First Quarter Progress:

- Linkage with GCM modeling effort

Data needs for downscaling and impact assessment have been communicated to the PCM modeling group. Several lists of variables archived at different temporal frequencies have been produced. Check http://www.cgd.ucar.edu/pcm/SpecialCases/ for more simulations in the future.

6-hour Instantaneous

FLD NO.	NAME	UNITS	LONG NAME
1	Q	KG/KG	SPECIFIC HUMIDITY
2	T	K	TEMPERATURE
3	U	M/S	ZONAL WIND COMPONENT
4	V	M/S	MERIDIONAL WIND COMP.
5	Z3	M	GEOPOTENTIAL HEIGHT
6	PS	PA	SURFACE PRESSURE
7	TS	K	SURFACE TEMPERATURE
8	PSL	PASCALS	SEA LEVEL PRESSURE
9	ORO	FLAG	OCEAN (0), LAND (1), SEA ICE (2)
10	TREFHT	K	REFERENCE HEIGHT TEMPERATURE
11	PHIS	M2/S2	SURFACE GEOPOTENTIAL

6-hour Average

FLD NO.	NAME	UNITS	LONG NAME
1	TAH	K	LSM SURFACE TEMPERATURE
2	RSW	FRACTION	LSM ROOT ZONE VOL. SOIL WATER
3	LHFLX	W/M2	SURFACE LATENT HEAT FLUX
4	QDRAI	MM/S	LSM SUB-SURFACE RUNOFF
5	PRECL	M/S	LARGE SCALE PRECIPITATION RATE
6	PRECC	M/S	CONVECTIVE PRECIPITATION RATE
7	SHFLX	W/M2	SURFACE SENSIBLE HEAT FLUX
8	TGRD	K	LSM GROUND SKIN TEMPERATURE
9	TVEG	K	LSM VEGETATION SKIN TEMPERATURE
10	QOVER	MM/S	LSM SURFACE RUNOFF
11	SRFRAD	W/M2	NET RADIATIVE FLUX AT SURFACE
12	TSOI3	K	LSM 3RD SOIL TEMPERATURE
13	TSOI4	K	LSM 4TH SOIL TEMPERATURE
14	SNOWH	M	WATER EQUIVALENT SNOW DEPTH

Daily Average

FLD NO.	NAME	UNITS	LONG NAME
1	PS	PA	SURFACE PRESSURE
2	TS	K	SURFACE TEMPERATURE
3	Z500	M	500MB HEIGHT
4	Z700	M	700MB HEIGHT
5	PSL	PASCALS	SEA LEVEL PRESSURE
6	ORO	FLAG	OCEAN (0), LAND (1), SEA ICE (2)
7	ICEFRAC	FRACTION	SEAICE FRACTION PER GRID
8	RSW	FRACTION	LSM ROOT ZONE VOL. SOIL WATER
9	LHFLX	W/M2	SURFACE LATENT HEAT FLUX
10	CLDTOT	FRACTION	VERTICALLY-INT. TOTAL CLOUD AMT
11	PRECL	M/S	LARGE SCALE PRECIPITATION RATE
12	PRECC	M/S	CONVECTIVE PRECIPITATION RATE
13	PRECSL	M/S	LARGE SCALE SNOW PRECIP RATE
14	PRECSC	M/S	CONVECTIVE SNOW PRECIP RATE
15	SHFLX	W/M2	SURFACE SENSIBLE HEAT FLUX
16	FSDS	W/M2	FLUX SHORTWAVE DOWNWELLING SFC
17	TREFHT	K	REFERENCE HEIGHT TEMPERATURE
18	TREFHTMN	K	DAILY MIN TREFHT
19	TREFHTMX	K	DAILY MAX TREFHT
20	FLNS	W/M2	NET LONGWAVE FLUX AT SFC
21	PHIS	M2/S2	SURFACE GEOPOTENTIAL
22	FSNS	W/M2	NET SOLAR FLUX AT SFC
23	QOVER	MM/S	LSM SURFACE RUNOFF
24	SNOWH	M	WATER EQUIVALENT SNOW DEPTH

Cases:

- ***Historical*** *(Historical 7)*
  - Period: 1974-0901 thru 1996-1101
- ***Future I*** *(Business-As-Usual 6)*
  - Period: 2029-1101 thru 2051-0101
- ***Future II*** *(Business-As-Usual 6)*
  - Period: 2075-0101 thru 2095-0101

- Parallelization of the regional climate model

The PNNL subgrid orographic precipitation scheme has been successfully implemented to the parallel MM5. A load-balancing algorithm has been developed that varies the domain sizes for different processors handling different numbers of subgrid elevation bands. Figures 1 and 2 show the domain decomposition when the subgrid parameterization is used, and the speed-up achieved for different domain sizes.

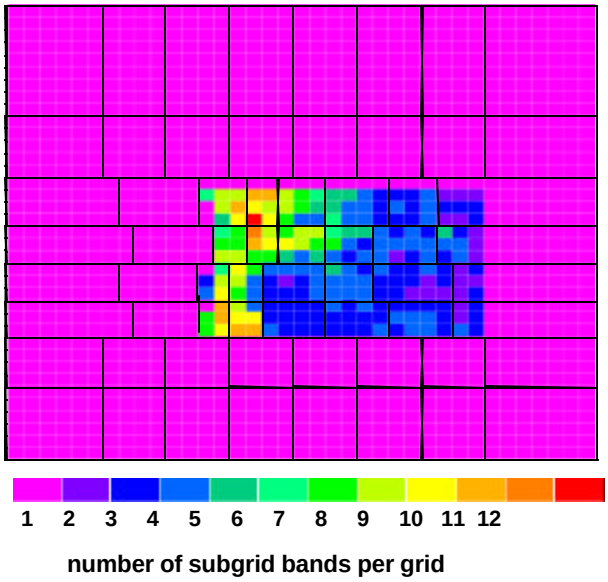

Figure 1. Domain decomposition

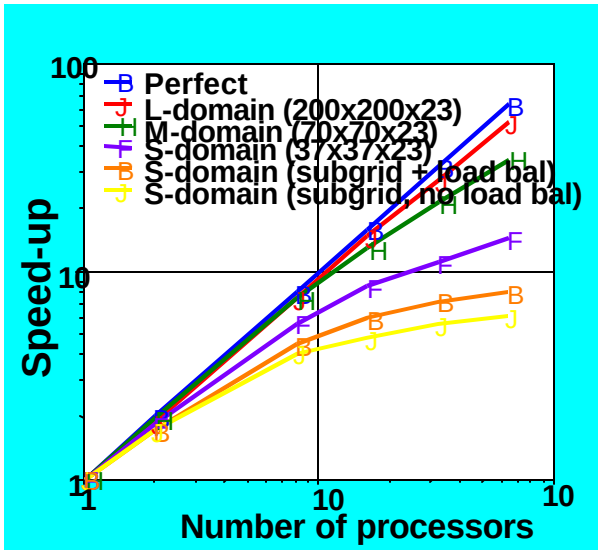

Figure 2. Model Speed-up

- Sensitivity experiments

A series of sensitivity experiments are being performed to determine the best model setup (different choices of physical parameterizations and domain locations). Several simulations have been performed with the regional climate model driven by the NCEP/NCAR reanalyses for 4 years starting on 85/10. These simulations are done using Domain 1 alone with 60x60 grid cells at 60 km resolution.

Figure 3 shows the observed (0.5 degree resolution) and simulated averaged precipitation for January – March of 1986 and 1987. During the 1987 El Nino, less precipitation is found along the west coast, while wetter conditions are found over the Great Plains, as compared to the winter of 1986. The model simulations capture the interannual variability between the two years. The simulations generally compare well with observations along

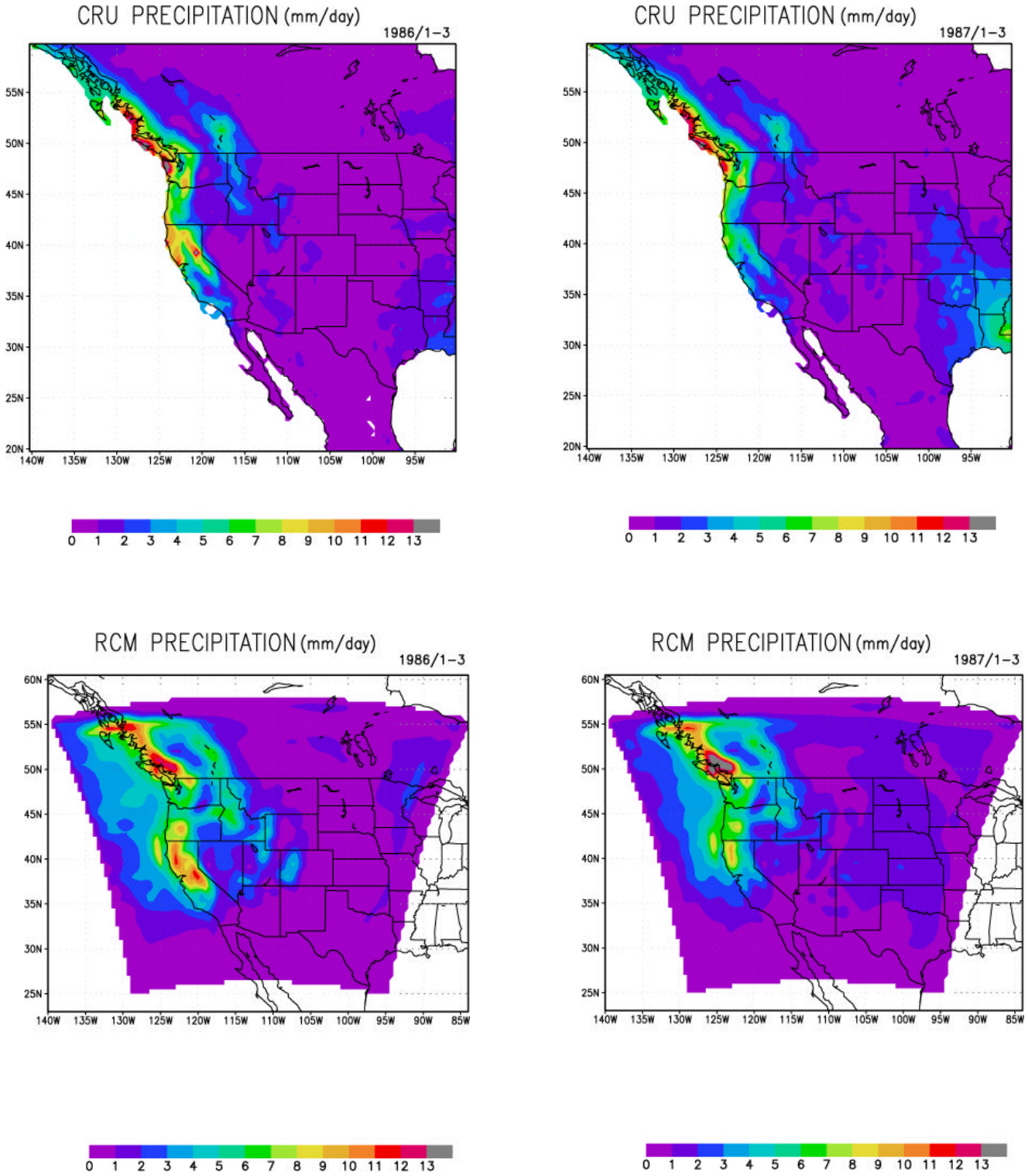

Figure 3. Observed (CRU) and simulated (RCM) winter time (January-March) precipitation for 1986 and 1987.

the west coast and the Great Plains. However, the model overpredicts precipitation in the southwestern U.S. near the Rockies. Figure 4 shows the observed and simulated precipitation anomaly (1987-1986).

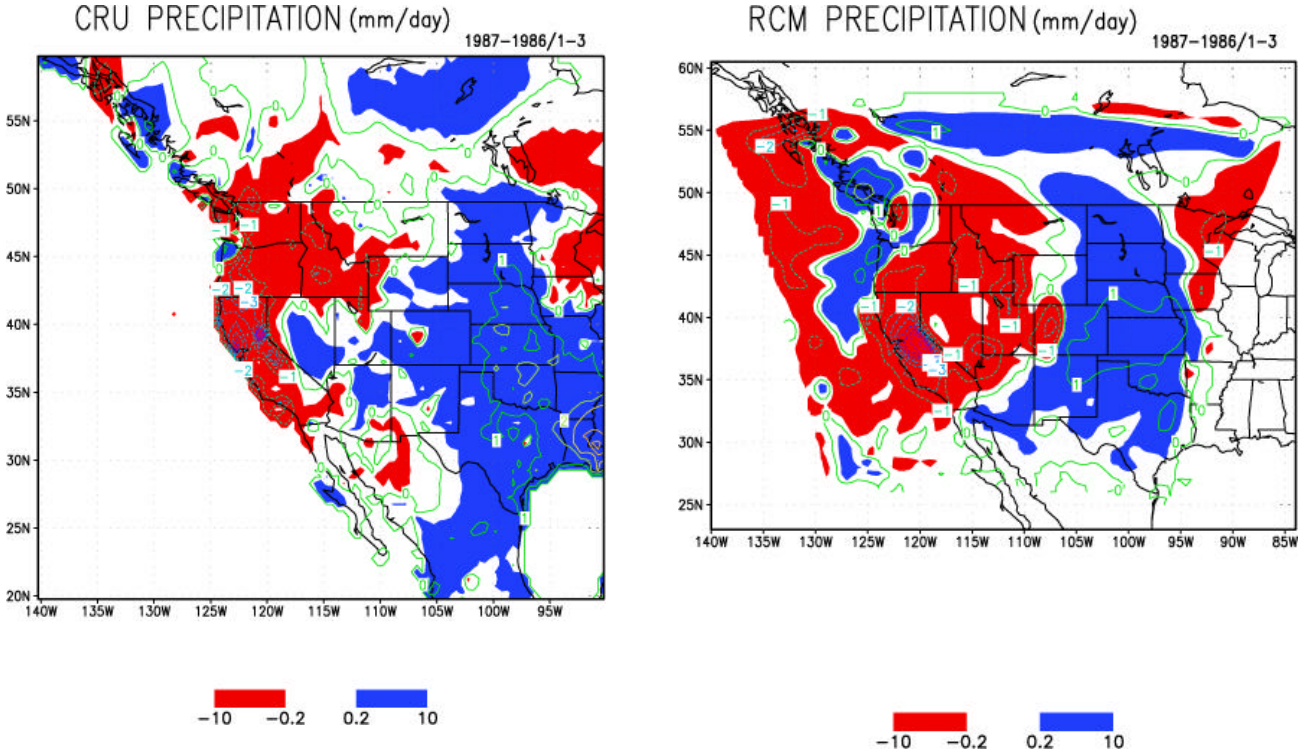

Figure 4. Observed and simulated winter time precipitation anomaly (1987-1986).

Figures 5 and 6 compare the observed and simulated surface temperature. Surface temperature is generally lower over the western U.S. and warmer in Canada during the winter of 1987. The model correctly captures this spatial feature.

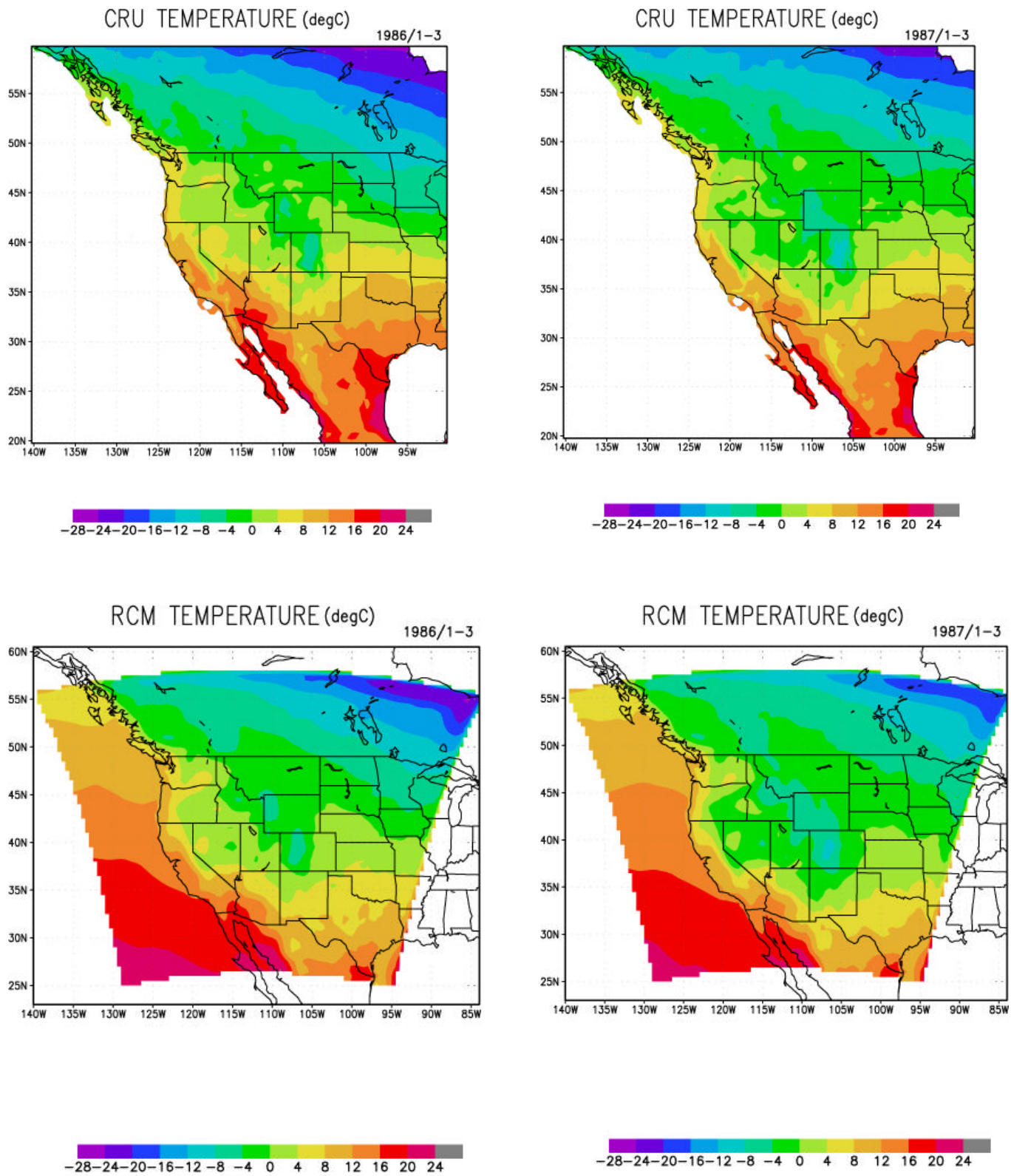

Figure 5. Observed and simulated surface temperature for averaged over January-March for 1986 and 1987.

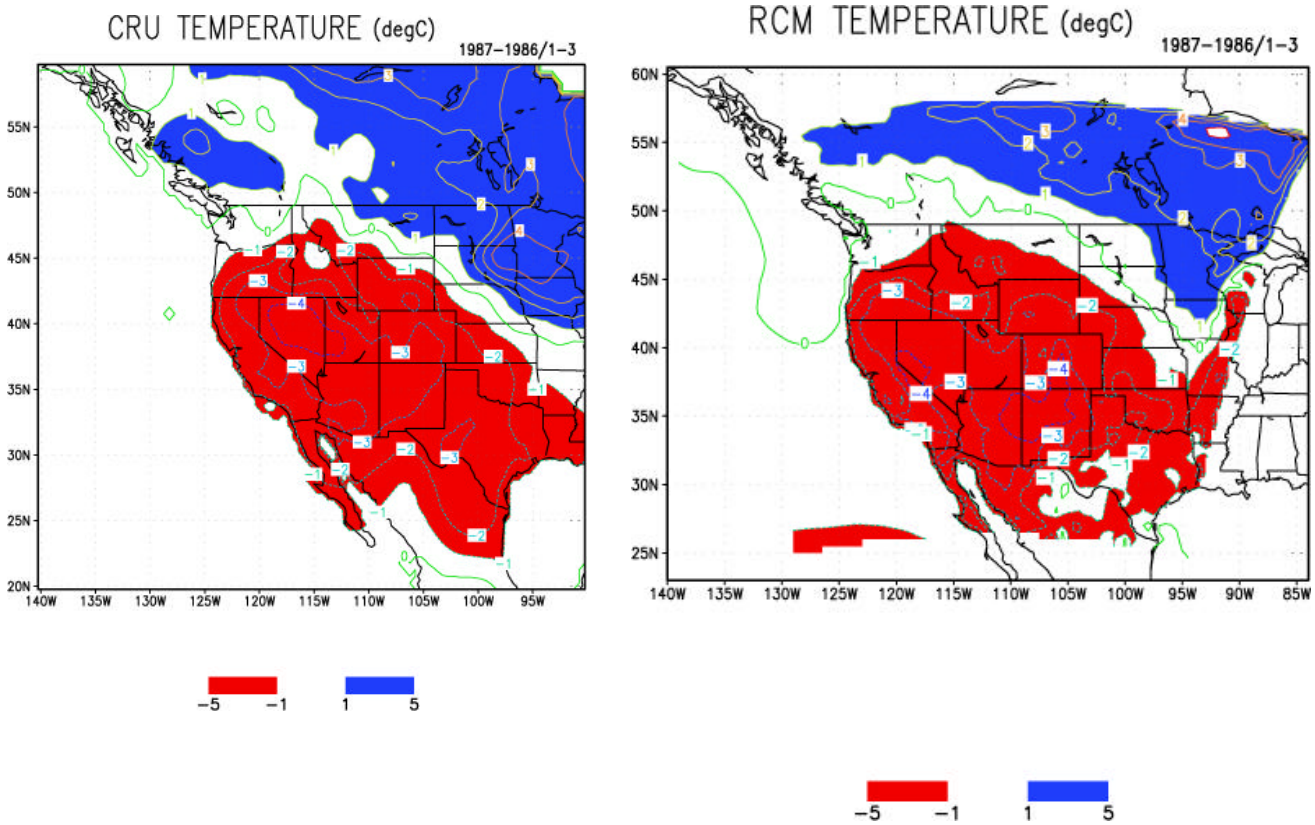

Figure 6. Observed and simulated winter time surface temperature anomaly (1987-1986).