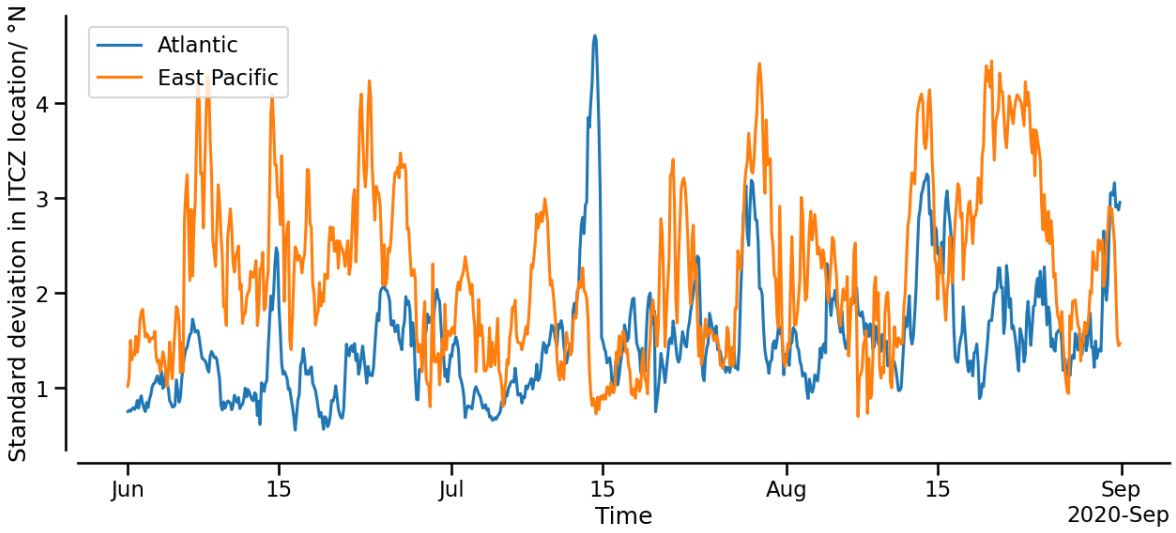


Figure S6: The standard deviation in the ITCZ location across longitudinal bins in the East Pacific and Atlantic basins during boreal summer months of 2020.