

Evaluation of Seven Different Atmospheric Reanalysis Products in the Arctic

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Supplemental Material

Table S1. Seasonal median and deviations from the median of each of the reanalysis products for 13 variables for ocean areas north of 70°N and land areas north of 65°N.

	Median	NCEP-R1	NCEP-R2	20CR	CFSR	MERRA	ERA_I	JRA25
<u>Sea Level Pressure (mb)</u>								
Spring ocean	1016.8	-0.7	-0.5	-0.1	0.1	0.1	0.3	0.0
land	1015.5	-0.1	-0.2	1.4	0.5	-1.2	0.3	-0.2
Summer ocean	1011.5	-0.4	-0.3	0.6	0.0	0.0	0.1	0.0
land	1010.7	-0.2	-0.0	1.4	0.3	-0.5	0.3	0.2
Fall ocean	1011.9	-0.5	-0.3	0.5	-0.0	0.1	0.1	0.0
land	1012.6	0.3	-0.1	1.4	0.3	-1.6	-0.0	-0.1
Winter ocean	1012.8	-0.8	-0.6	0.5	0.1	0.1	0.2	-0.0
land	1013.8	0.4	-0.3	2.4	0.7	-2.1	0.1	-0.8
<u>2-m Temperature (C)</u>								
Spring ocean	-14.3	-0.9	-0.8	8.1	-0.7	2.2	-0.5	1.8
land	-13.6	-0.5	-0.4	3.5	-0.3	-0.1	-0.8	0.9
Summer ocean	1.3	-0.3	-0.7	0.6	-0.4	-0.0	0.3	0.3
land	5.7	-0.9	-1.1	1.0	-0.3	0.2	0.1	0.4
Fall ocean	-10.0	-2.5	-1.1	4.9	0.3	0.7	0.4	-1.1
land	-11.3	-1.7	-0.0	2.0	0.3	-0.8	0.1	-0.0
Winter ocean	-22.4	-2.7	-0.6	12.3	-0.3	1.4	0.1	-0.7
land	-25.4	-1.3	0.8	5.5	0.1	-1.6	-2.0	0.6
<u>Sensible Heat Flux (W/m²)</u>								
Spring ocean	4.1	-4.3	-14.0	4.8	3.3	13.2	2.5	-0.6
land	-6.0	-6.2	-17.3	-1.7	-0.1	10.0	9.2	5.8
Summer ocean	-7.0	-7.6	-12.1	-6.9	-0.3	9.3	6.9	3.3
land	19.1	-11.4	-17.3	2.7	4.3	4.2	-2.2	4.7
Fall ocean	5.2	-8.3	-14.9	4.7	4.8	8.6	3.8	-2.2
land	-16.1	-12.3	-19.0	1.0	0.4	9.8	9.6	0.7
Winter ocean	4.2	-6.6	-12.5	25.3	6.5	15.5	4.7	-4.6
land	-25.5	-9.9	-18.7	7.0	2.0	14.5	9.5	0.9
<u>Latent Heat Flux (W/m²)</u>								
Spring ocean	14.3	-0.1	-1.8	13.9	3.5	2.5	-2.8	-0.1
land	14.6	4.5	0.2	8.0	3.9	-2.1	-6.0	-4.2
Summer ocean	9.5	5.7	-5.9	-3.5	1.6	1.3	0.2	0.5
land	37.2	9.6	9.9	-3.2	-5.1	11.5	-2.3	-3.3
Fall ocean	16.7	-2.9	0.3	10.9	6.5	-0.4	-1.6	-0.3
land	9.1	1.7	3.4	6.6	2.7	-2.3	-2.4	-2.5
Winter ocean	14.3	0.1	2.4	26.8	4.6	-0.4	-1.6	-0.7
land	3.1	3.4	3.2	9.1	2.5	-1.8	-2.2	-1.7
<u>Surface Downwelling Shortwave Flux (W/m²)</u>								
Spring ocean	146.1	35.7	22.0	-8.9	-2.4	-30.6	-16.5	7.3
land	166.8	39.0	16.4	-3.9	-8.9	-18.2	-10.1	4.4
Summer ocean	218.1	60.3	47.2	-0.5	-25.1	-25.4	-35.6	19.5
land	231.5	52.3	20.6	-2.7	-18.8	-5.1	-20.6	3.2
Fall ocean	21.7	10.3	4.9	0.0	-2.8	-3.0	-6.3	2.7
land	38.9	17.5	4.5	-0.6	-4.0	-2.6	-7.8	2.0

Winter ocean	1.3	1.0	0.3	-0.1	-0.0	-0.4	-0.3	0.0
land	6.6	3.7	0.5	0.0	0.2	-1.2	-1.1	-0.1
<u>Surface Downwelling Longwave Flux (W/m²)</u>								
Spring ocean	207.6	-9.6	-12.0	34.4	4.5	10.0	6.5	-10.7
land	205.5	-9.8	-9.3	26.8	11.4	1.5	3.1	-13.3
Summer ocean	280.2	-14.5	-16.8	10.9	17.6	-0.5	19.3	-5.7
land	280.9	-6.7	-6.2	17.4	12.2	-3.5	12.3	-4.9
Fall ocean	232.9	-16.5	-15.6	18.9	7.9	-0.3	11.3	-19.5
land	221.5	-11.8	-7.5	15.1	9.7	-0.5	9.9	-12.1
Winter ocean	181.0	-8.2	-7.7	43.4	4.6	7.5	3.6	-19.4
land	170.7	-7.2	-3.5	22.9	4.8	2.0	1.8	-15.9
<u>Surface Upwelling Shortwave Flux (W/m²)</u>								
Spring ocean	90.4	34.8	32.0	-20.0	8.5	-31.4	-2.6	-8.8
land	101.9	28.0	19.5	7.3	2.8	-21.9	-15.3	-13.2
Summer ocean	96.0	48.3	71.2	-9.9	-8.1	-14.6	-14.3	10.1
land	83.4	45.2	19.0	3.5	-1.2	-13.1	-1.0	-12.1
Fall ocean	7.4	8.0	4.7	-0.2	-0.6	-2.0	-2.0	0.6
land	14.4	14.7	2.6	0.9	-0.2	-3.1	-2.5	-0.9
Winter ocean	0.7	1.0	0.4	-0.2	0.2	-0.7	-0.0	-0.0
land	4.4	2.2	0.6	0.2	0.3	-3.0	-1.8	-1.0
<u>Surface Upwelling Longwave Flux (W/m²)</u>								
Spring ocean	259.0	-5.3	-6.3	31.1	-3.5	9.5	-1.0	5.8
land	257.5	-0.3	-1.1	15.1	-0.2	-6.5	-3.2	2.6
Summer ocean	318.9	-6.2	-5.7	1.5	-0.3	-0.2	2.7	1.6
land	342.4	-7.0	-4.5	6.9	0.9	-6.4	0.2	3.7
Fall ocean	276.5	-10.5	-6.8	19.9	1.7	0.9	2.7	-5.2
land	266.3	-2.6	1.7	10.4	3.5	-12.4	-0.4	-2.0
Winter ocean	227.5	-8.8	-2.8	48.6	0.2	6.1	2.2	-3.4
land	211.4	-0.2	4.8	22.5	2.4	-14.7	-8.9	-1.2
<u>Top Downwelling Shortwave Flux (W/m²)</u>								
Spring ocean	249.9	0.2	-0.2	-999.0	0.0	-2.2	5.3	-3.1
land	273.8	0.2	-0.2	-999.0	0.0	-2.0	4.5	-2.8
Summer ocean	427.0	-0.5	-1.4	-999.0	-1.0	0.0	3.4	0.3
land	421.0	-0.1	-1.2	-999.0	-0.8	-0.1	4.1	0.2
Fall ocean	53.5	-0.5	-0.9	-999.0	-0.9	0.0	1.9	0.7
land	85.8	-0.6	-1.0	-999.0	-1.0	0.0	2.0	0.7
Winter ocean	3.3	0.1	0.0	-999.0	-0.0	-0.2	0.7	-0.2
land	14.4	0.3	-0.0	-999.0	-0.1	-0.5	1.8	-0.5
<u>Top Upwelling Shortwave Flux (W/m²)</u>								
Spring ocean	144.1	3.0	12.0	-19.4	1.0	-8.6	5.4	-24.4
land	149.4	1.8	5.4	7.9	8.5	-3.0	-4.8	-22.5
Summer ocean	212.7	-2.1	21.1	-21.4	3.6	4.8	8.2	-16.4
land	182.9	3.4	-6.4	-1.5	10.5	-9.0	11.8	-24.1
Fall ocean	25.9	-1.1	0.4	-1.1	0.8	1.7	4.3	-1.6
land	41.6	-1.0	-3.0	-0.2	1.8	0.5	4.4	-4.0
Winter ocean	1.9	0.1	0.2	-0.2	0.0	-0.1	0.5	-0.3
land	8.3	-0.6	0.5	0.3	0.1	-0.2	0.5	-1.3
<u>Top Upwelling Longwave Flux (W/m²)</u>								
Spring ocean	197.6	-5.1	-0.9	-3.3	-0.8	0.9	0.8	6.8
land	195.7	-3.8	-0.5	-4.3	0.9	-2.0	1.5	8.6
Summer ocean	227.8	-2.7	0.5	-2.1	0.0	-0.1	0.5	8.4
land	229.8	-4.0	-0.2	-2.8	0.9	-2.0	2.0	12.6
Fall ocean	197.7	-5.0	-0.7	-0.7	-0.5	-1.1	1.4	5.1

	land	193.9	-4.9	-1.4	-1.9	2.0	-2.7	2.4	8.9
Winter	ocean	177.5	-8.0	-2.2	-0.3	-0.9	0.8	2.1	2.6
	land	171.5	-4.8	-0.0	-2.5	2.3	-3.1	1.0	6.1
<u>Precipitation (mm/mth)</u>									
Spring	ocean	21.3	-1.2	-5.4	17.3	6.5	-0.6	-1.5	0.4
	land	25.8	2.4	-3.7	18.7	14.2	-0.6	-1.6	-1.2
Summer	ocean	31.9	-1.2	-13.8	6.9	13.1	-2.2	1.0	-5.4
	land	49.8	2.8	2.1	4.9	8.9	-1.6	0.7	-7.7
Fall	ocean	32.2	-6.5	-8.3	12.6	11.7	-1.9	0.8	-0.5
	land	36.8	-3.3	-4.6	11.8	12.6	-1.4	-0.3	-1.2
Winter	ocean	23.7	-0.2	-2.7	23.0	6.9	-1.8	-0.9	0.5
	land	22.8	1.9	-2.2	13.4	6.8	-1.1	-1.5	-0.1
<u>Average 10-m Wind Speed (m/s)</u>									
Spring	ocean	5.6	-1.0	0.3	-0.1	-0.4	-0.0	0.3	-999.0
	land	4.4	-0.9	0.6	-0.6	-0.7	0.4	0.1	-999.0
Summer	ocean	5.2	-0.8	0.2	-0.4	-0.1	0.2	0.1	-999.0
	land	3.9	-0.6	0.7	-0.5	-0.3	0.2	-0.0	-999.0
Fall	ocean	6.5	-1.0	0.4	-0.2	-0.1	-0.0	-0.1	-999.0
	land	4.7	-0.6	1.0	-0.5	-0.6	0.3	-0.3	-999.0
Winter	ocean	6.3	-1.2	0.4	0.2	-0.5	-0.2	0.2	-999.0
	land	4.9	-0.8	0.9	-0.4	-1.0	0.4	-0.3	-999.0

-999 indicates missing values.

SUPPLEMENTAL FIGURES

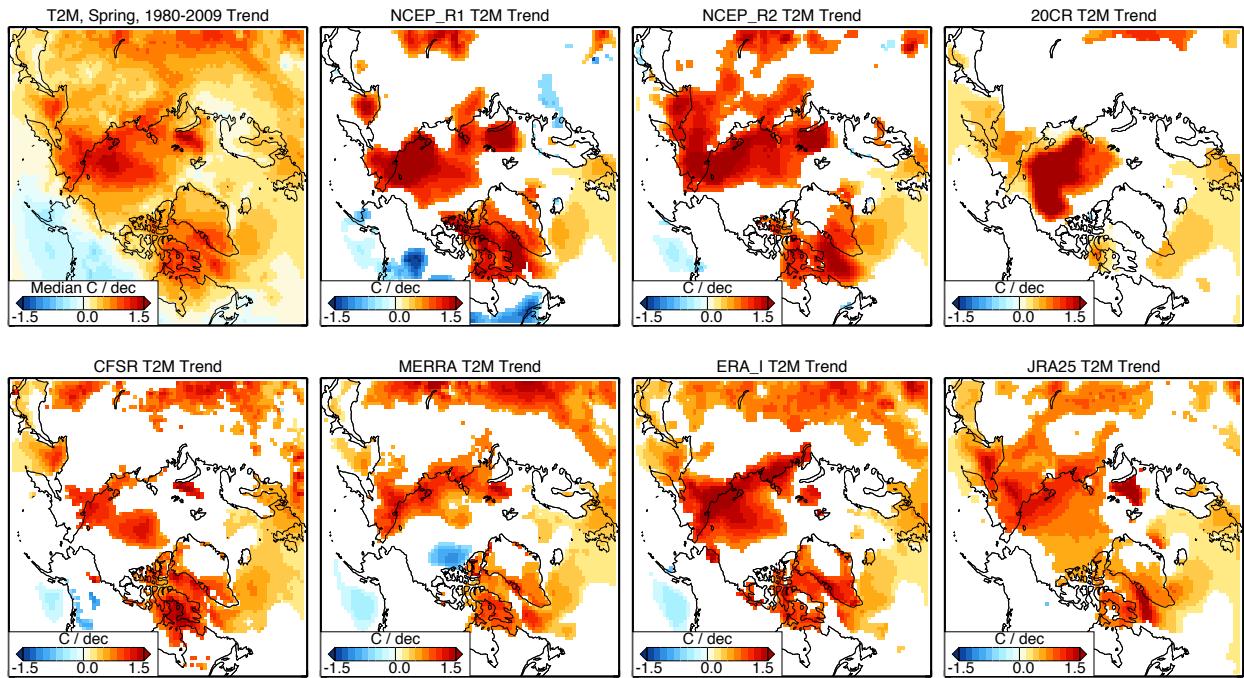


Fig. S1. The 2-m temperature trends in the spring. The upper left map is the median trend and the others are the trends for each reanalysis. Only trends that are greater than the 95% confidence interval are plotted.

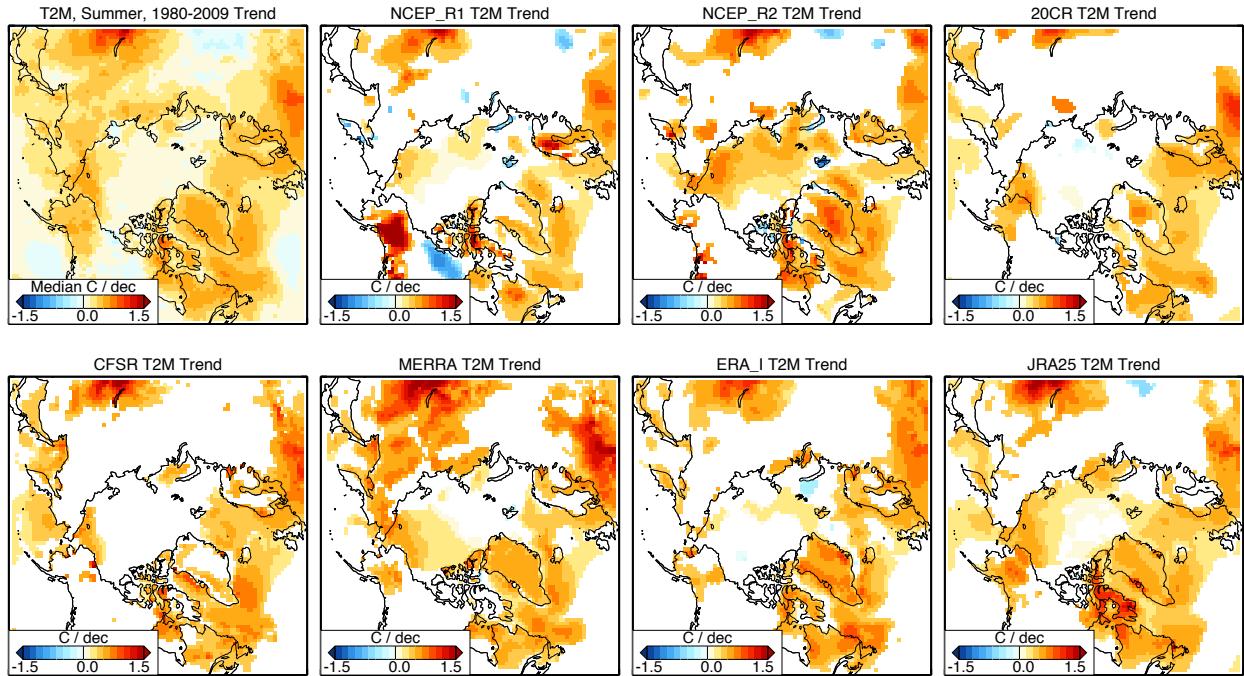


Fig. S2. As in Fig.S1 but for summer.

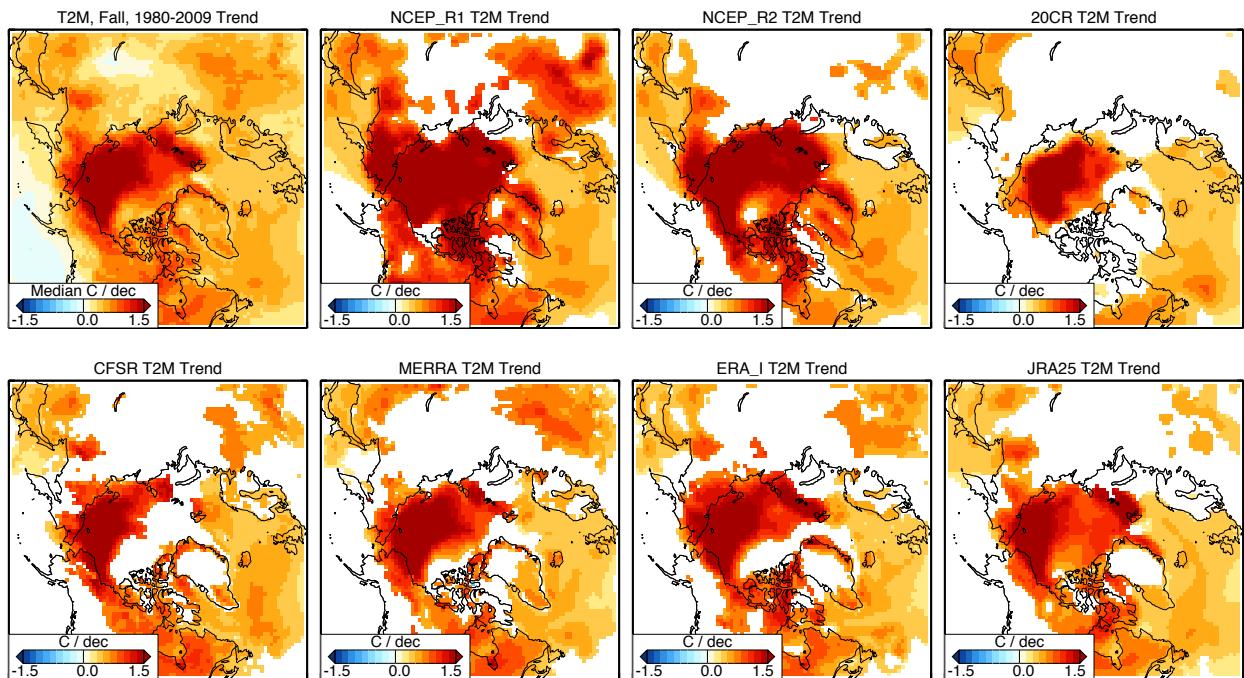


Fig. S3. As in Fig.S1 but for fall.

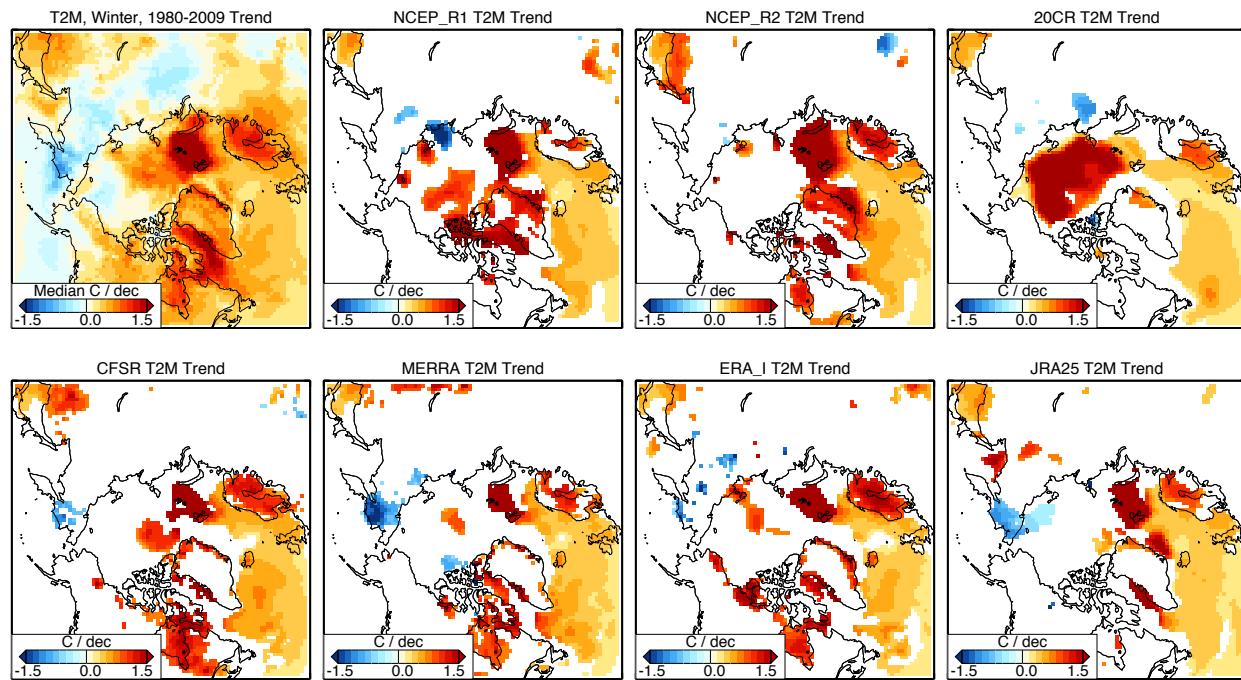


Fig. S4. As in Fig.S1 but for winter.

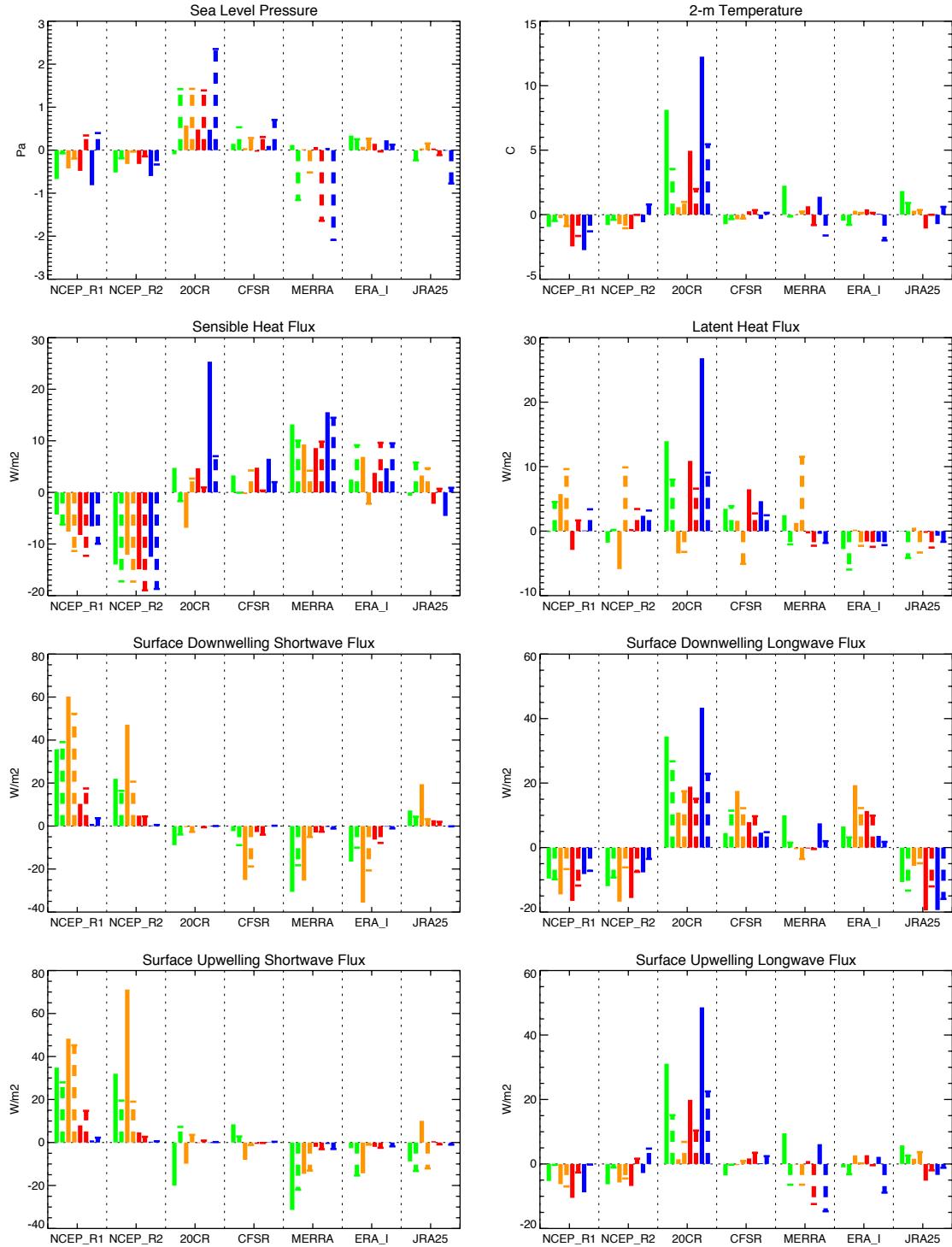


Fig S5a. Bar plots of the deviations from the median of each of the reanalysis products for 8 variables from Table S1 for ocean areas north of 70°N and land areas north of 65°N. The seasons are MAM: green, JJA: orange, SON: red, DJF: blue. Oceans: solid, land: dashed.

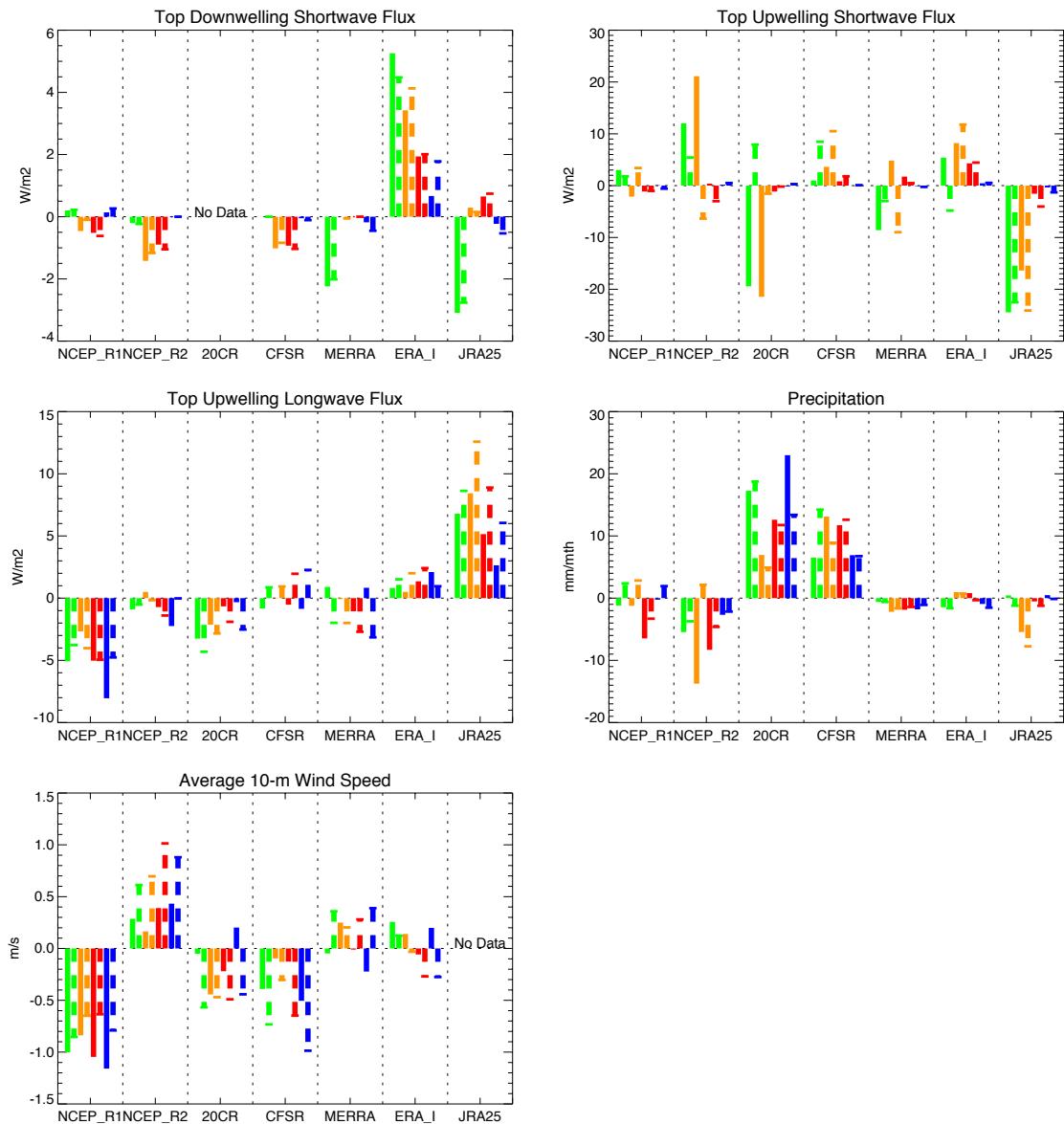


Fig S5b. Bar plots of the deviations from the median of each of the reanalysis products for 5 variables from Table S1 for ocean areas north of 70°N and land areas north of 65°N.