Evaluation of seven different atmospheric reanalysis products in the Arctic

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Modeling, Analysis, Predictions, and Projections (MAPP) Seminar

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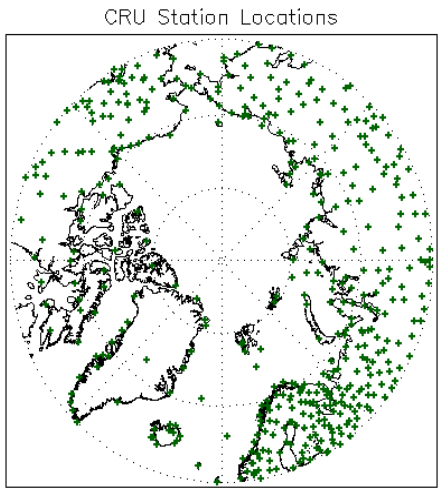
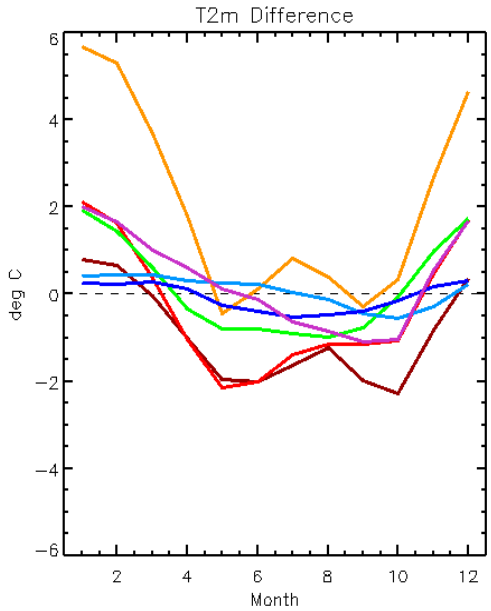
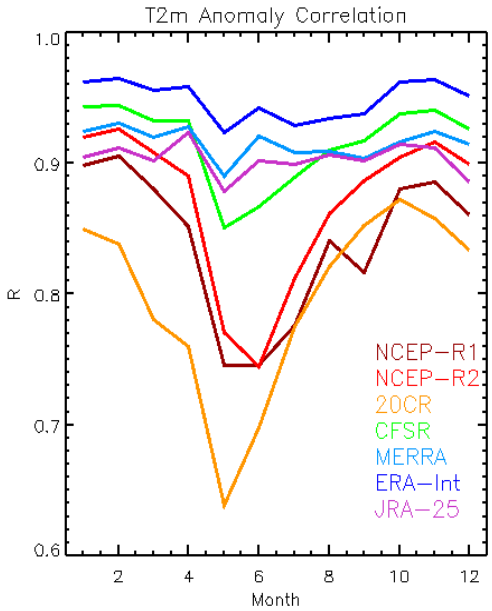
Reanalysis Models

	NCEP-R1	NCEP-R2	CFSR	20CR	MERRA	ERA-Int	JRA-25
Time interval	1948–p	1979–p	1979–p	1871-2008	1979–p	1979–p	1979-p
Spatial Resolution	T62 (209 km)	T62 (209 km)	T382 (38 km)	T62 (209 km)	0.5º x 0.66º (65 km)	T255 (79 km)	T106 (125 km)
Vertical levels	28 to 3 hPa	28 to 3 hPa	63 to 0.26 hPa	28 to 0.2 hPa	72 to 0.1 hPa	60 to 0.1 hPa	40 to 0.4 hPa
Data assimilation method	3D Var	3D Var	3D Var	Ensemble Kalman Filter	IAU	4D-Var	3D-Var
Sea Ice and SST	Prescribed	Prescribed	**Interactive**	Prescribed	Prescribed	Prescribed	Prescribed

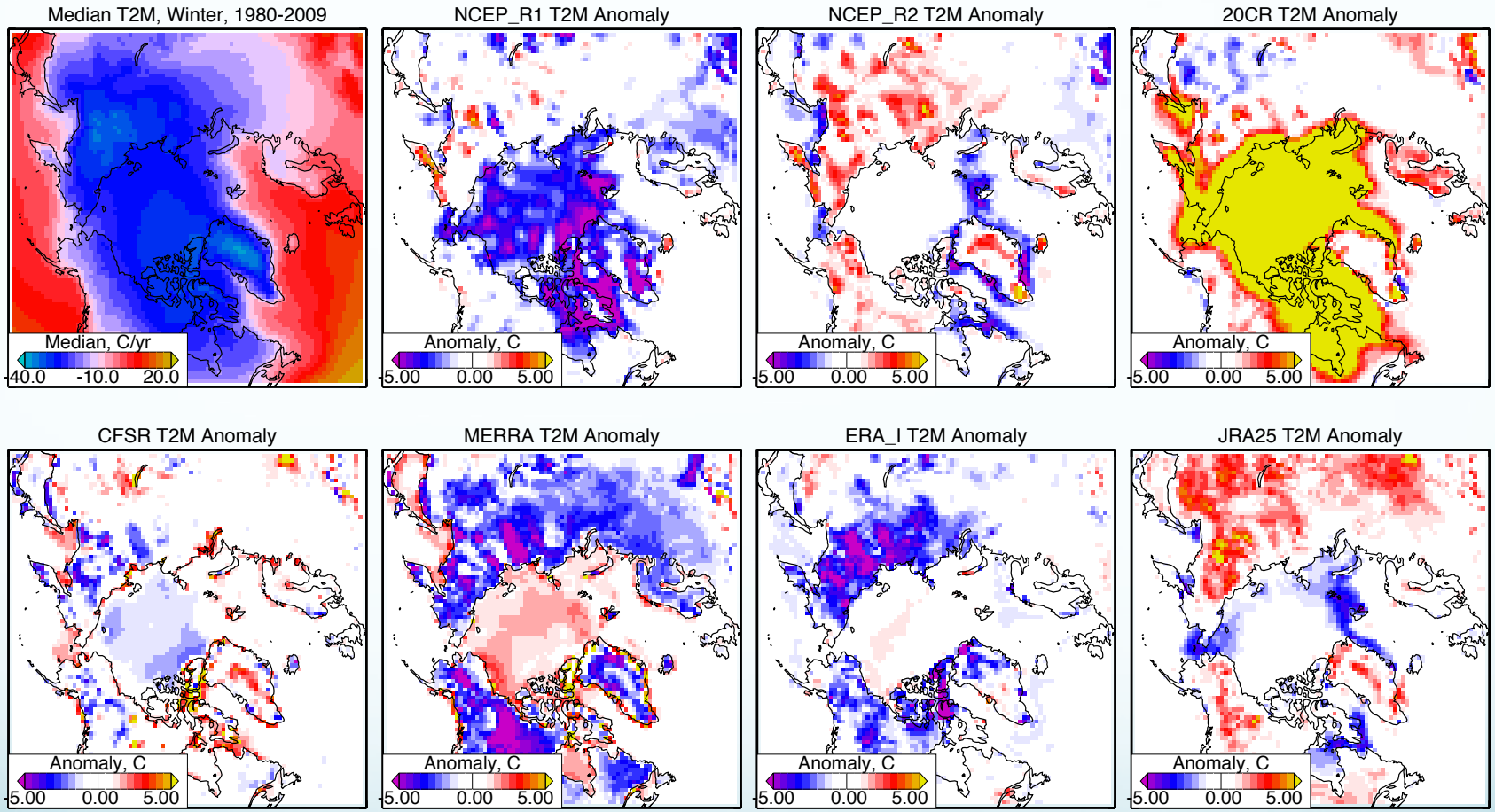
2-m Air Temperatures



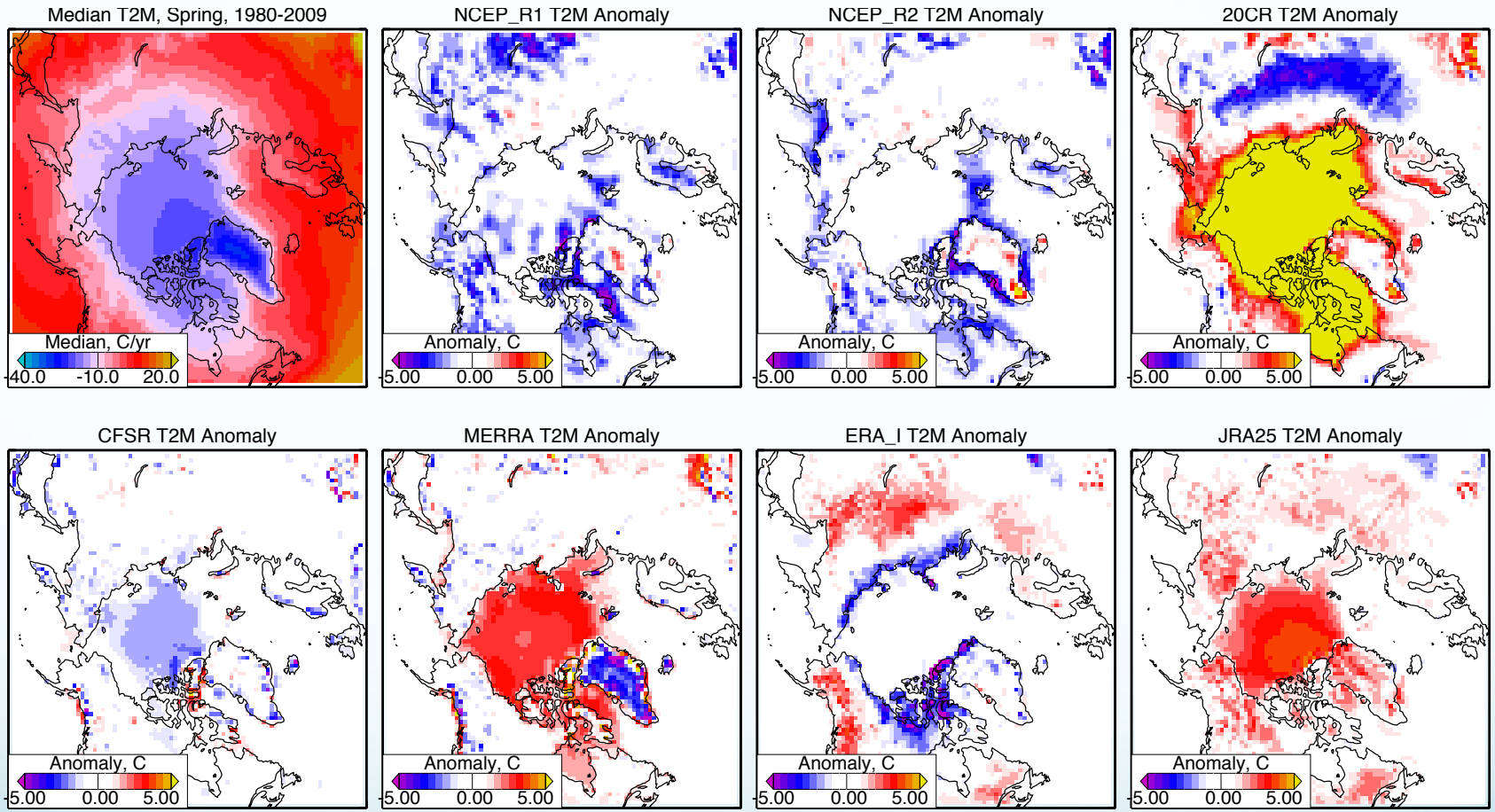




T2m, Winter


Median T2M, Winter, 1980-2009
Median, C/yr
-40.0 -10.0 20.0
NCEP_R1 T2M Anomaly
Anomaly, C
-5.00 0.00 5.00
NCEP_R2 T2M Anomaly
Anomaly, C
-5.00 0.00 5.00
20CR T2M Anomaly
Anomaly, C
-5.00 0.00 5.00
CFSR T2M Anomaly
Anomaly, C
-5.00 0.00 5.00
MERRA T2M Anomaly
Anomaly, C
-5.00 0.00 5.00
ERA_I T2M Anomaly
Anomaly, C
-5.00 0.00 5.00
JRA25 T2M Anomaly
Anomaly, C
-5.00 0.00 5.00

T2m, Spring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Anomaly, C
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Anomaly, C
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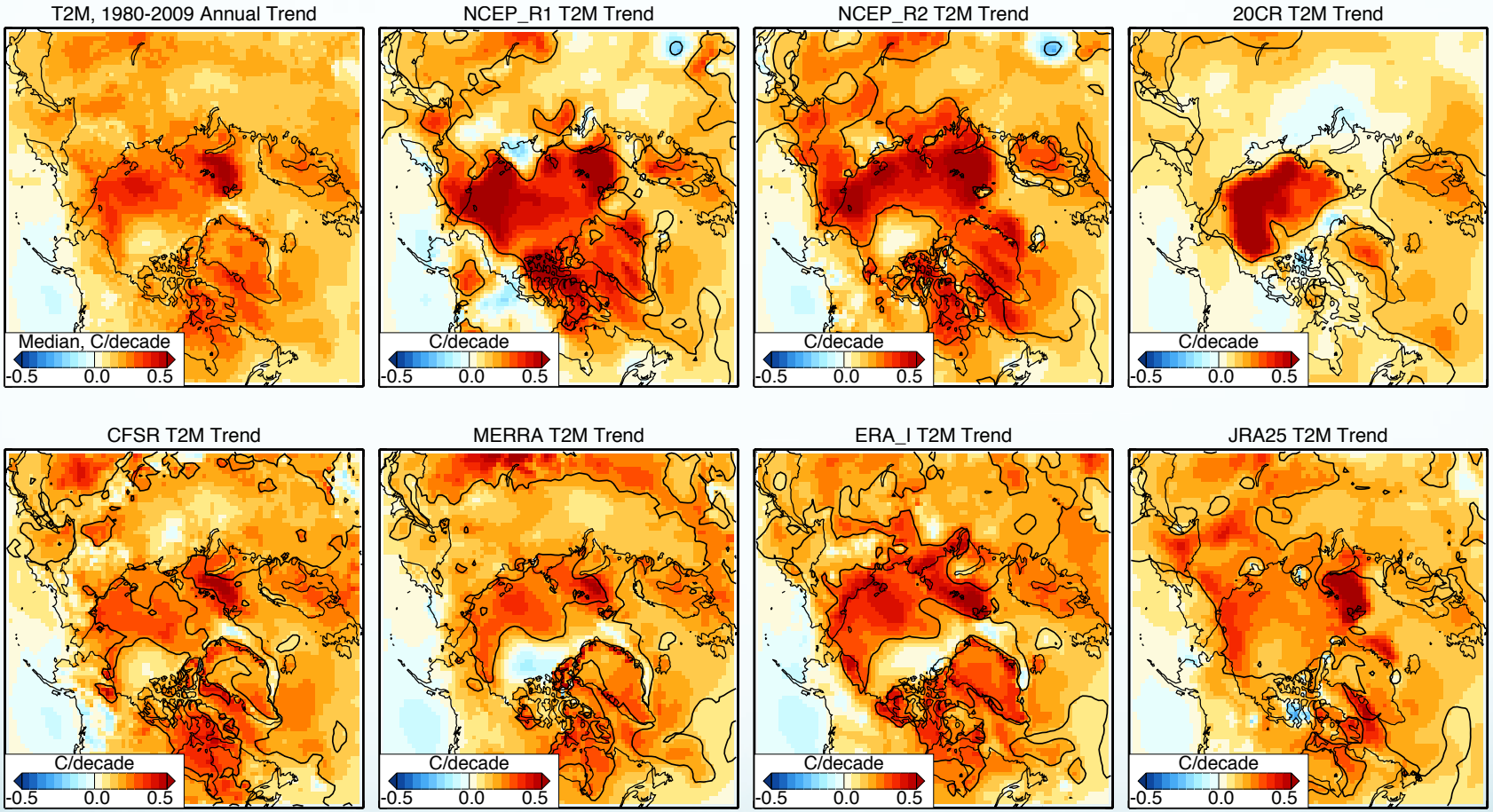
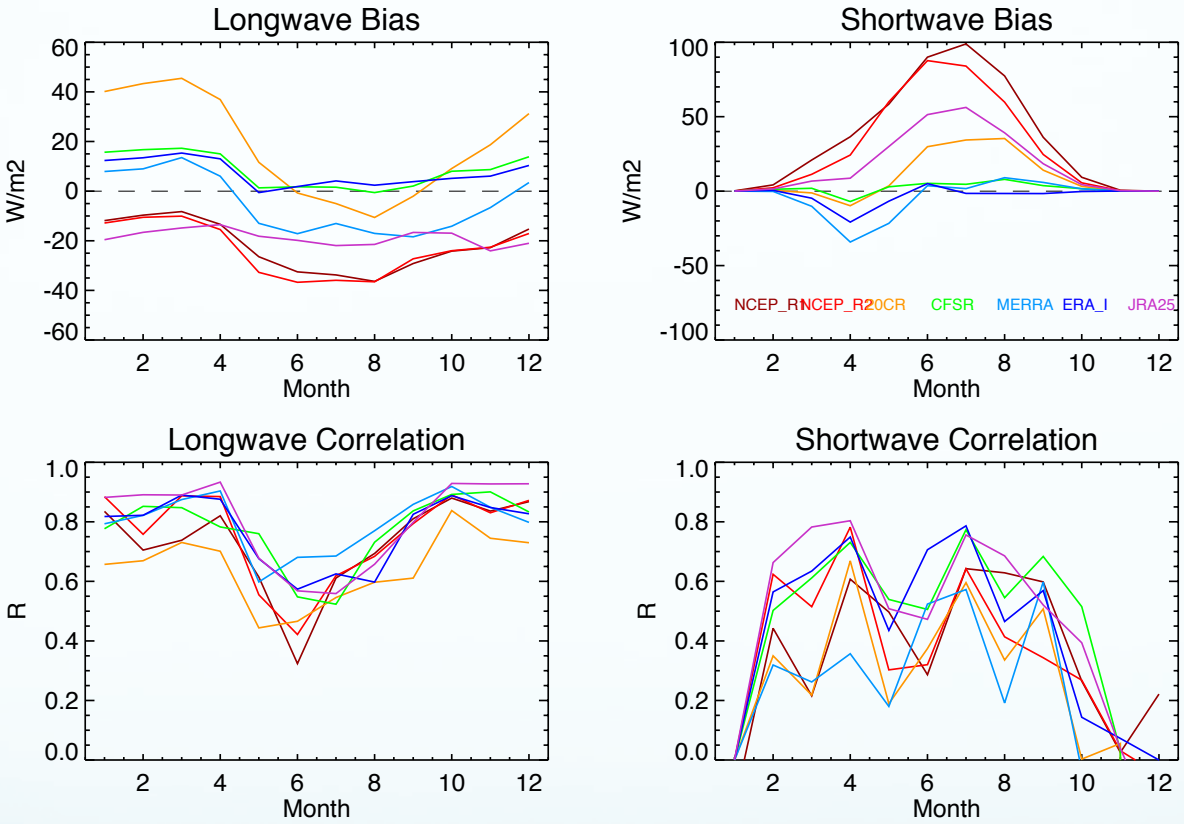
ERA_I T2M Anomaly
Anomaly, C
-5.00 0.00 5.00
JRA25 T2M Anomaly
Anomaly, C
-5.00 0.00 5.00

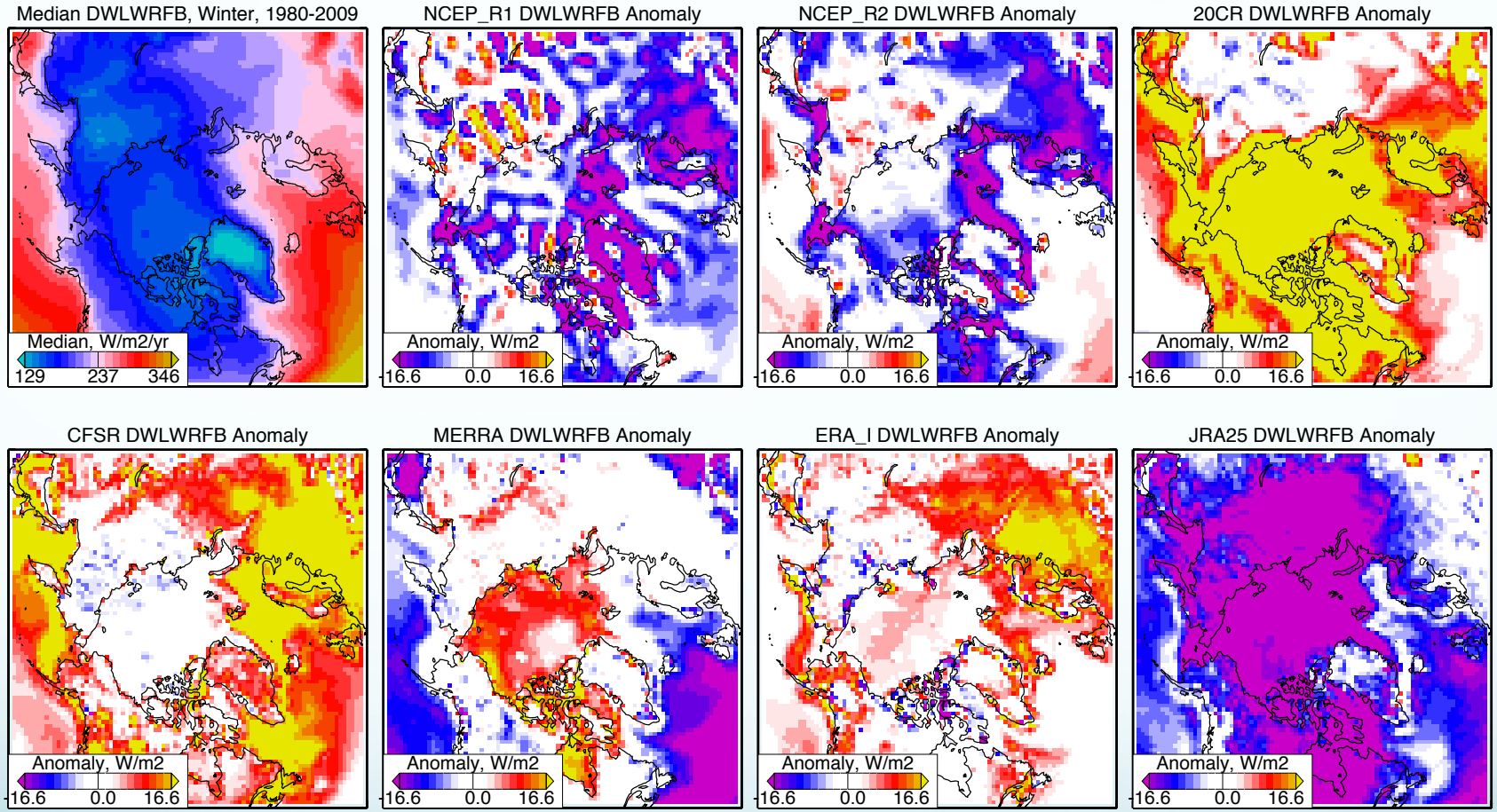
T2m Annual Temperature Trends



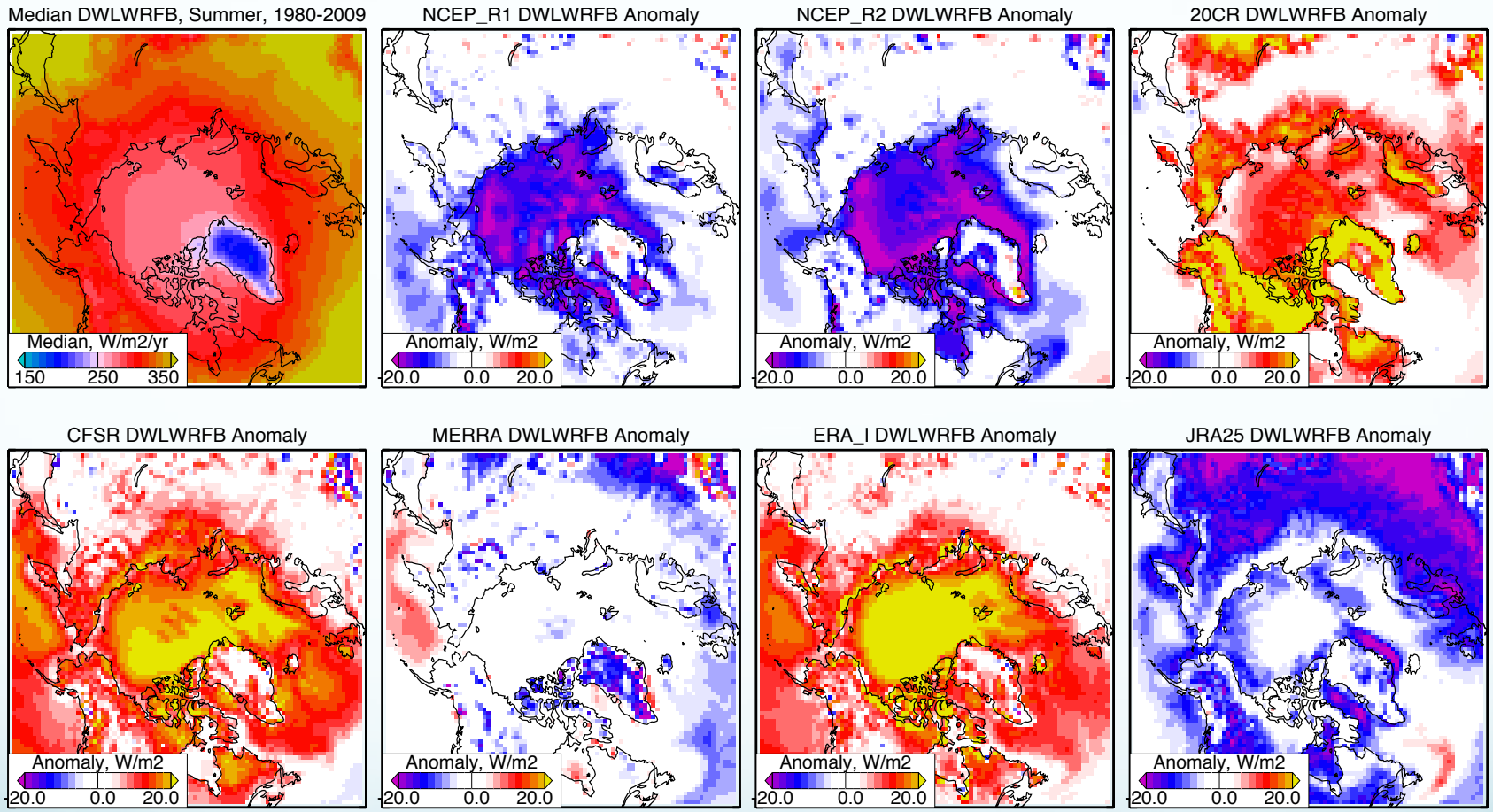
Downwelling Surface Radiative Fluxes



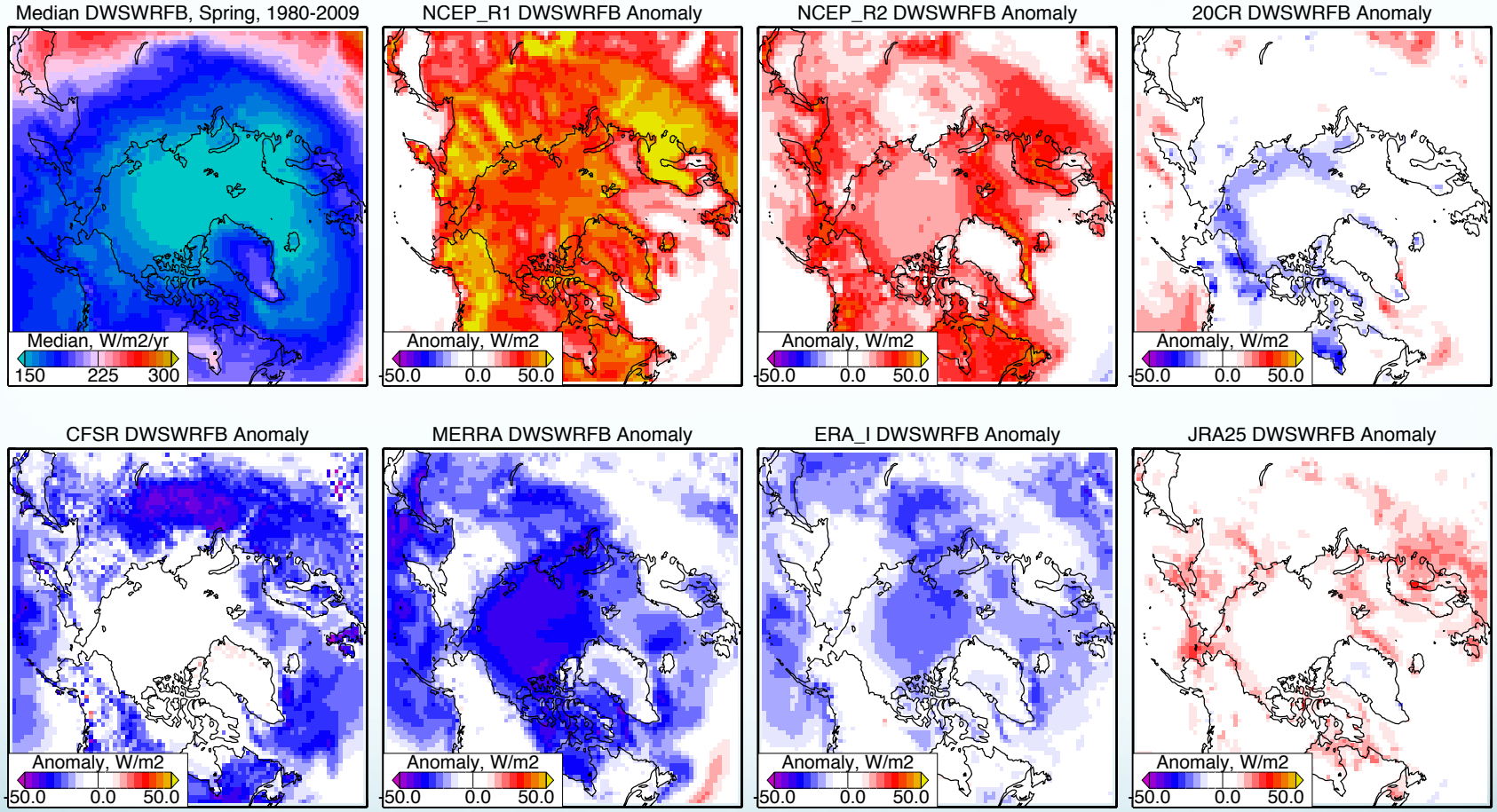
Longwave Flux, Winter



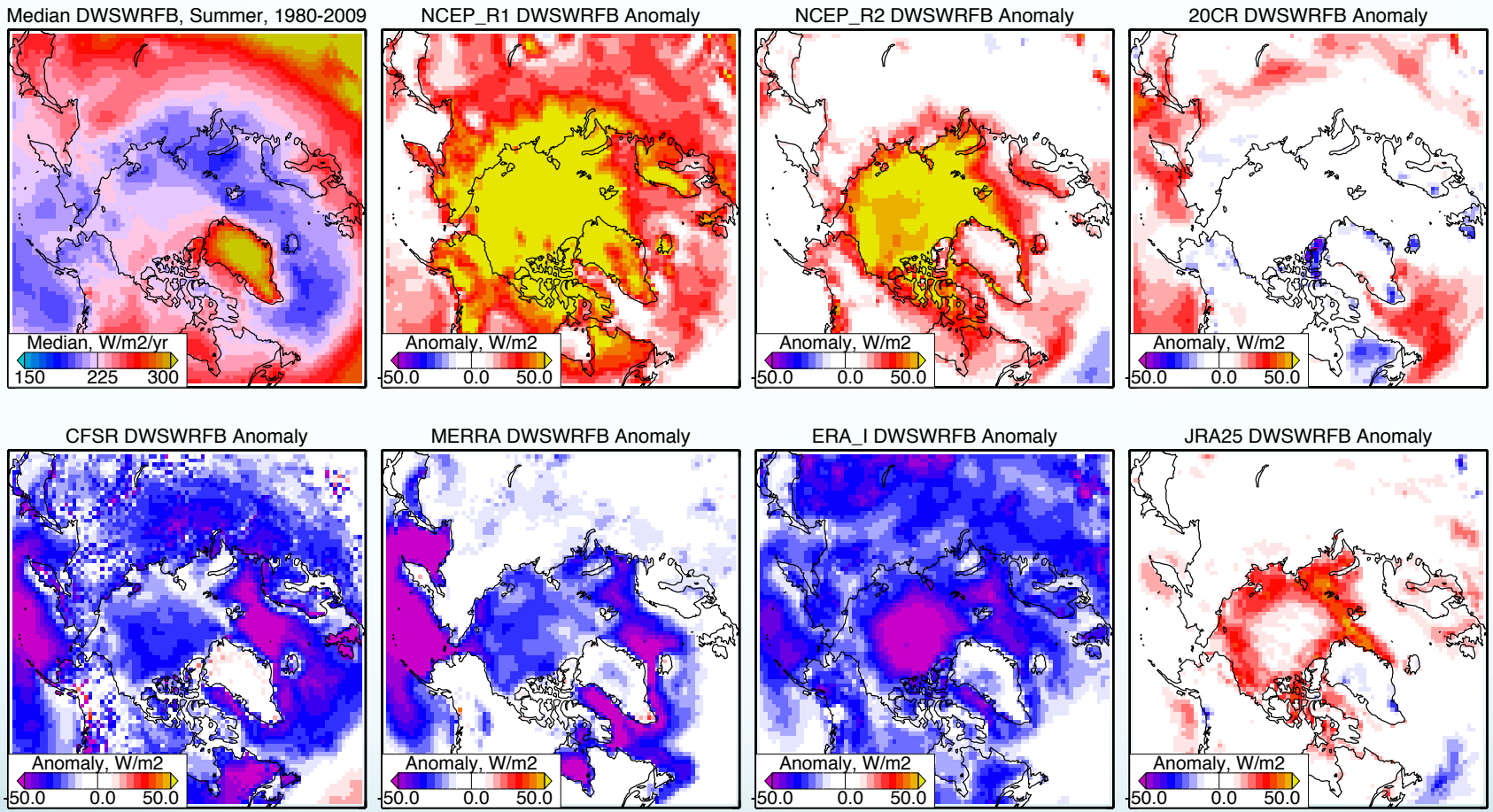
Longwave Flux, Summer



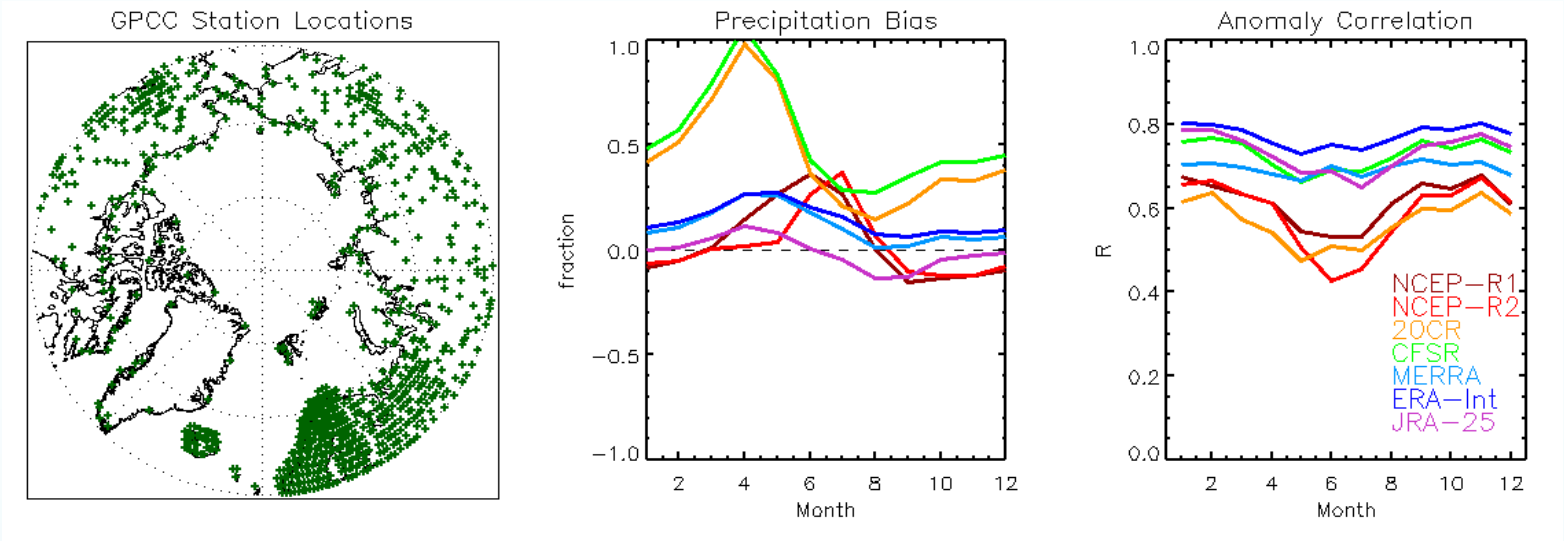
Shortwave Flux, Spring



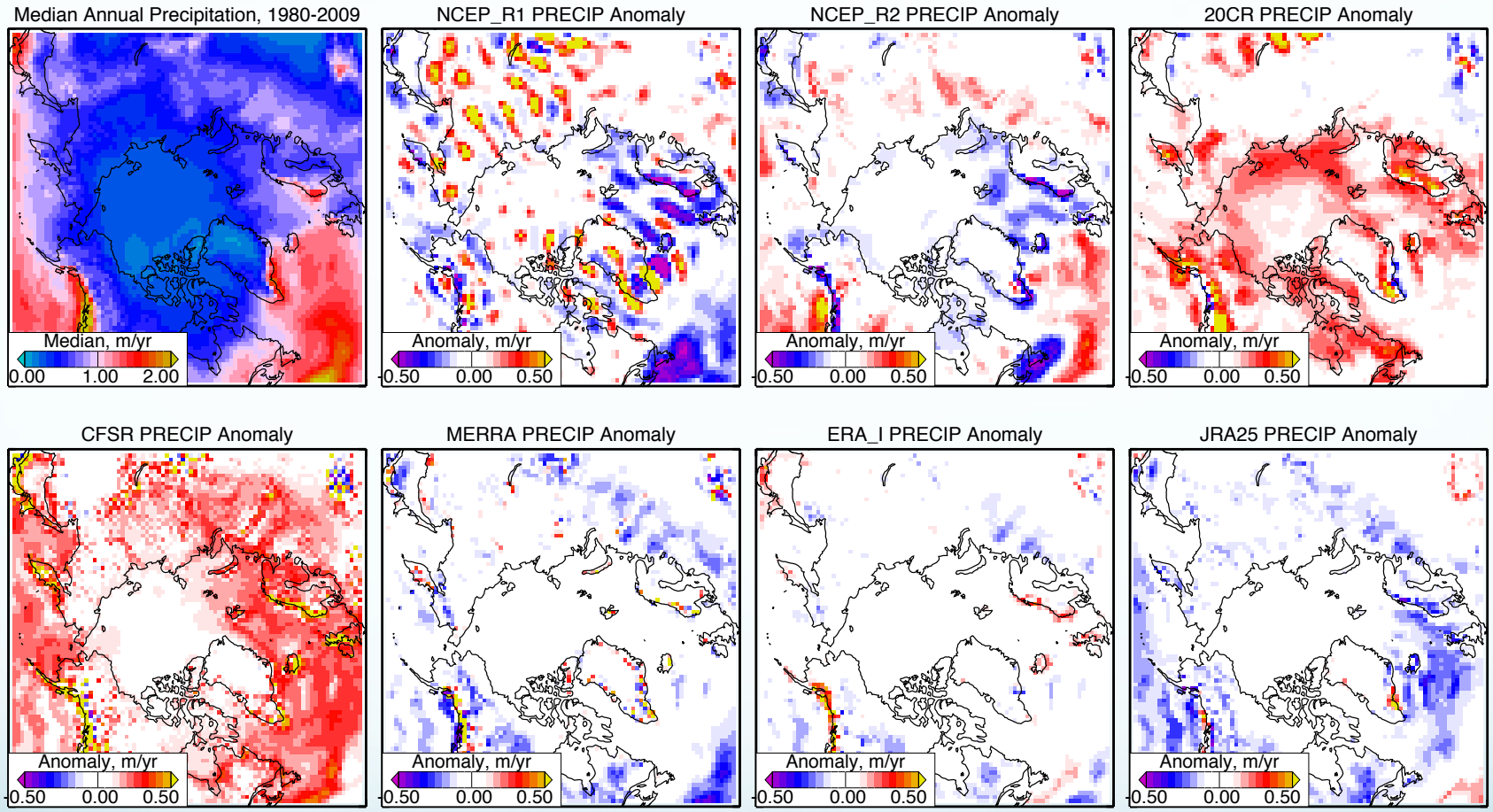
Shortwave Flux, Summer



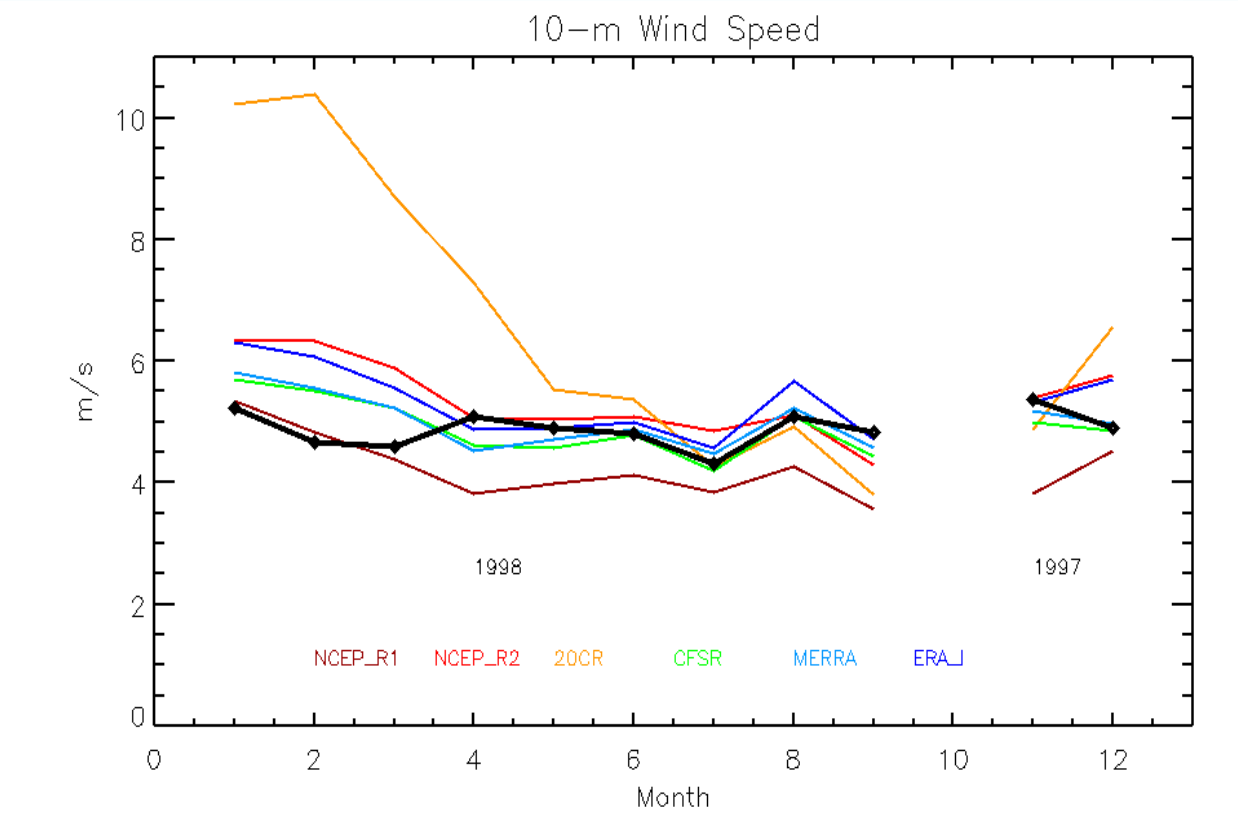
Precipitation



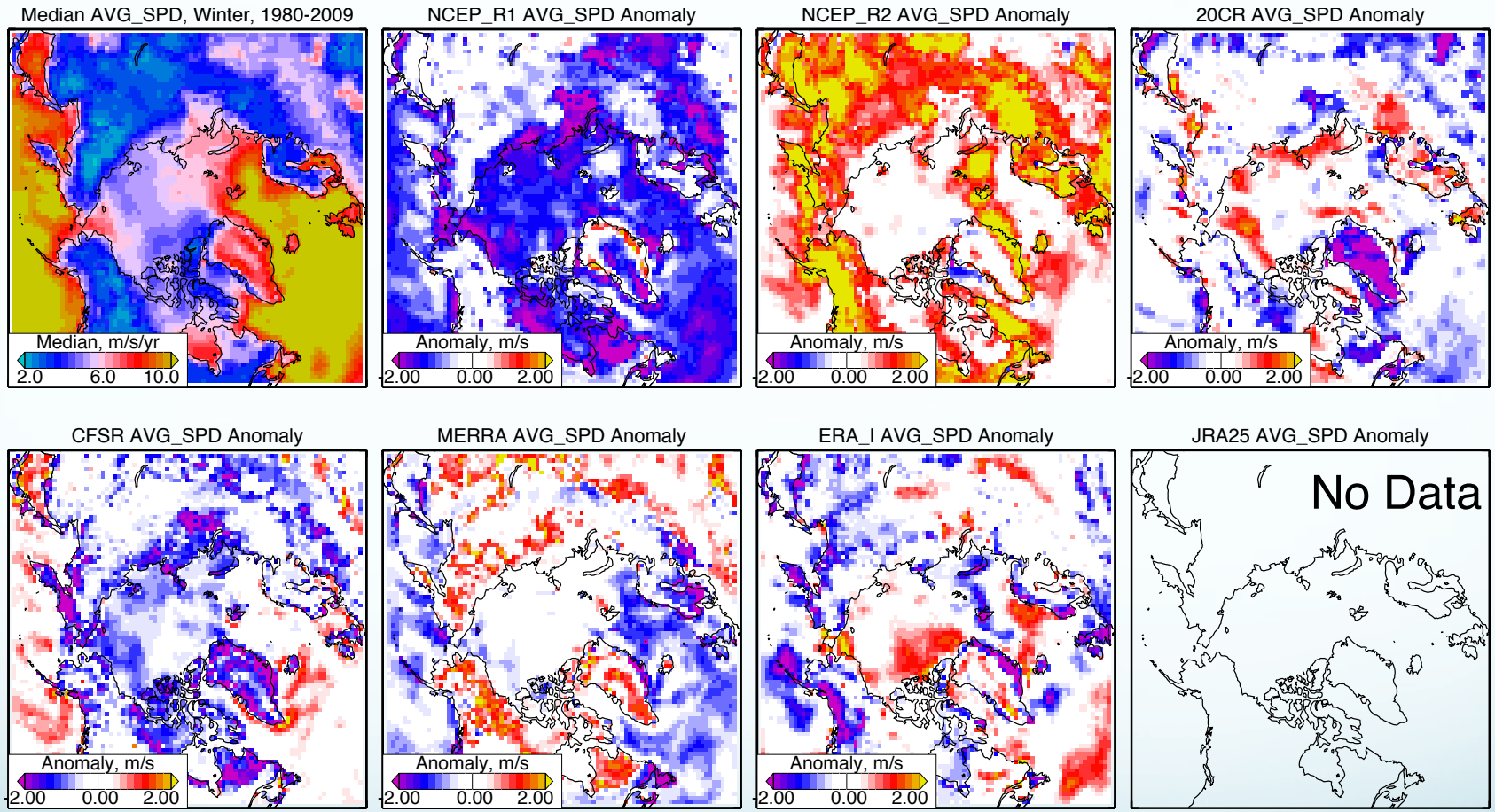
Annual Precipitation



10-m Wind Speed at SHEBA



10-m Wind Speed, Winter



Conclusions

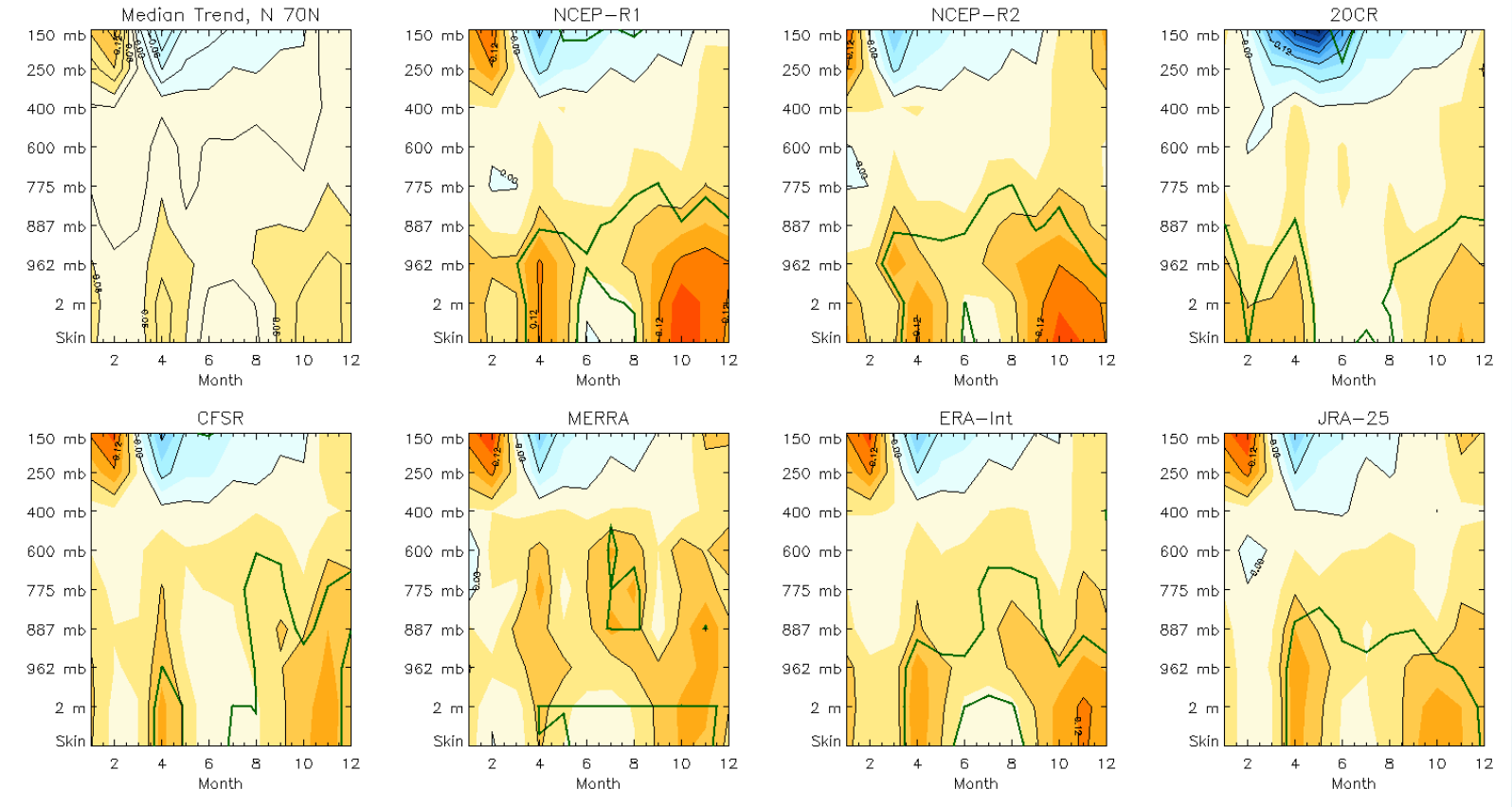
✓**2-m Temperature**: MERRA does best in bias, MERRA, CFSR, and JRA-25 do well in correlations. Trends are much stronger in the NCEP-R1 and R2 models.

✓**Radiative fluxes**: MERRA, CFSR, and ERA-Interim all do well in both bias and correlations.

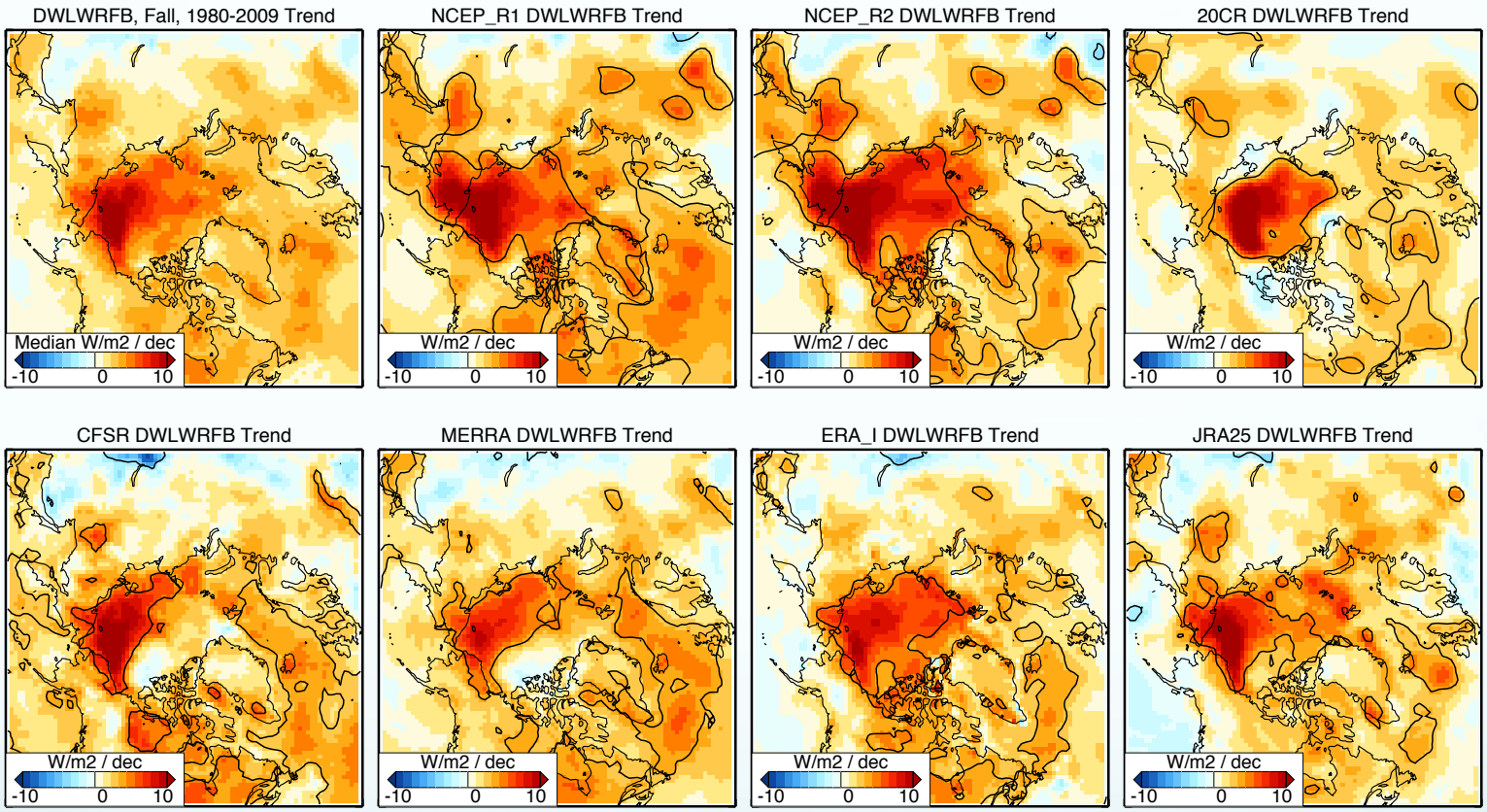
✓**Precipitation**: JRA-25 has the smallest bias. The anomaly correlations is best for ERA-Interim. But MERRA, JRA25, and CFSR. are also good. CFSR is much wetter over the oceans, though not in the Arctic.

✓**Wind speed**: NCEP-R2 has a low bias except in winter. All the others have a high bias in winter. Otherwise they do quite well. NCEP-R1 is markedly higher than the others over land.

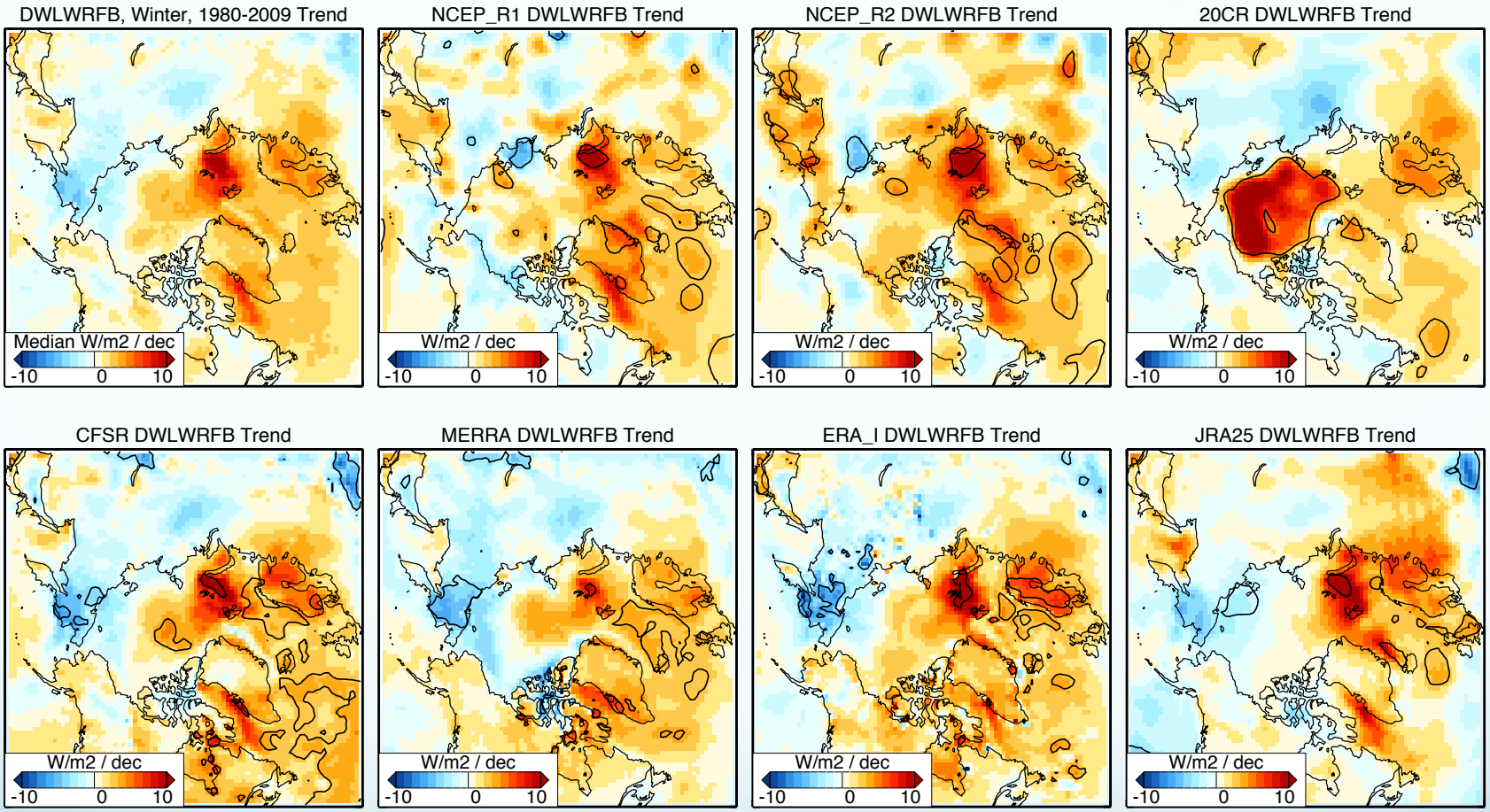
Seasonal trends vs height for temperatures N of 70N.



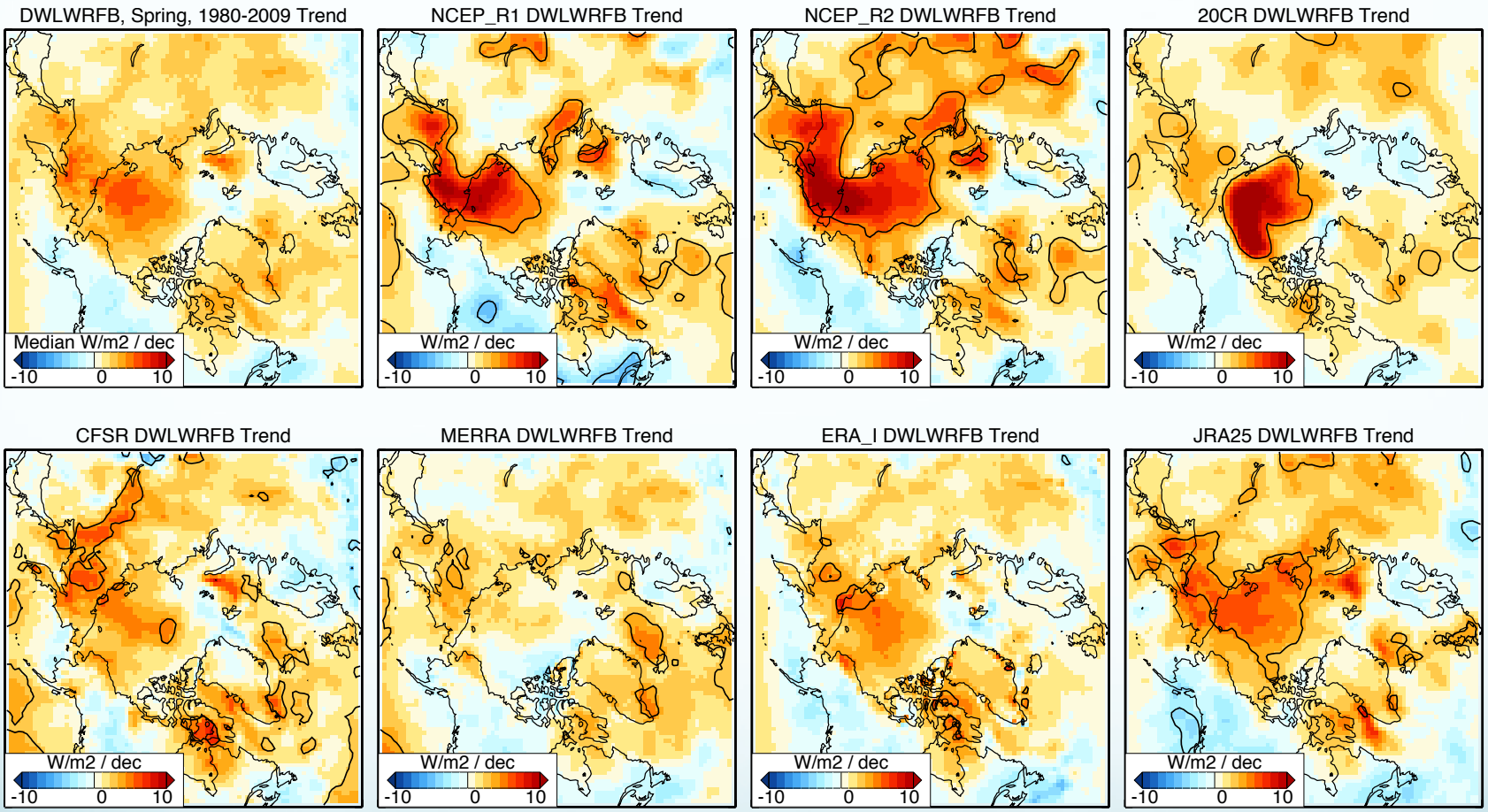
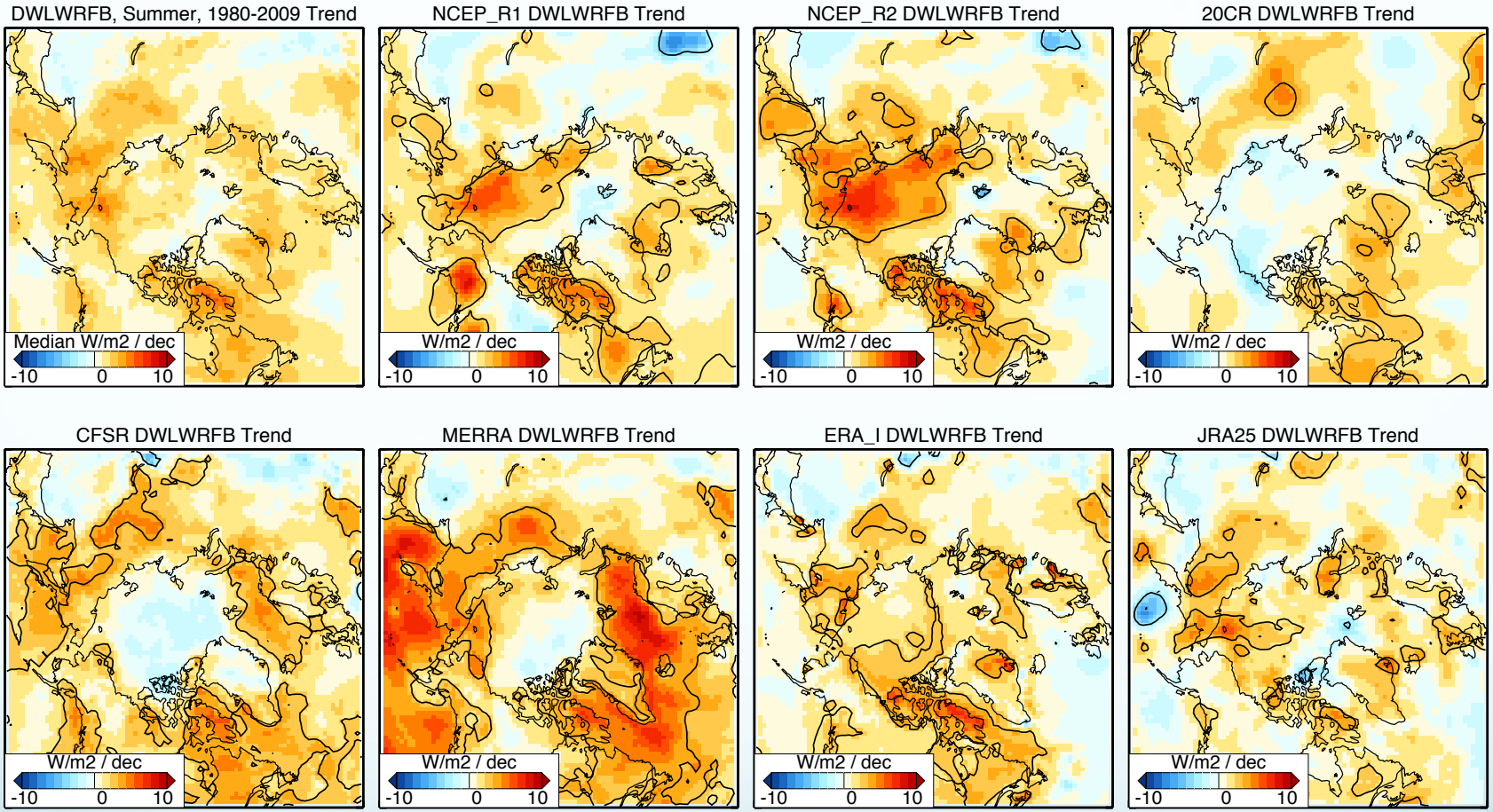
Surface Downwelling Longwave Trends, Fall



Surface Downwelling Longwave Trends, Winter



Surface Downwelling Longwave Trends, Spring



Surface Downwelling Longwave Trends, Summer