# Soil-variable initialization in the GEFS: effect of GLDAS

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# Hypothesis

- Land-surface temperature forecasts can be improved by replacing the current GEFS soil state (which is merely a persistence of the background forecast(s)) with GLDAS soil state.
- GLDAS soil state has a 1-day latency, so we intend to test:
  - Init using 1-day old GLDAS state, and
  - Init using 1-day old GLDAS state + 24-h soil tendencies from GFS system

# Experimental setup

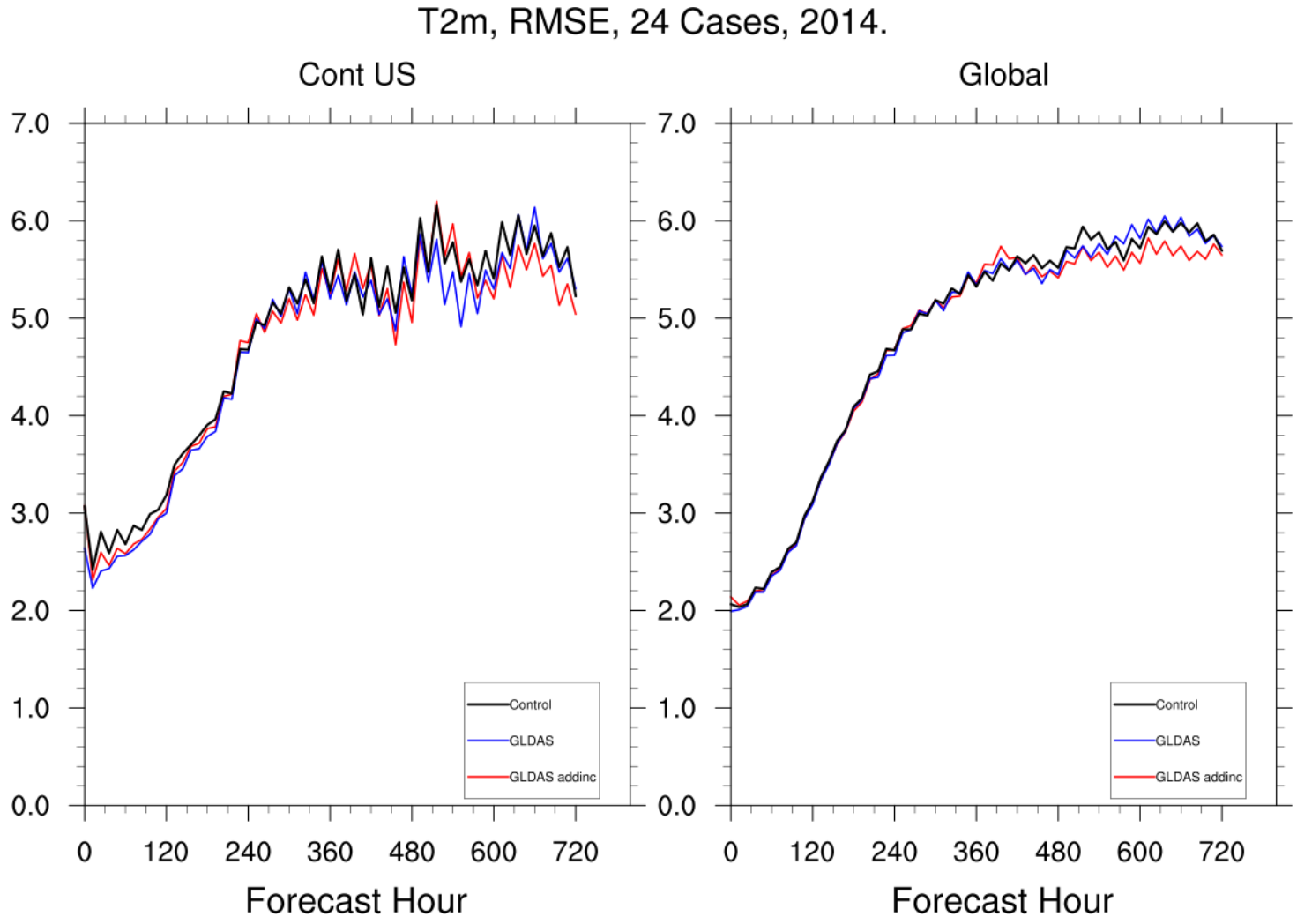
- GEFS T574
- One member control only
- 24 cases (start: 00 UTC of the 3rd and the 17th each month in 2014)
- forecasts to +30-day lead

- Experiments:
  - Control: soil variable “initialization” is persistence of GEFS forecast state from previous cycle
  - GLDAS: initialize soil moisture and temperature with GLDAS 1-day latency
  - GLDAS addinc: GLDAS + previous day’s 24 forecast soil moisture and temp tendencies

# RMSE compared to 'consensus' T2m analysis (average of ECMWF, Env Canada, NCEP, MetOffice)

Cont US:
30N-49N,
125W-75W.
Only land points

Note: the differences are not significant; need bigger sample size



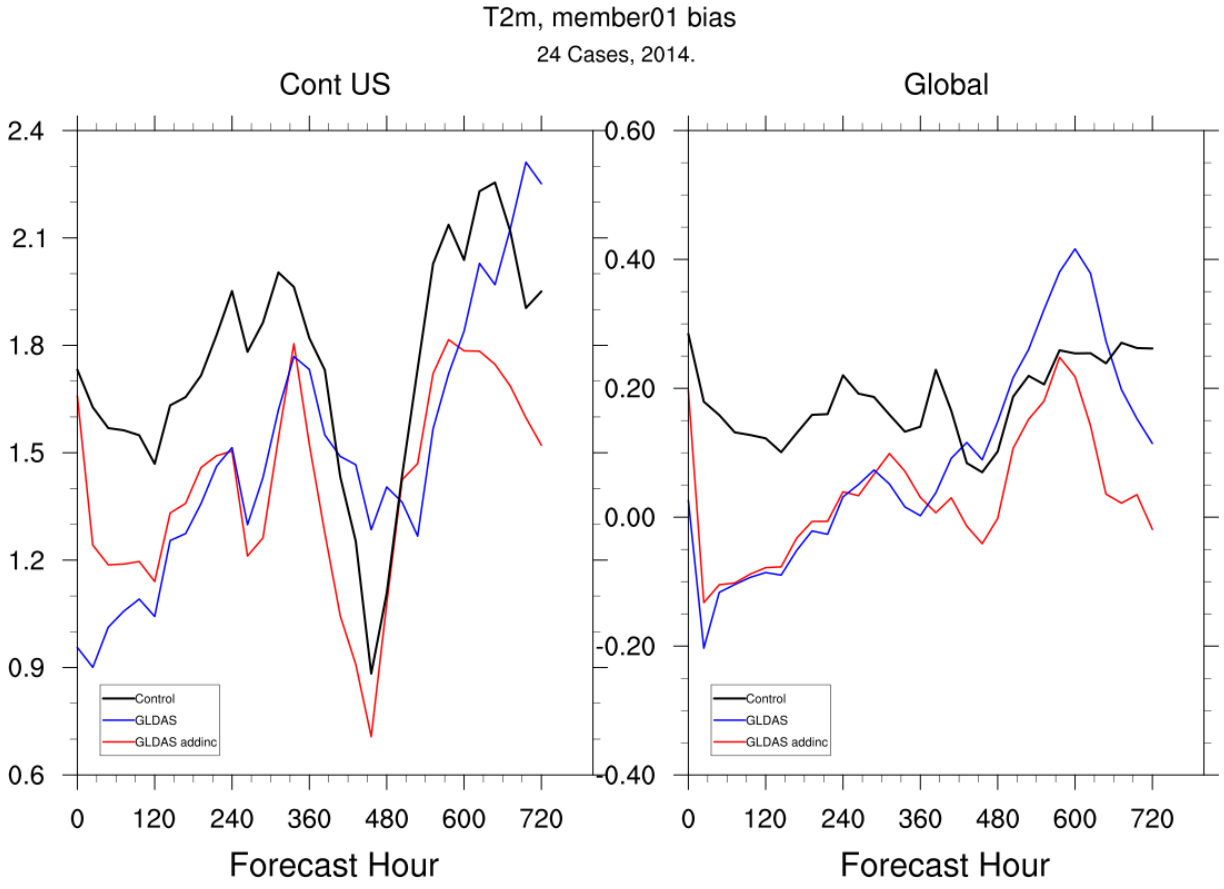

Consensus analysis over globe may still not be trustworthy in many areas that don't have extensive data, hence verification over CONUS at left.

Note small improvement in RMSE at shorter leads with GLDAS and GLDAS addinc.

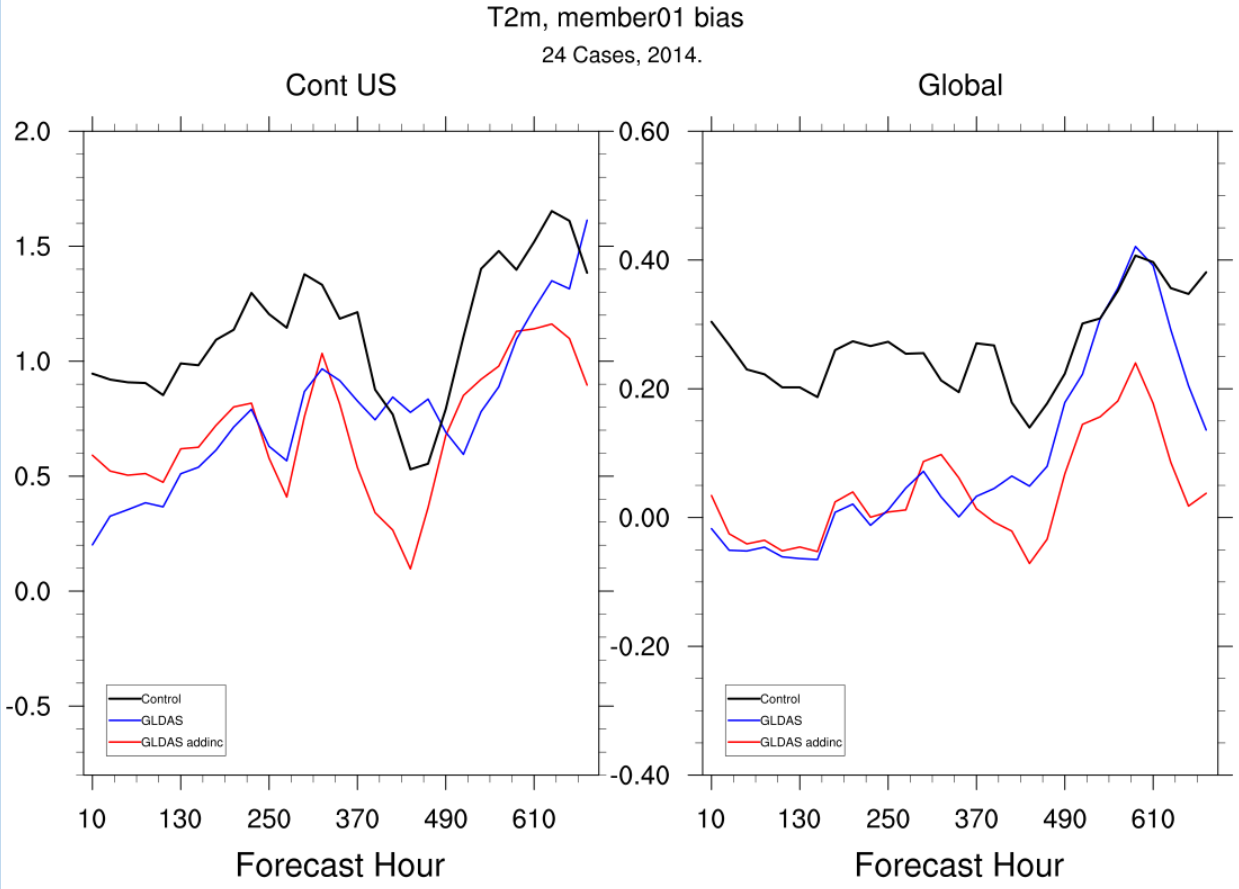
# Bias compared to 'consensus' T2m analysis (average of ECMWF, Env Canada, NCEP, Metoffice)

Note the substantial reduction in bias with GLDAS and GLDAS addinc. Forecasts split because of strong diurnal bias differences

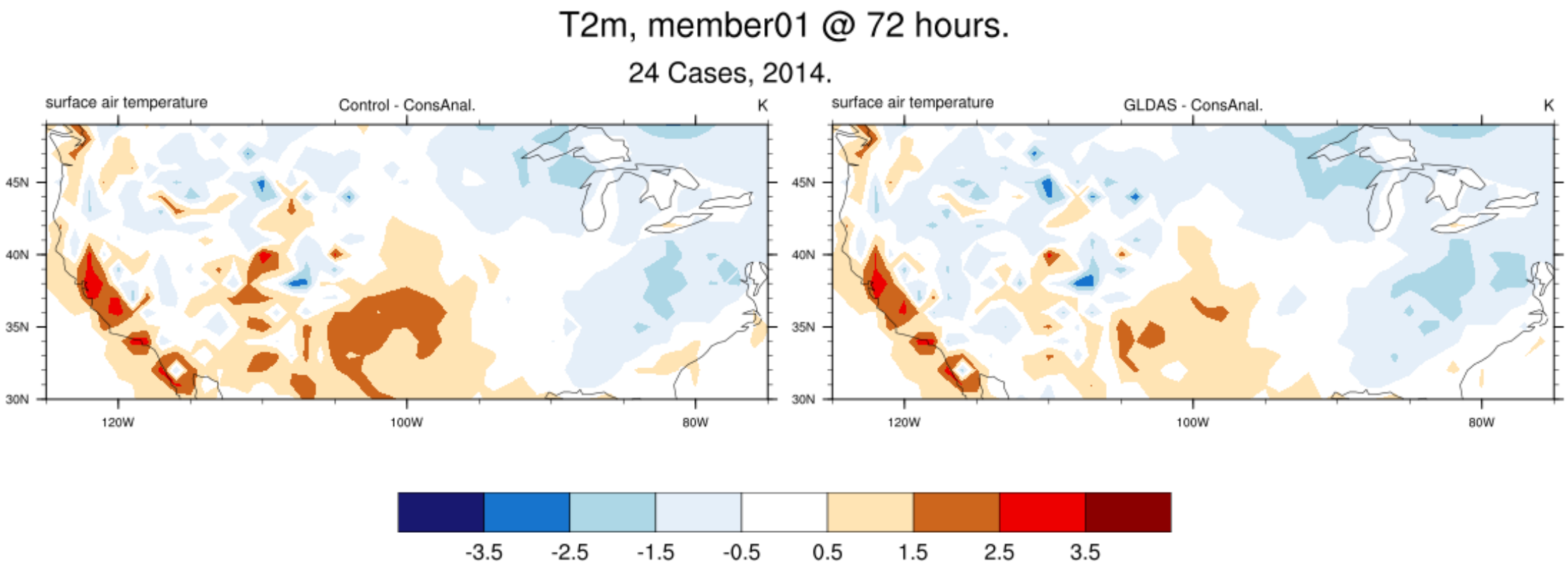
0, 24, 48, … ,720-hr forecast




12, 36, 60,…,708 hr forecast

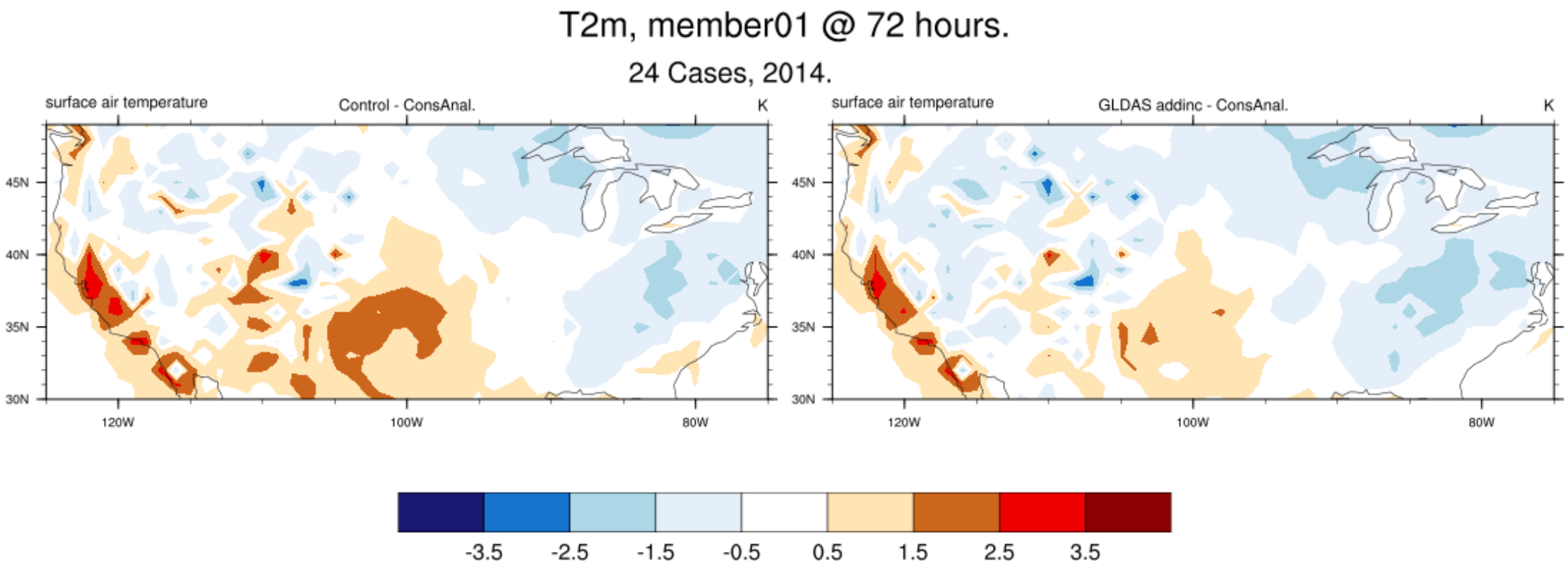


# Bias (control and GLDAS) compared to ‘consensus’ T2m analysis , 72hr forecast

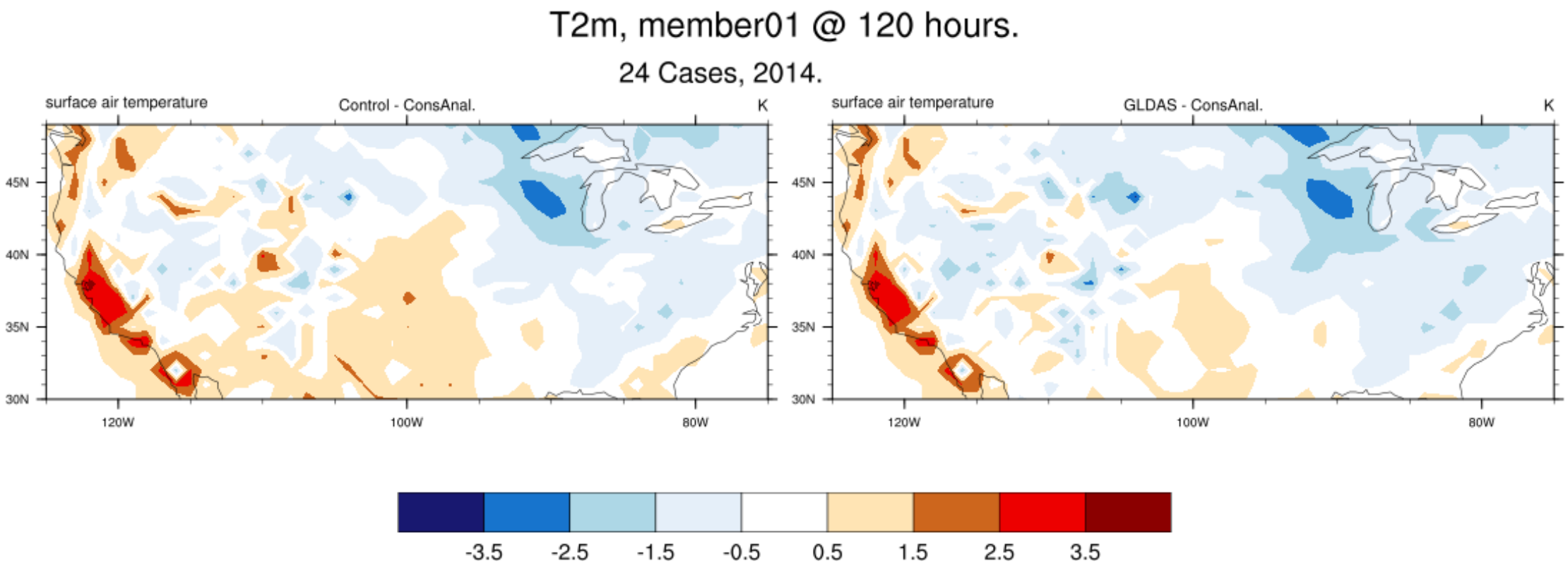



central US high-temperature bias reduced

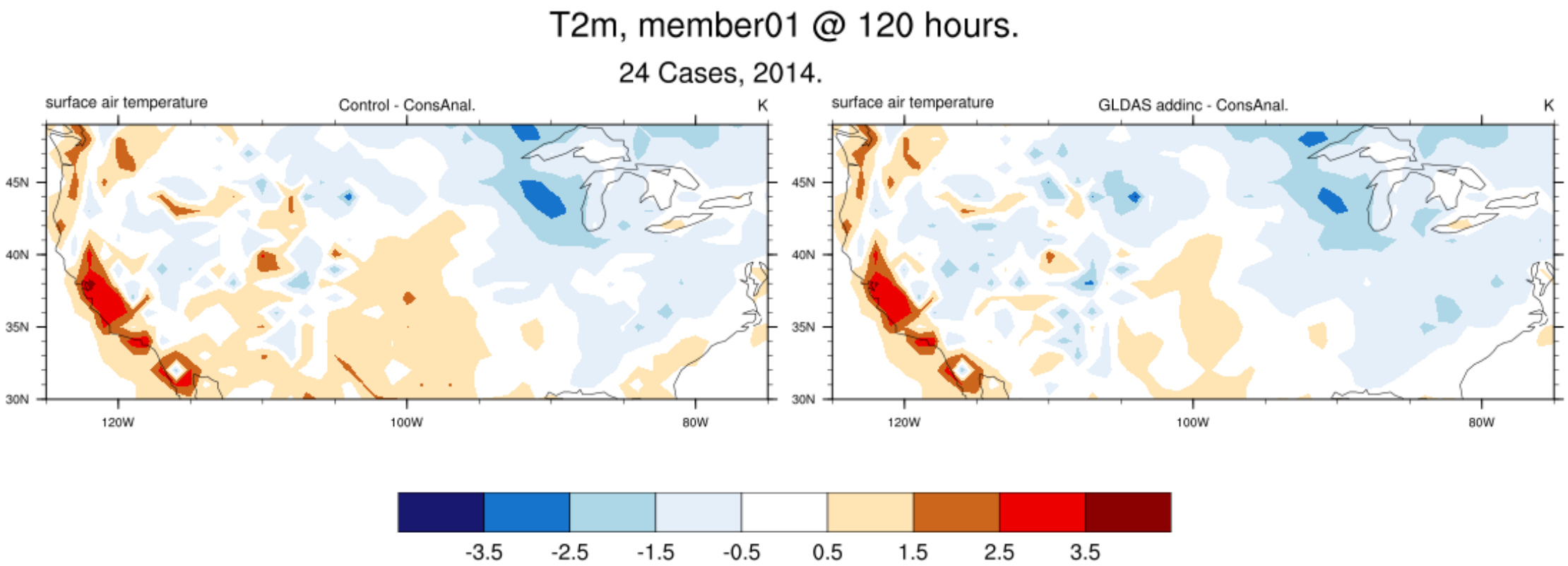
# Bias (control and GLDAS addinc) compared to ‘consensus’ T2m analysis, 72hr forecast



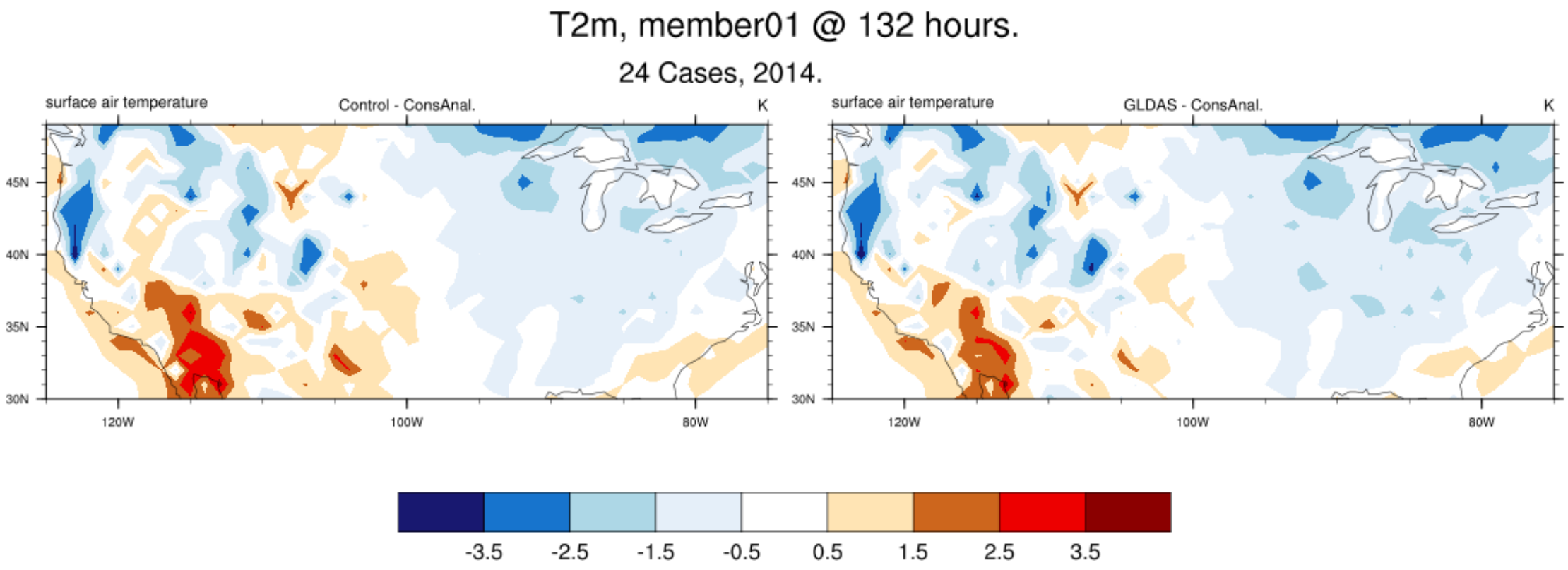
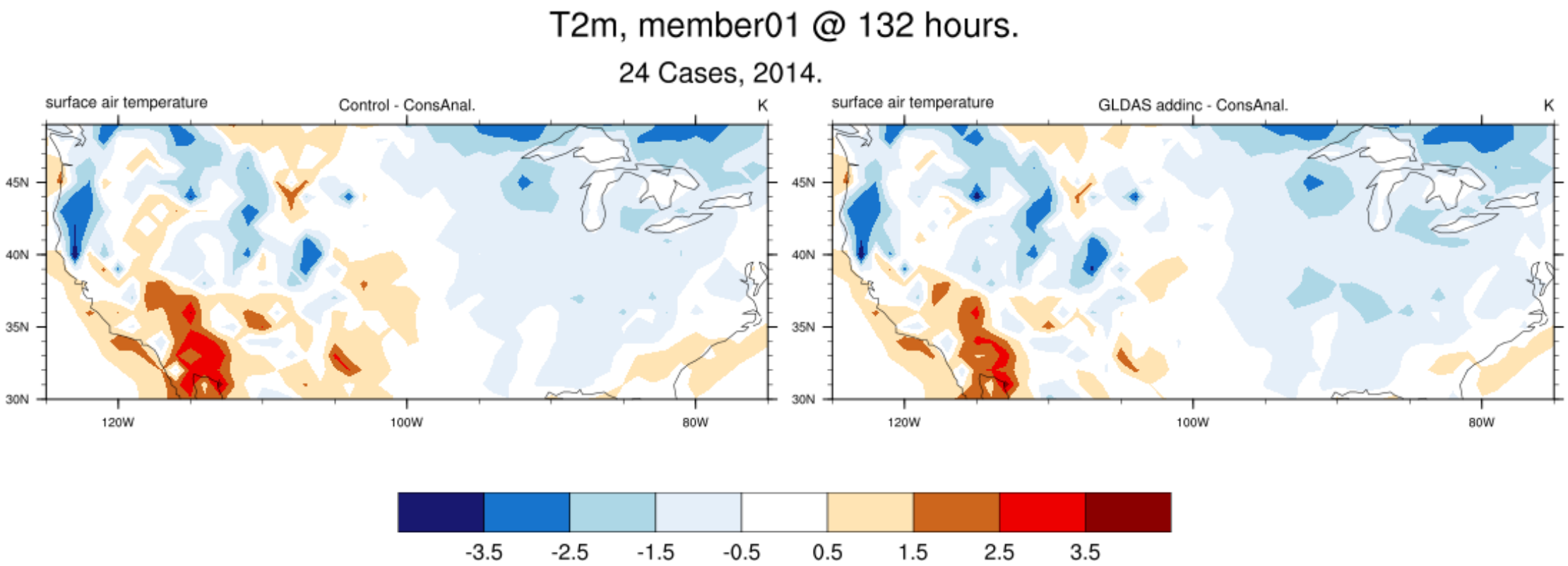
# Bias (control and GLDAS) compared to ‘consensus’ T2m analysis , 120hr forecast



# Bias (control and GLDAS addinc) compared to ‘consensus’ T2m analysis, 120hr forecast



# Bias (control and GLDAS) compared to ‘consensus’ T2m analysis , 132hr forecast



# Bias (control and GLDAS addinc) compared to ‘consensus’ T2m analysis, 132hr forecast