



*Supplement of*

## **Minimal impact of model biases on Northern Hemisphere El Niño–Southern Oscillation teleconnections**

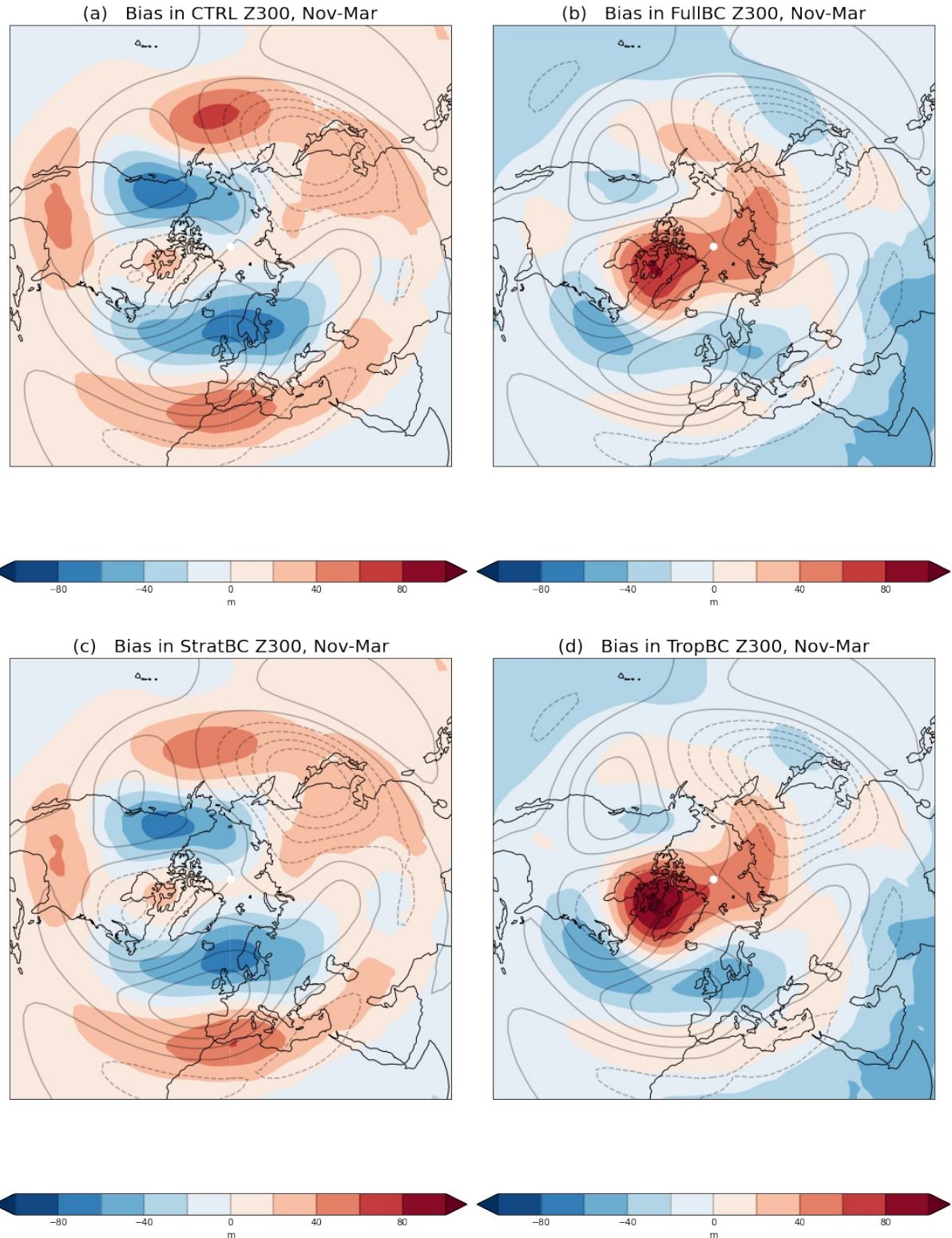
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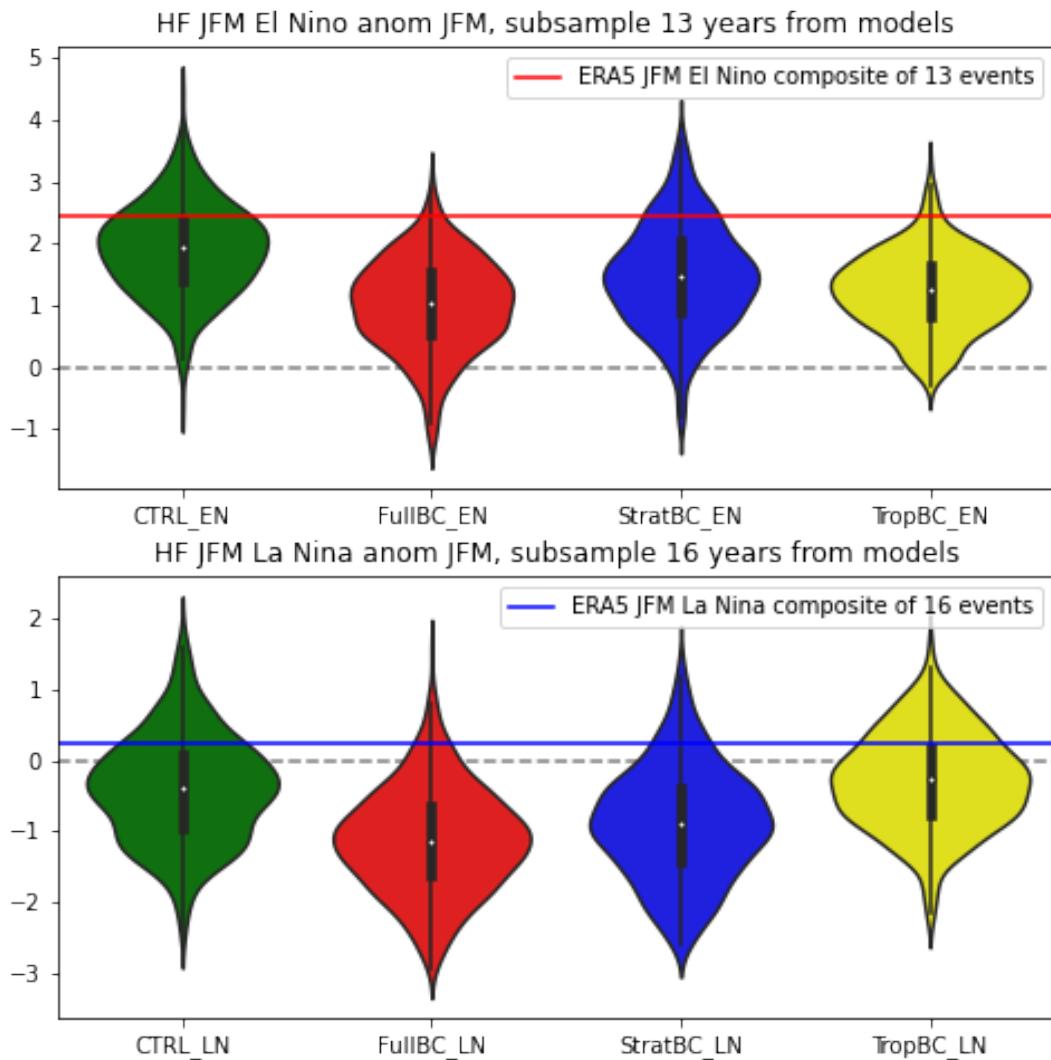
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5 **Supplementary Table S1. List of years used for ERA5 ENSO composites and DJF NINO3.4 temperature anomalies.**  
 ENSO years defined using a threshold of  $-0.9 \leq \text{NINO3.4} \leq 0.9$  for La Niña and El Niño, and  $0.5 < \text{NINO3.4} < 0.5$ .

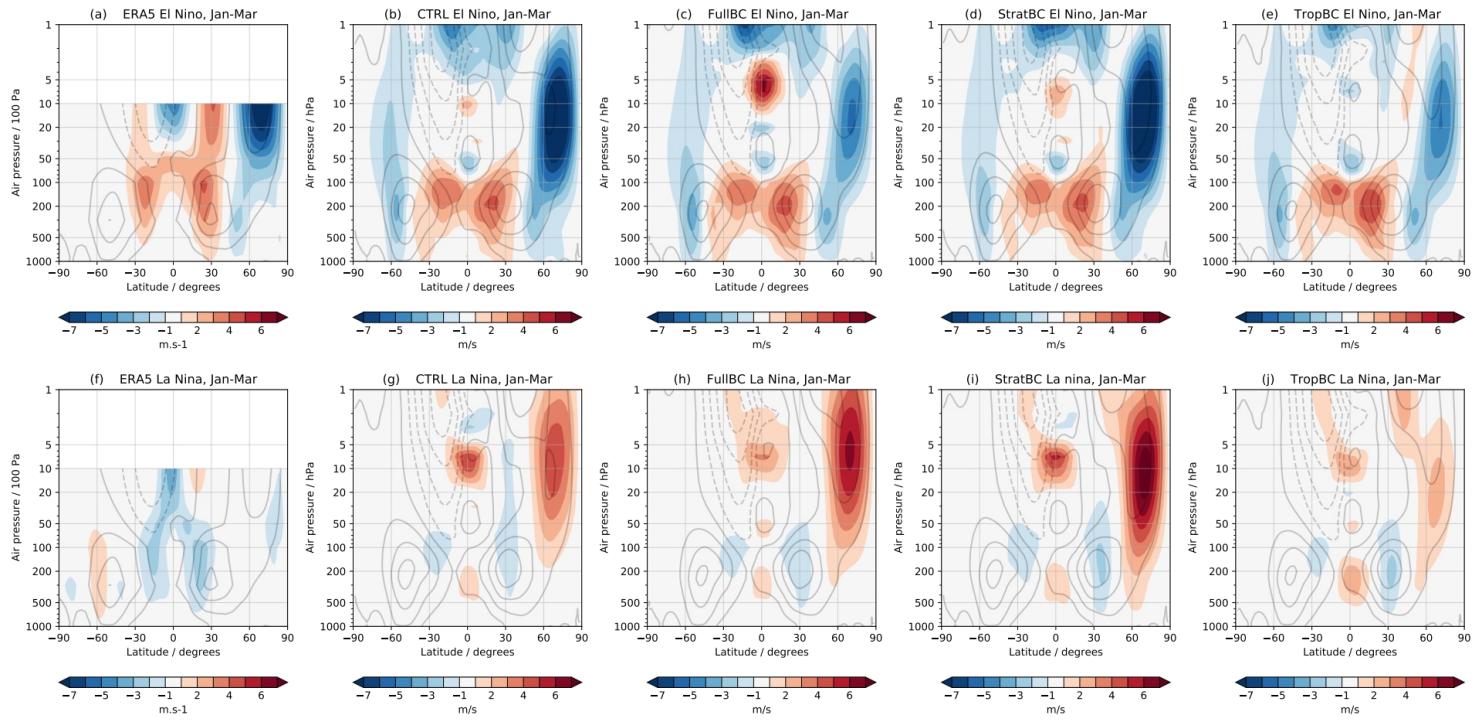
	La Niña		Neutral		El Niño	
	Year	NINO3.4	Year	NINO3.4	Year	NINO3.4
1	1950	-1.5	1953	0.4	1958	1.8
2	1956	-1.1	1957	-0.2	1964	1.1
3	1971	-1.4	1960	-0.1	1966	1.4
4	1974	-1.8	1961	0.0	1969	1.1
5	1976	-1.6	1962	-0.2	1973	1.8
6	1985	-1.0	1963	-0.4	1983	2.2
7	1989	-1.7	1967	-0.4	1987	1.2
8	1996	-0.9	1979	0.0	1992	1.7
9	1999	-1.5	1981	-0.3	1995	1.0
10	2000	-1.7	1982	0.0	1998	2.2
11	2006	-0.9	1990	0.1	2003	0.9
12	2008	-1.6	1991	0.4	2010	1.5
13	2011	-1.4	1993	0.1	2016	2.5
14	2012	-0.9	1994	0.1		
15	2018	-0.9	2002	-0.1		
16	2021	-1.0	2004	0.4		
17			2013	-0.4		
18			2014	-0.4		
19			2017	-0.3		



Supplementary figure S1. Biases relative to ERA5 of November-March geopotential height at 300hPa in (a) CTRL, (b) FullBC, (c) StratBC, and (d) TropBC. Grey contours show model climatology of Z300 with zonal mean values removed (i.e. eddy geopotential height). Negative contours dashed. Contours are drawn at 50 m intervals for Z300 (-200, -150, ..., 200 m)



15 **Supplementary Figure S2. Response of Jan-Feb-Mar HF (Heat flux at 100hPa, 45-75N) during El Nino and La Nina years.**  
 The violin plots show the difference between El Nino/La Nina and neutral years, and are generated by subsampling the model runs 500 times for 13 years (El Nino) and 16 years (La Nina) to match the number of events in ERA5 (1950-2021). The width of the violin plots indicates approximate frequency of data points at each value. Red and blue lines show corresponding ERA5 anomalies for El Nino and La Nina.



**Supplementary Figure S3. Response of zonal mean zonal wind to El Niño (a-e) and La Niña (f-j), for December to March. Late winter season shown to emphasize ERA5 El Niño response. Grey contours show model climatology. Negative winds are marked with dashed lines. Contours are drawn at 10 m/s for zonal winds (-40, -20, ..., 40 m/s)**