Supplement of Weather Clim. Dynam., 6, 789–806, 2025
https://doi.org/10.5194/wcd-6-789-2025-supplement

Supplement of

Extreme weather anomalies and surface signatures associated with merged Atlantic–African jets during northern winter

Sohan Suresan et al.

Correspondence to: Sohan Suresan (sohansuresan@mail.tau.ac.il)

1 Supplementary details

Winter month groups				
Group-A (14 months)	**Group-B (29 months)**	**Group-C (20 months)**	**Group-D (32 months)**	**Group-E (25 months)**
month=1 year=1963	month=1 year=1960	month=1 year=1960	month=12 year=1963	month=1 year=1964
month=12 year=1963	month=2 year=1960	month=2 year=1960	month=1 year=1964	month=12 year=1965
month=2 year=1965	month=12 year=1961	month=12 year=1961	month=12 year=1965	month=1 year=1966
month=2 year=1969	month=12 year=1962	month=12 year=1962	month=1 year=1966	month=2 year=1966
month=1 year=1970	month=1 year=1963	month=2 year=1964	month=2 year=1966	month=1 year=1969
month=1 year=1973	month=12 year=1963	month=1 year=1966	month=1 year=1969	month=12 year=1972
month=12 year=1981	month=2 year=1964	month=2 year=1966	month=2 year=1969	month=2 year=1973
month=1 year=1996	month=2 year=1965	month=2 year=1968	month=12 year=1972	month=12 year=1982
month=12 year=2002	month=1 year=1966	month=12 year=1968	month=1 year=1973	month=1 year=1983
month=2 year=2005	month=2 year=1966	month=12 year=1970	month=2 year=1973	month=2 year=1983
month=12 year=2009	month=2 year=1968	month=1 year=1971	month=12 year=1982	month=12 year=1986
month=1 year=2010	month=12 year=1968	month=12 year=1976	month=1 year=1983	month=1 year=1987
month=2 year=2010	month=2 year=1969	month=2 year=1978	month=2 year=1983	month=2 year=1987
month=12 year=2010	month=1 year=1970	month=12 year=1978	month=12 year=1986	month=12 year=1987
	month=12 year=1970	month=1 year=1979	month=1 year=1987	month=12 year=1991
	month=1 year=1971	month=1 year=1985	month=2 year=1987	month=1 year=1992
	month=12 year=1976	month=1 year=1987	month=12 year=1987	month=2 year=1992
	month=2 year=1978	month=12 year=1989	month=12 year=1991	month=12 year=1994
	month=12 year=1978	month=12 year=1995	month=1 year=1992	month=12 year=1997
	month=1 year=1979	month=12 year=1996	month=2 year=1992	month=1 year=1998
	month=1 year=1985		month=12 year=1994	month=2 year=1998
	month=1 year=1987		month=12 year=1997	month=12 year=2006
	month=12 year=1989		month=1 year=1998	month=12 year=2015
	month=12 year=1995		month=2 year=1998	month=1 year=2016
	month=12 year=1996		month=12 year=2002	month=2 year=2016
	month=12 year=2009		month=12 year=2006	
	month=1 year=2010		month=12 year=2009	
	month=2 year=2010		month=1 year=2010	
	month=12 year=2010		month=2 year=2010	
			month=12 year=2015	
			month=1 year=2016	
			month=2 year=2016	

Table S1

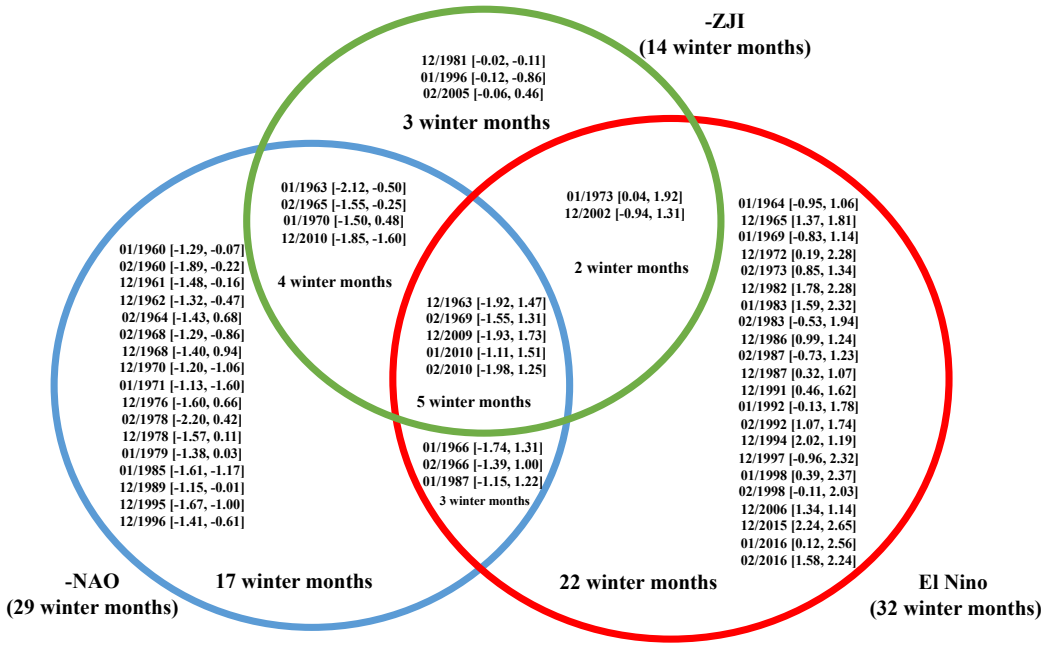


Table S2: Venn diagram of winter groups in Table S1. The winter months are mentioned as: month/year [NAO index, Oceanic Niño Index]

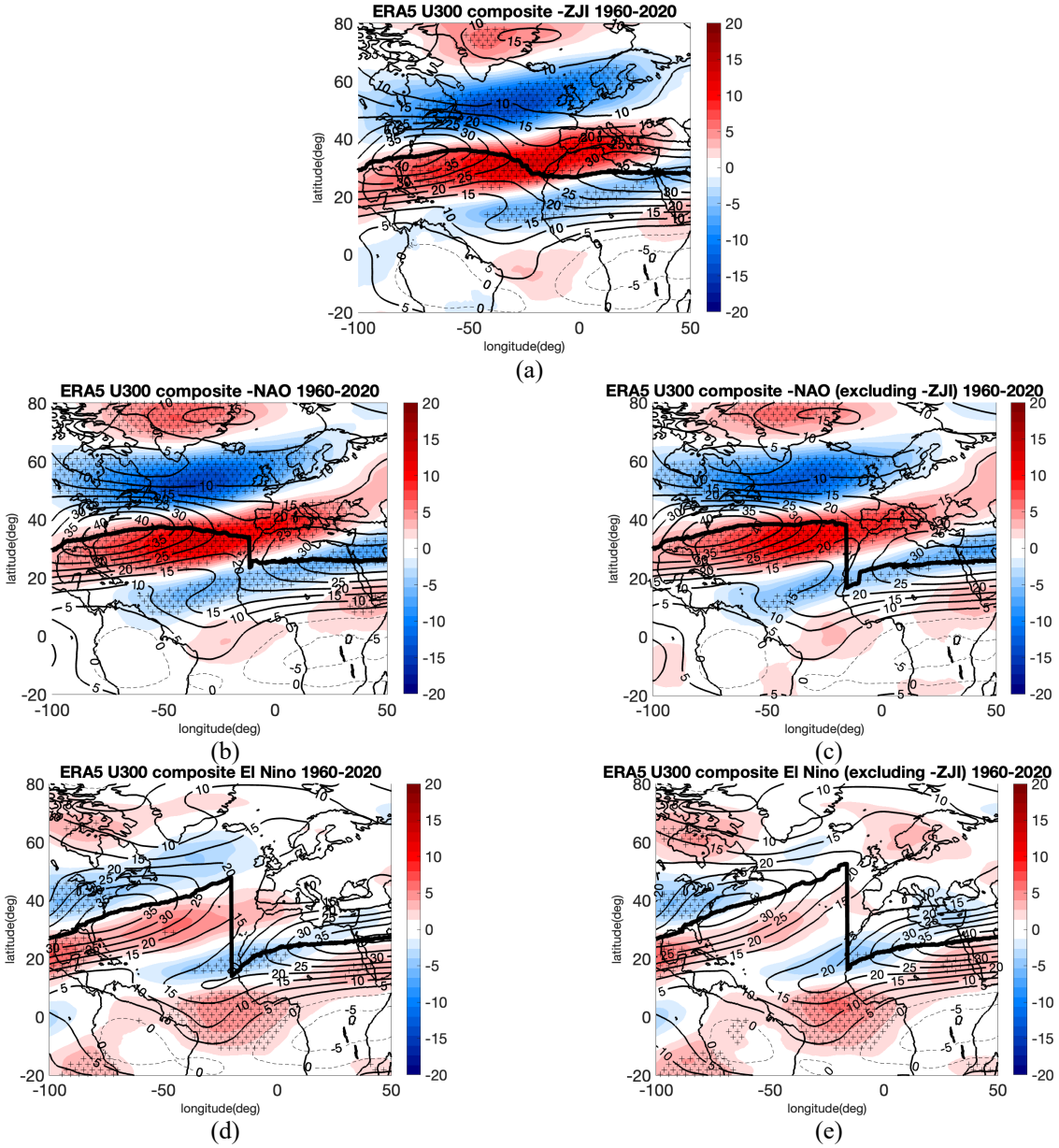


Figure S1: Composites of zonal wind at 300 hPa (in black contours) for (a)negative ZJI winter months (b) negative NAO winter months (c)negative NAO winter months excluding merged jet months (d) El Niño winter months (e)El Niño winter months excluding merged jet months. The red-blue shading in background represents the composite of U300 anomaly from climatology. The stipples(+) represents regions for which the composites are significant at 99.9% based on a two-sided Student's t-test against climatology. Contour interval is 5m/s, negative and zero values are dashed, and the thick black line represents the zonal jet axis (latitude of maximum U300 wind).

Figure S1 shows the composites of zonal wind at 300hPa (U300) for the 5 winter month groups mentioned in Table S1 and S2 above. Here in Fig.S1a we seen that the the Atlantic and African jets merged to one unusually zonal jet with a zonally oriented jet axis. The zonal wind anomaly composite in the background shows an equatorward shift of the Atlantic jet and a poleward shift of the jet over east-central Africa. Comparing with Fig.S1b which shows the negative NAO winter month composite of U300, we see that while the Atlantic jet appears similar in both the negative NAO and negative ZJI composites, the African jet exhibits a weaker poleward shift in the negative NAO case, preventing

the two jets from merging as seen in the negative ZJI composite. Note that Fig.S1b includes months with the merged jet. Removing the merged jet months from Fig.S1b results in Fig.S1c where the split between the jets is more prominent as there is a larger jump in the jet axis. The African jet is much more equatorward and Atlantic jet appear poleward compared to negative ZJI composite. Fig.S1d-e shows the U300 composites for El Niño months with and without negative ZJI months respectively. In Fig.S1d we see that the jets are well separated with a large split in the jet axis. This split is stronger in Fig.S1e with El Niño composites excluding negative ZJI months. In contrast to first three figures the El Niño composites are much more closer to the climatology as the anomaly patterns in the background of Atlantic jet are not statistically significant.

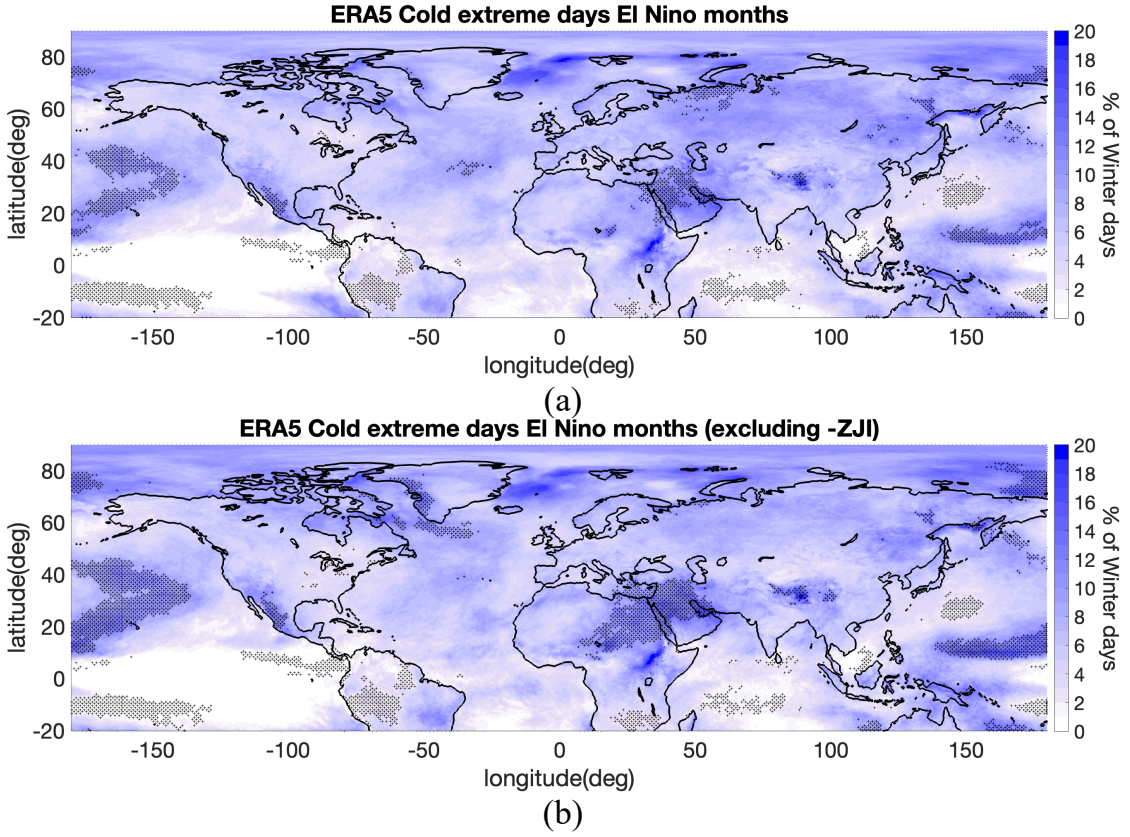
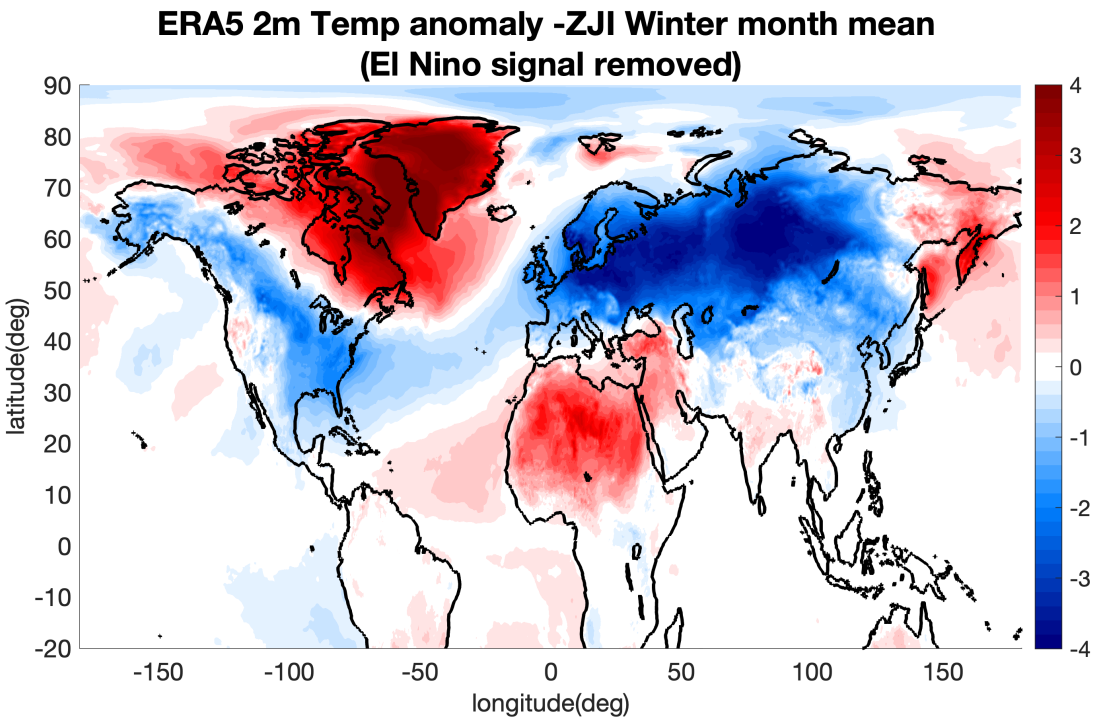
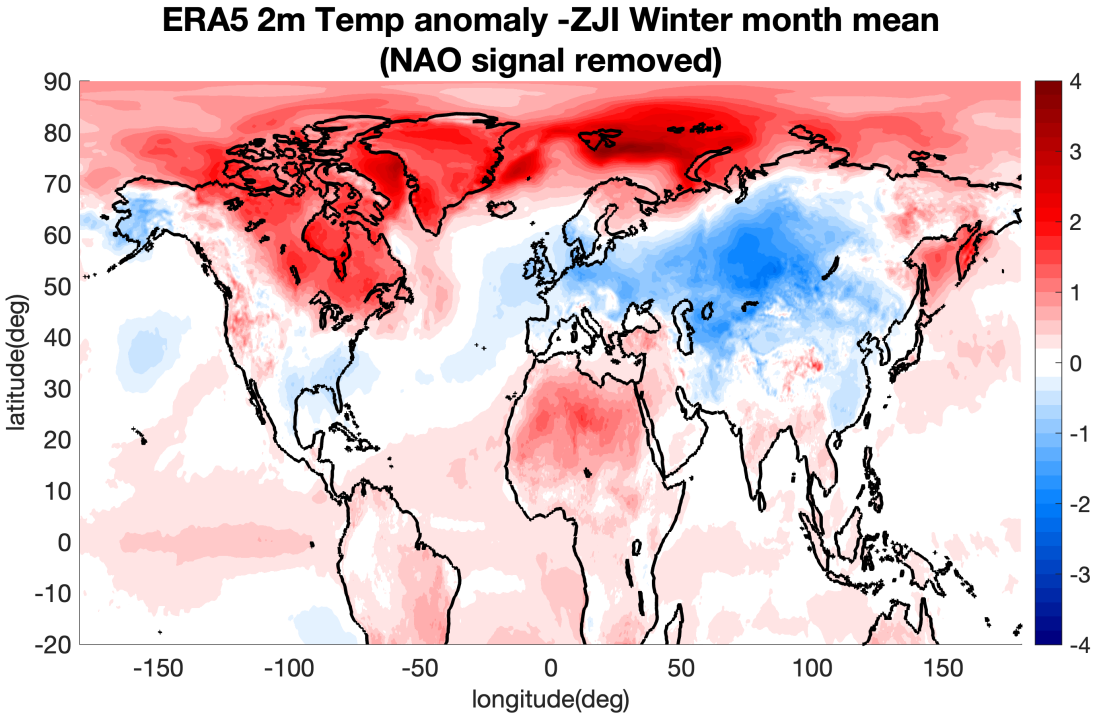


Figure S2: The distribution of the percentage of cold extreme days for (a) El Niño winter months (b)El Niño winter months excluding merged jet months. The regions marked in (∗) represent regions significant at 99% using Monte Carlo simulation.



(a)



(b)

Figure S3: Composite for anomalous detrended 2m surface temperature (K) composite for negative ZJI winter months after regressing out (a) El Niño signals (b) NAO signals

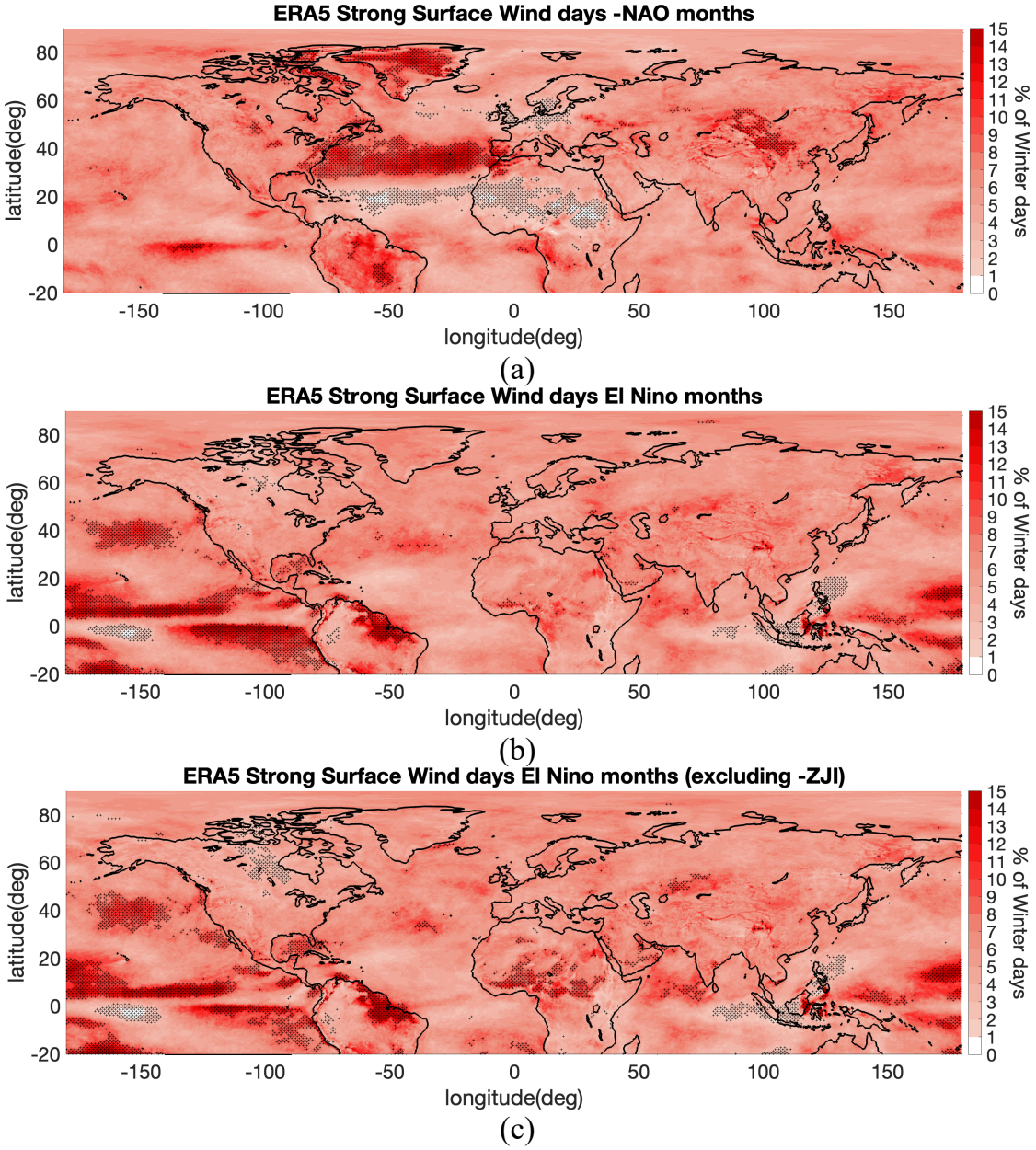
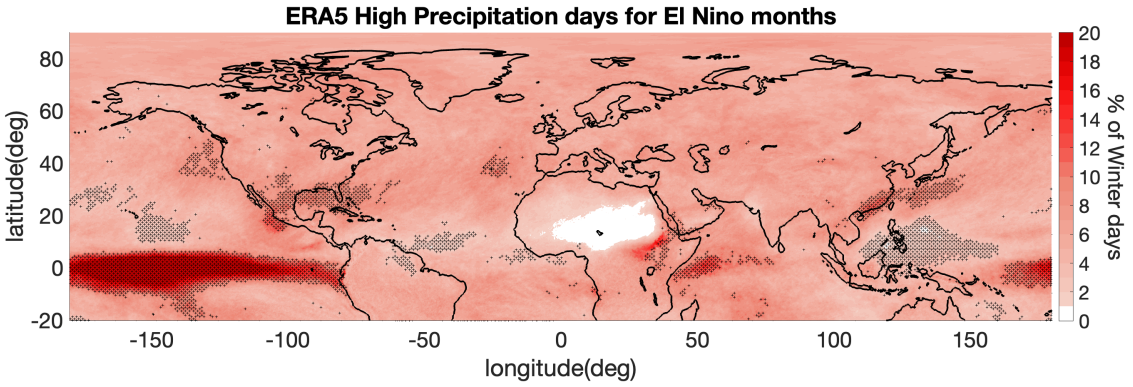
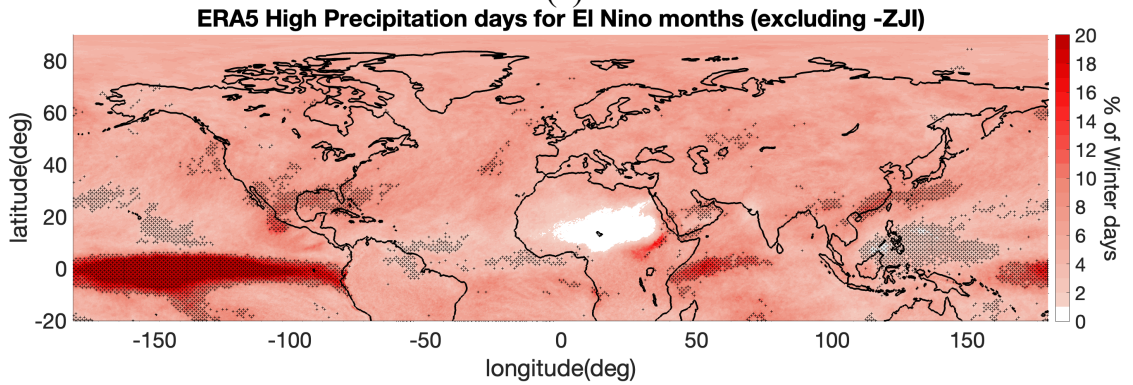


Figure S4: The distribution of the percentage of strong surface wind days for (a) negative NAO winter months (b)El Niño winter months (c) El Niño winter months excluding merged jet months. The regions marked in (∗) represent regions significant at 99% using Monte Carlo simulation.

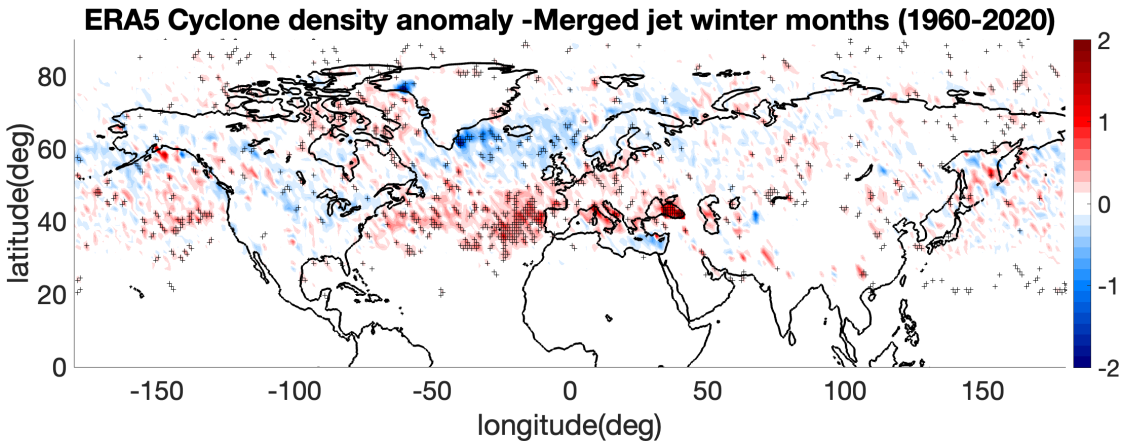


(a)

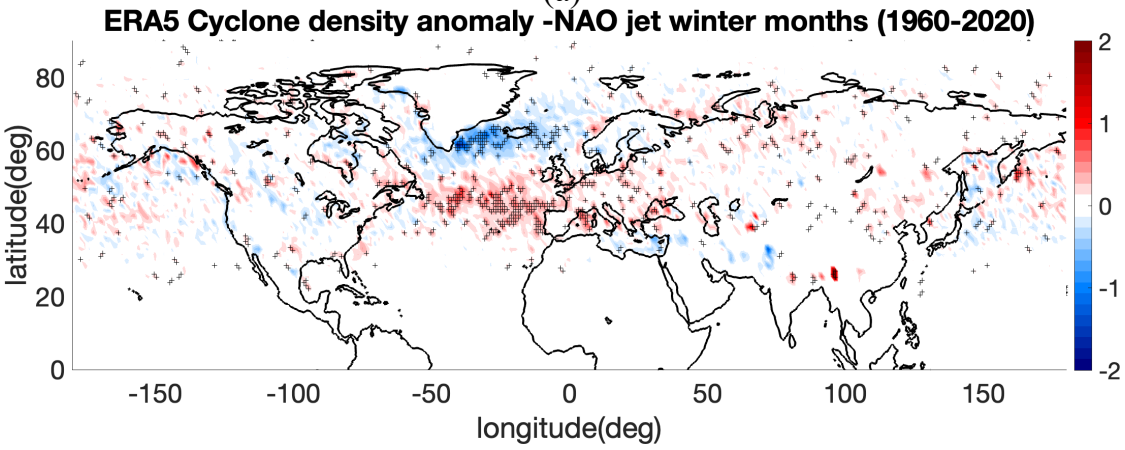


(b)

Figure S5: The distribution of the percentage of high precipitation days for (a) El Niño winter months (b)El Niño winter months excluding merged jet months. The regions marked in (∗) represent regions significant at 99% using Monte Carlo simulation.



(a)



(b)

Figure S6: The cyclone density (number of cyclones per month per grid point) monthly anomaly composite during (a) merged jet winter (b)negative NAO winter months excluding merged jet months.The stipples(+) represents regions for which the composites are significant at 95% based on a two-sided Student's t test against climatology.