

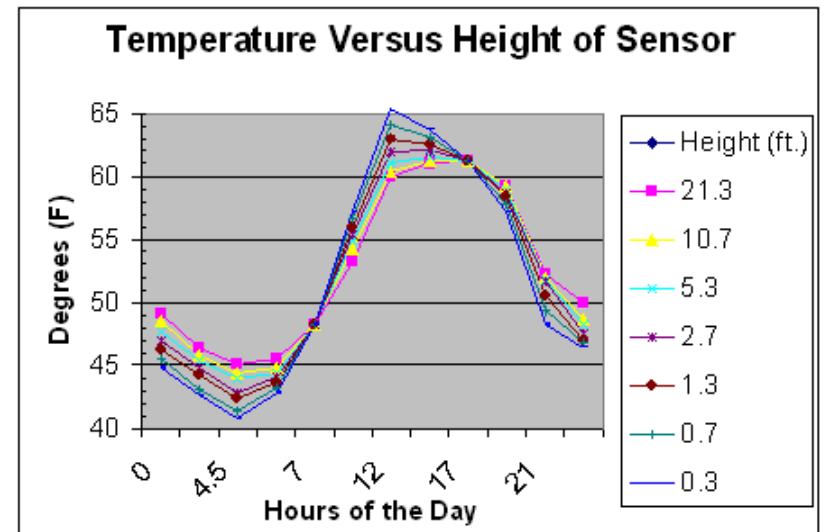


Validation of NLDAS-3 Tair product using in situ data

Susan Stillman

Introduction

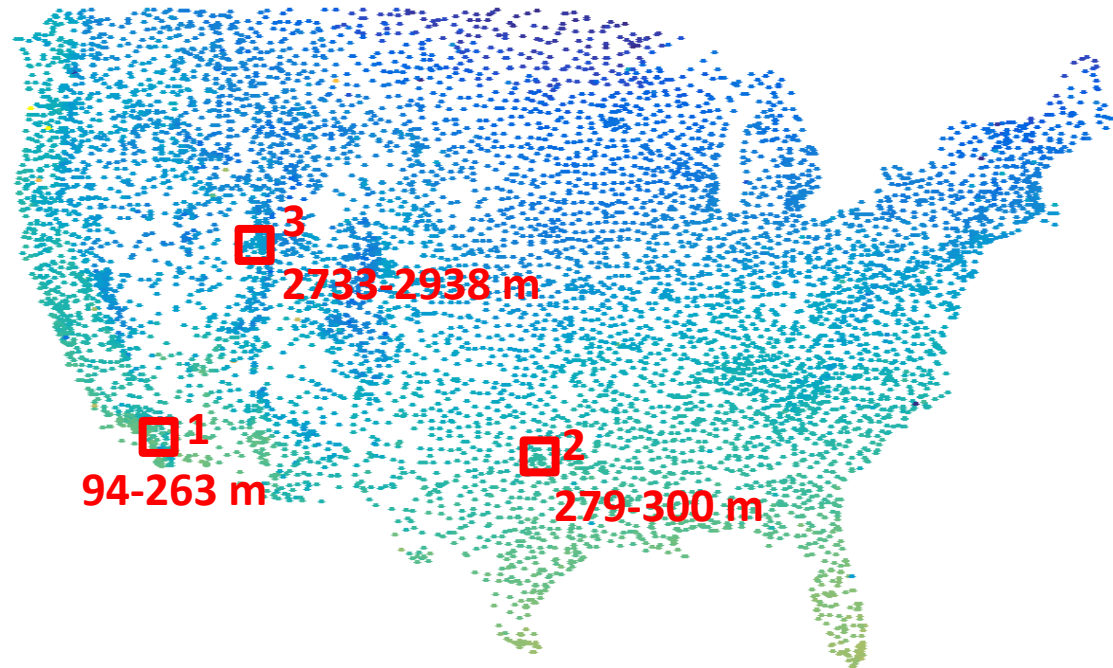
- How well does NLDAS-3 estimate near surface air temperature?
- Validation of NLDAS-3 temperature data using GHCN station data for one year (2005)
- NLDAS-3 near surface air temperature (M. Pan, Princeton)
 - Downscaled from 1/8-degree NLDAS-2
- Uncertainties in observations
 - Scaling from point to area
 - Sensor height above ground/topographic setting
- Therefore, we use in situ observations to evaluate:
 - Absolute temperature (**with caution**)
 - Spatial variability
 - Elevation adjustment



http://www.nws.noaa.gov/om/csd/pds/PCU6/IC6_2/tutorial1/Factors_exposure.htm

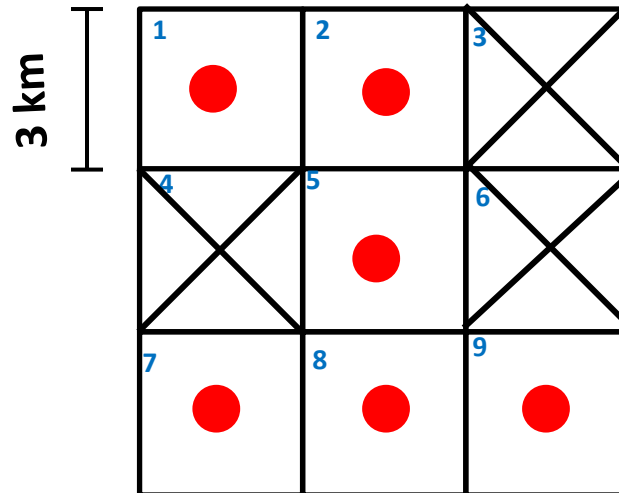
Data

- NLDAS-3 three km hourly temperature data
- GHCN station daily Tmax and Tmin
- 3 regions with sufficient station data
 - 2 mountainous regions, 1 flat region
 - Each region consists of 3X3 3km grid boxes
 - At least 4 grid boxes must have at least 1 station



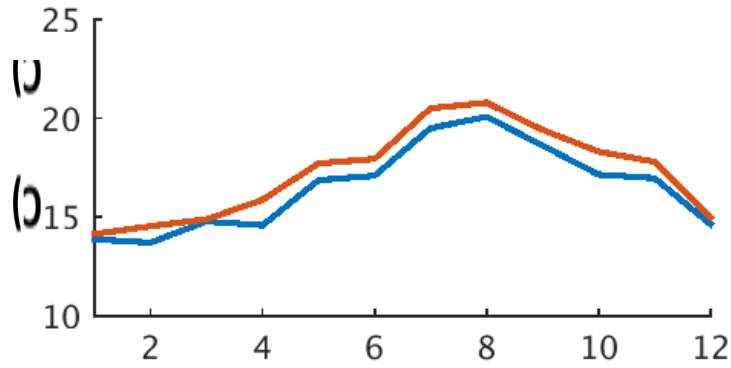
Method

- Only include grid boxes with station data
- $T_{av} = (T_{max} + T_{min}) / 2$
- Grid boxes with more than one station
 $T_{av} = T_{av_1} + T_{av_2} + \dots$
- Usually only one station per grid box



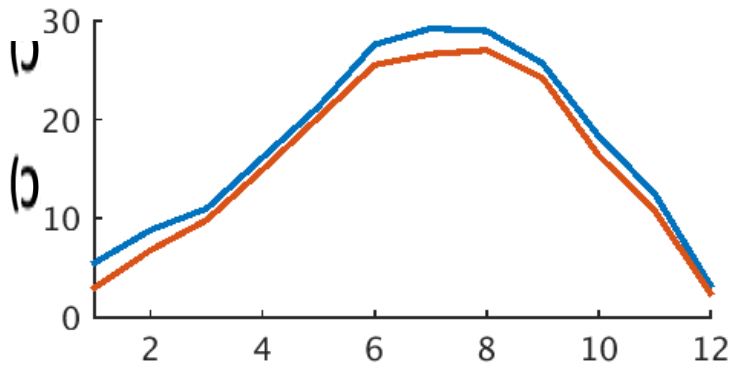
Monthly Temperature

Region 1

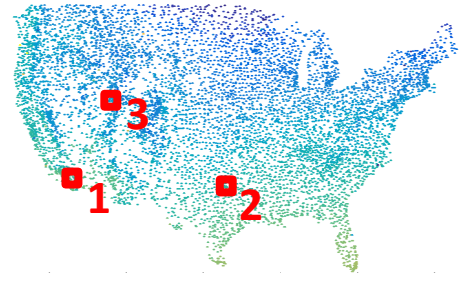
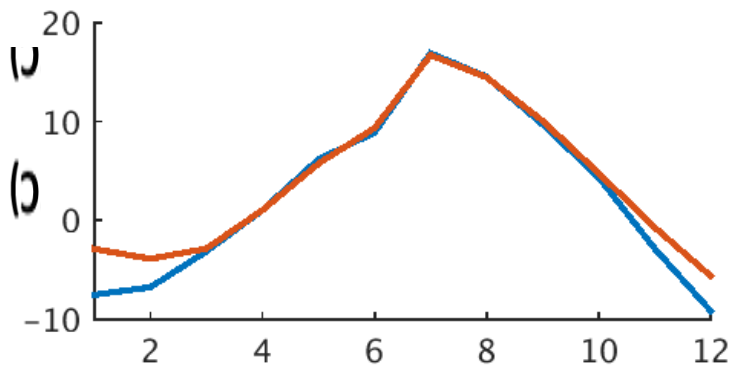


NLDAS
GHCN

Region 2



Region 3

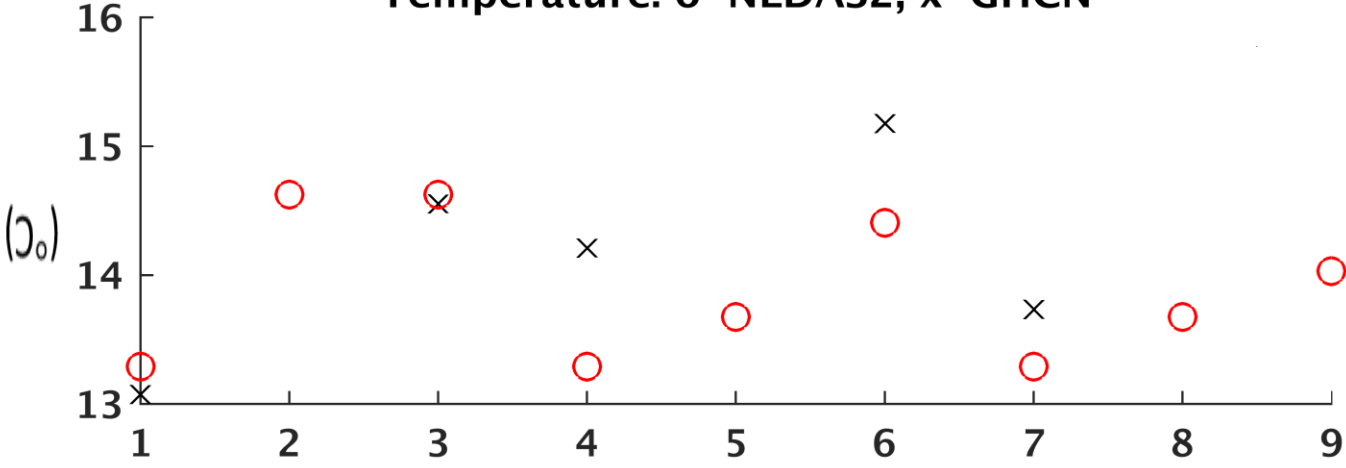


Monthly Temperature



Jan 2005

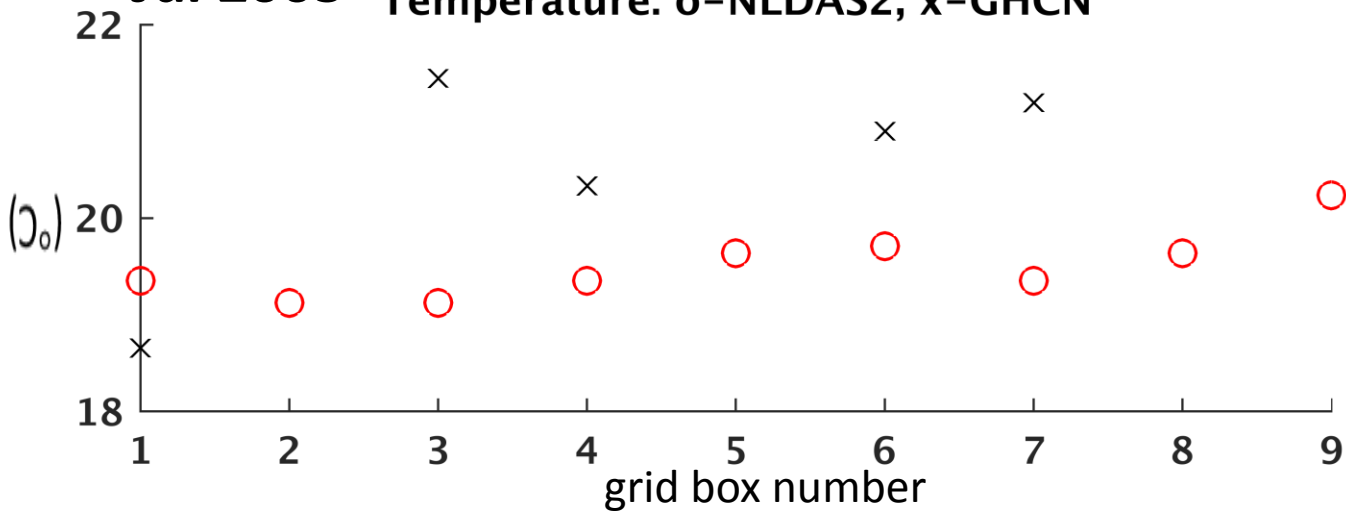
Temperature: o-NLDAS2, x-GHCN



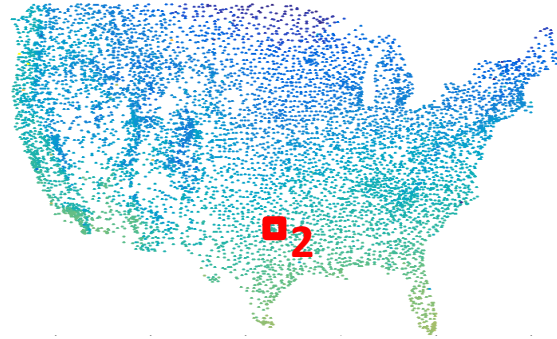
○ NLDAS3
× GHCN

Jul 2005

Temperature: o-NLDAS2, x-GHCN

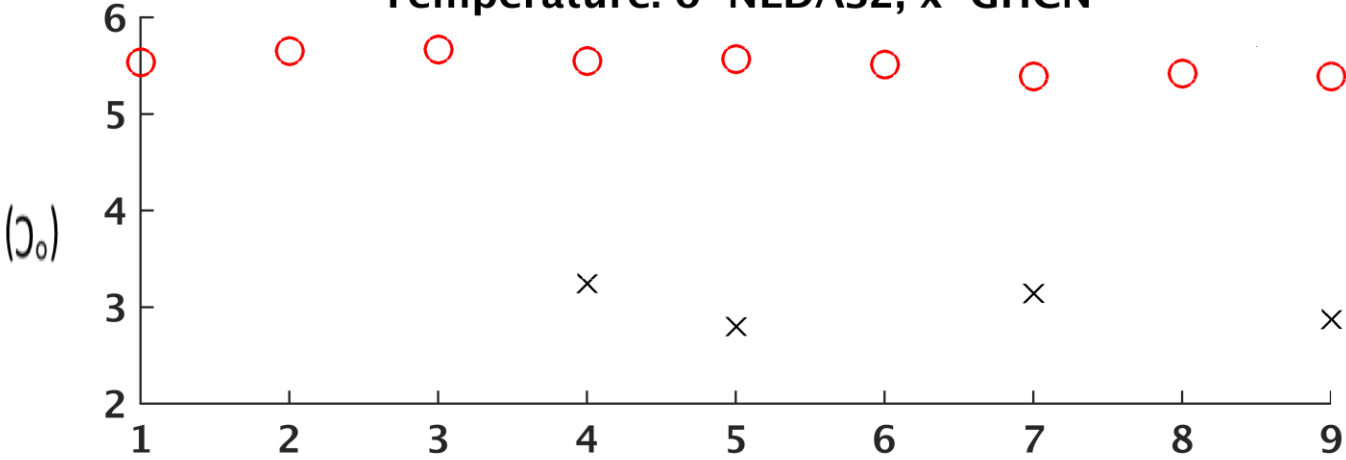


Monthly Temperature



Jan 2005

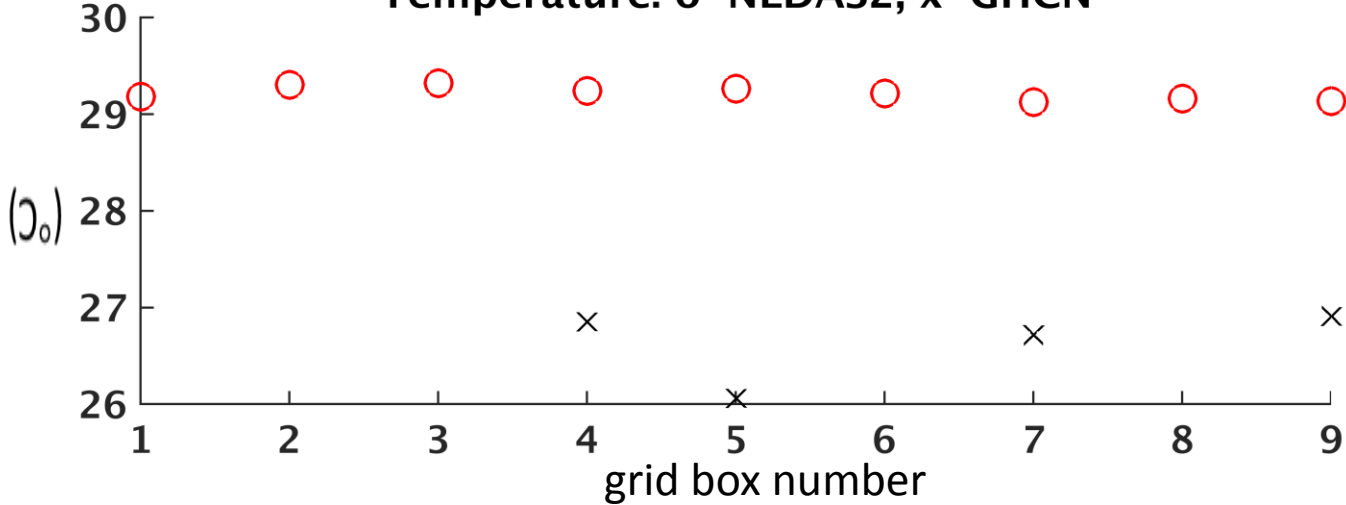
Temperature: o-NLDAS2, x-GHCN



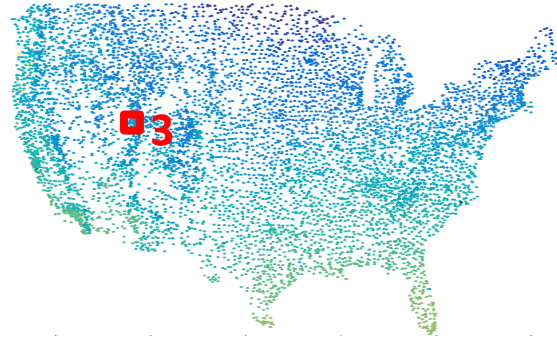
○ NLDAS3
× GHCN

Jul 2005

Temperature: o-NLDAS2, x-GHCN

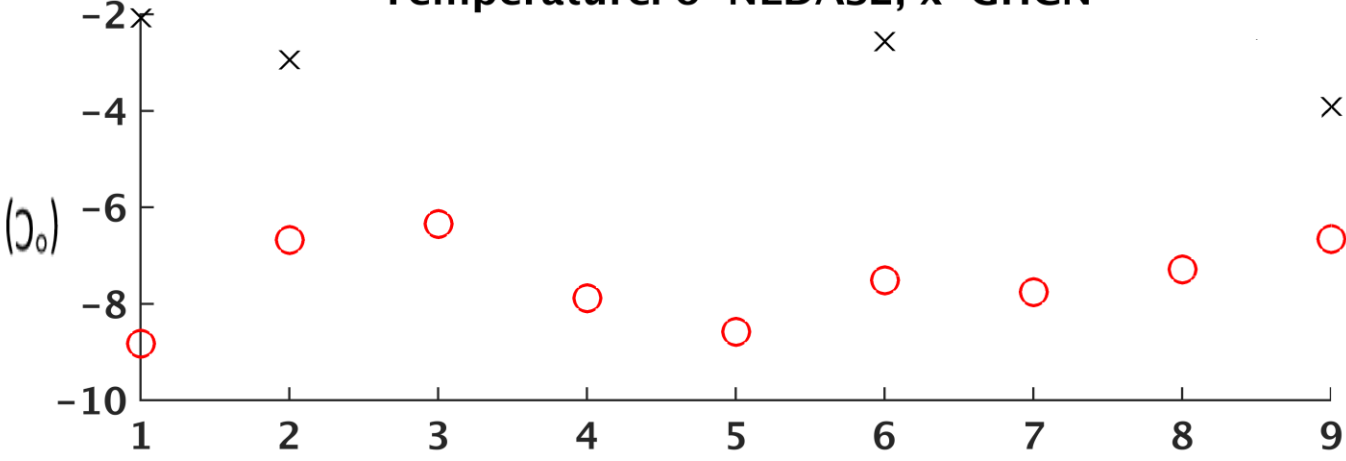


Monthly Temperature



Jan 2005

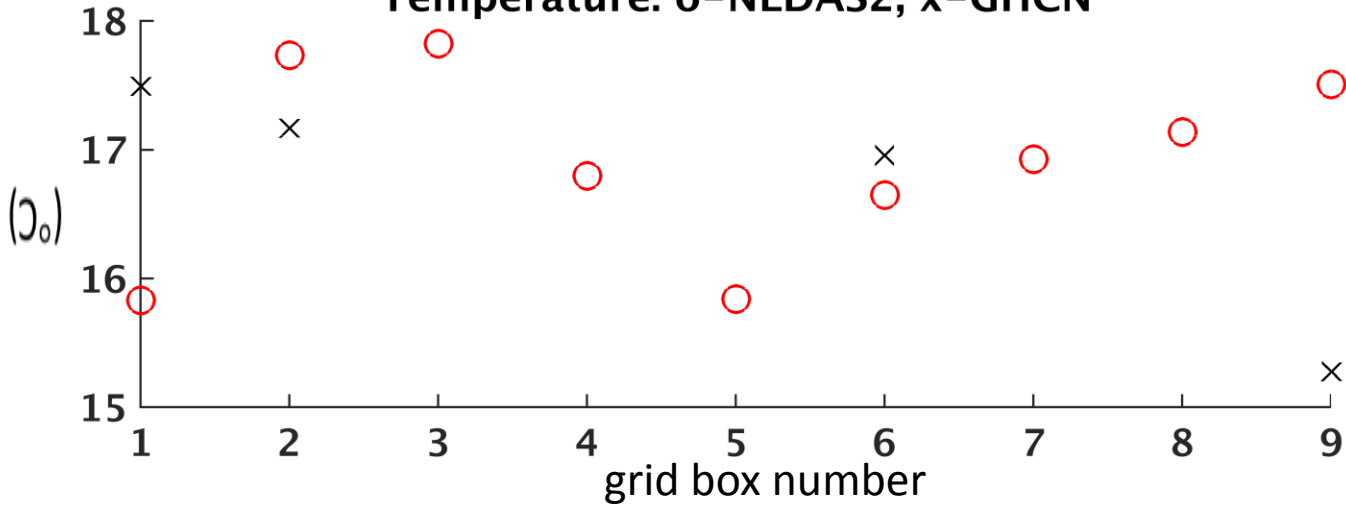
Temperature: o-NLDAS2, x-GHCN



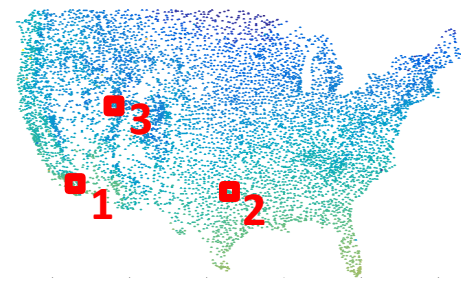
○ NLDAS3
× GHCN

Jul 2005

Temperature: o-NLDAS2, x-GHCN

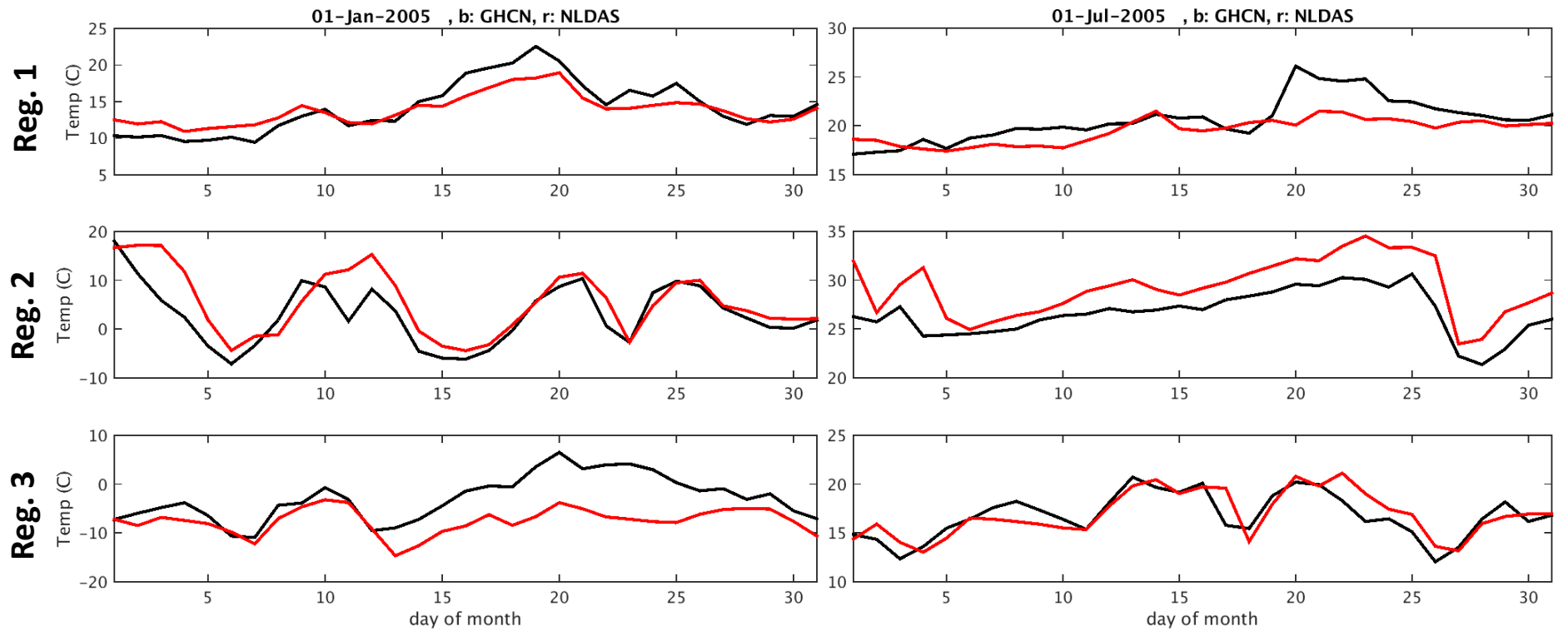


Daily Temperature



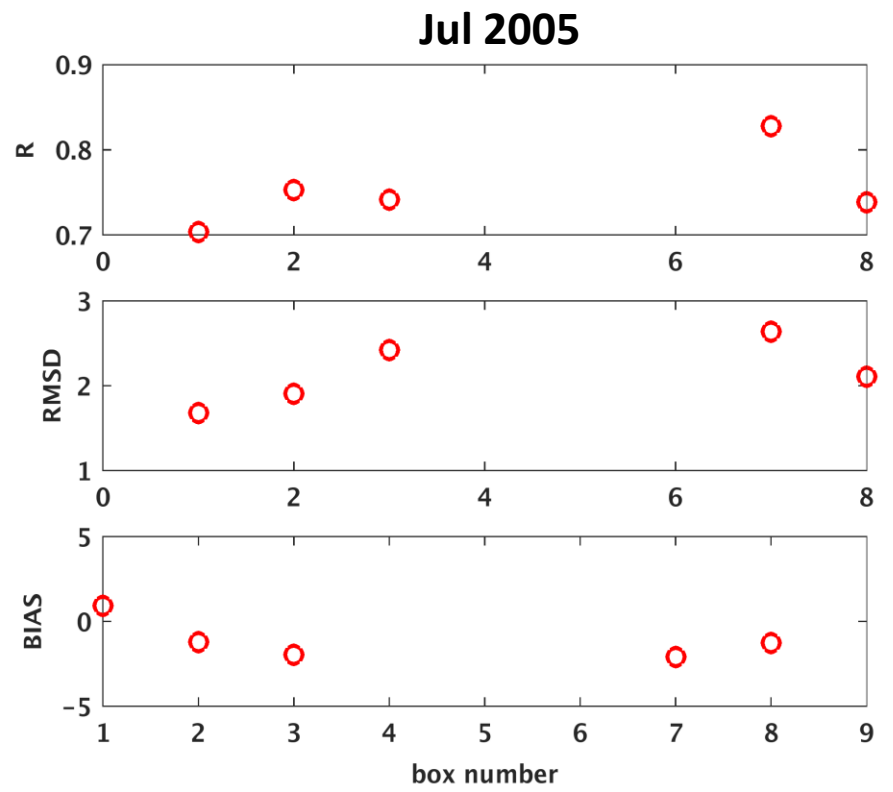
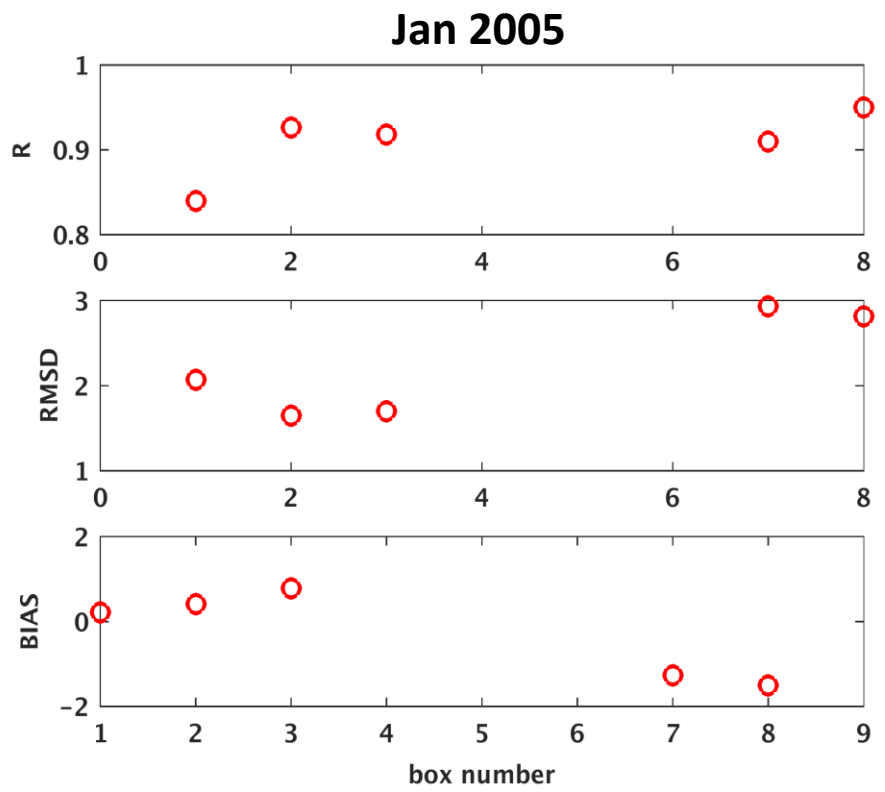
Jan 2005

Jul 2005

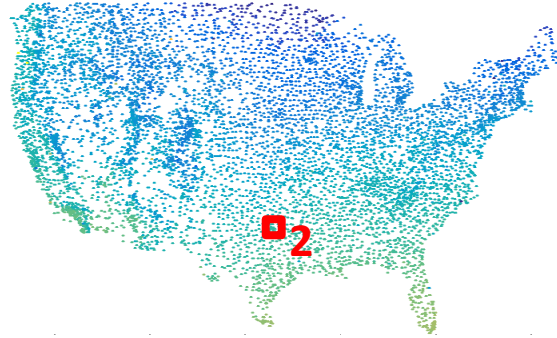
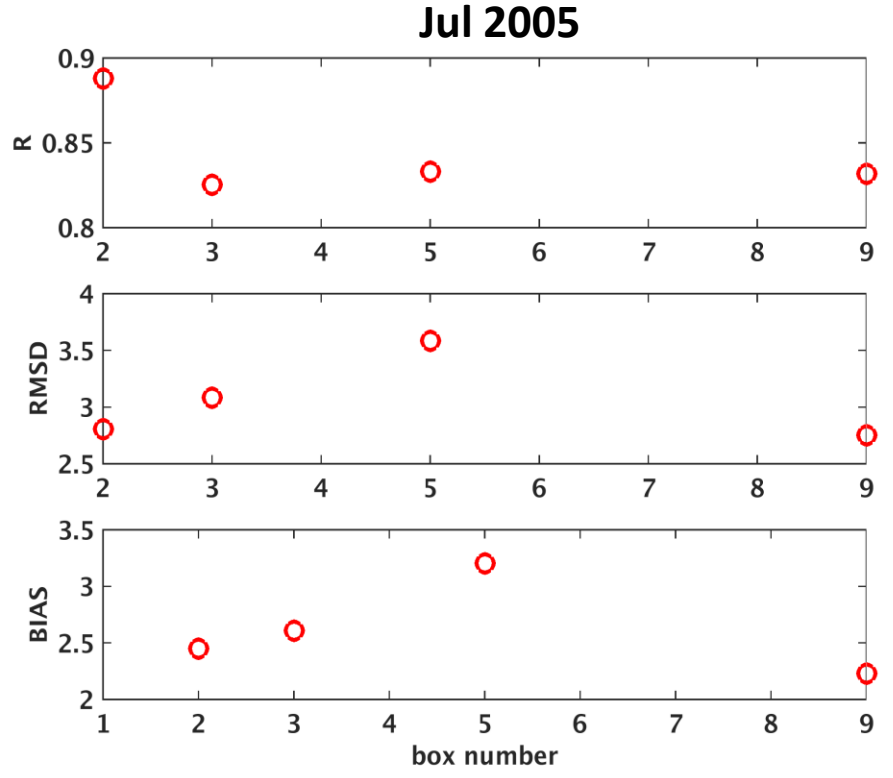
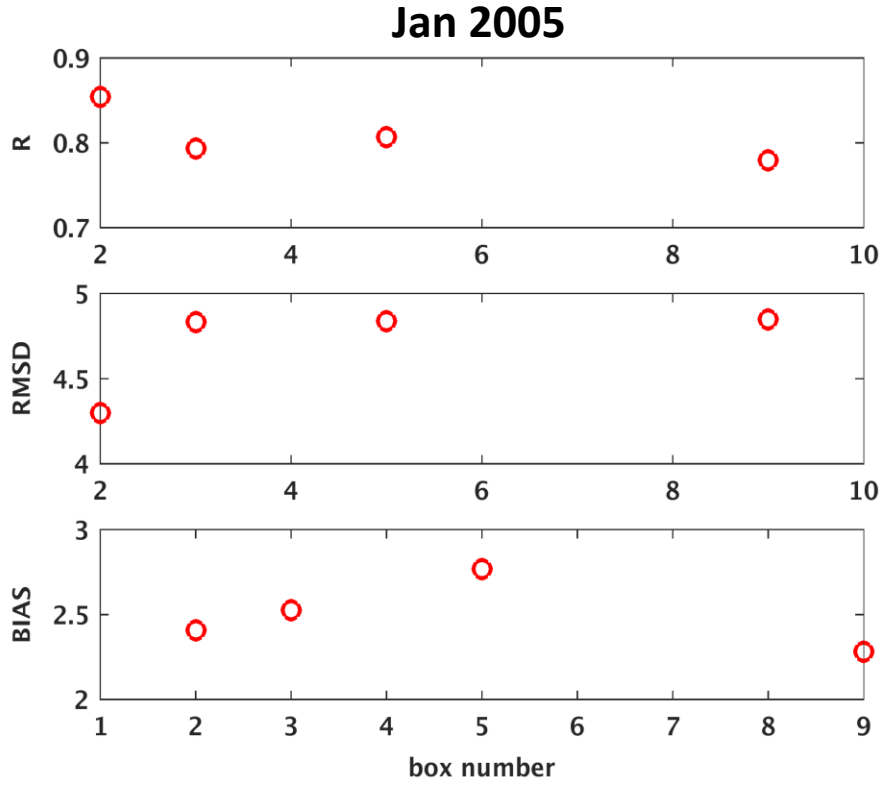


— NLDAS **— GHCN**

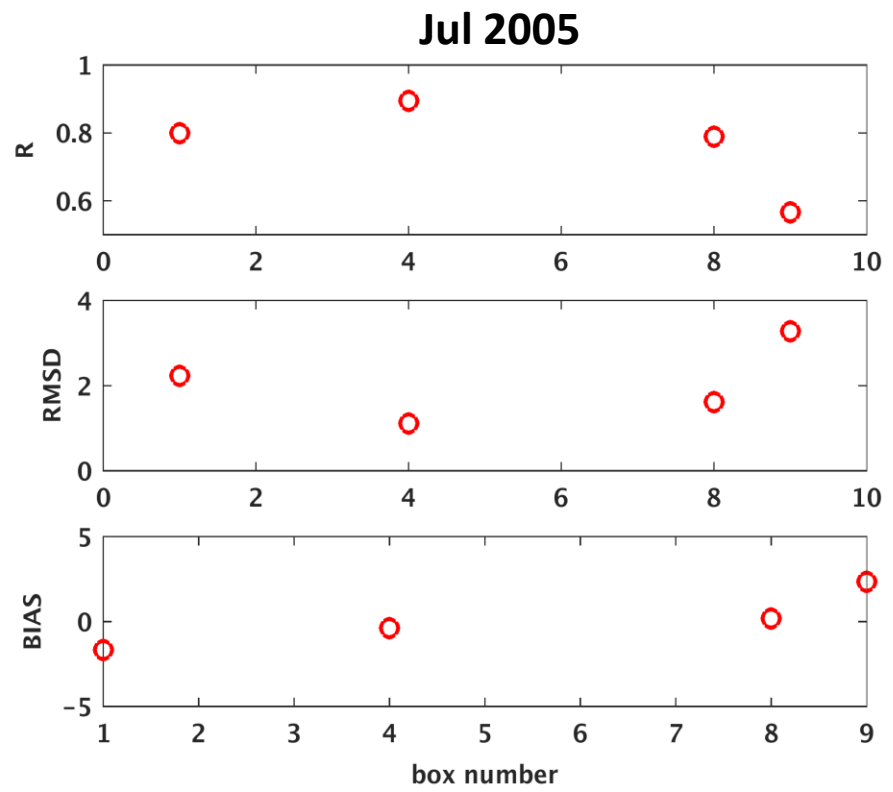
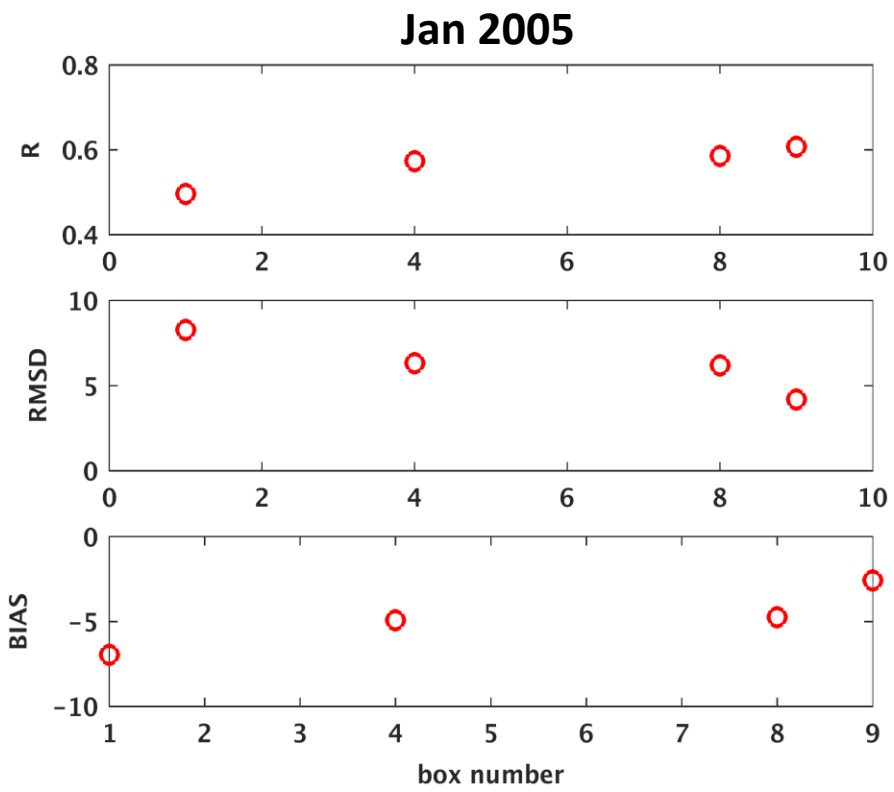
Daily Temperature



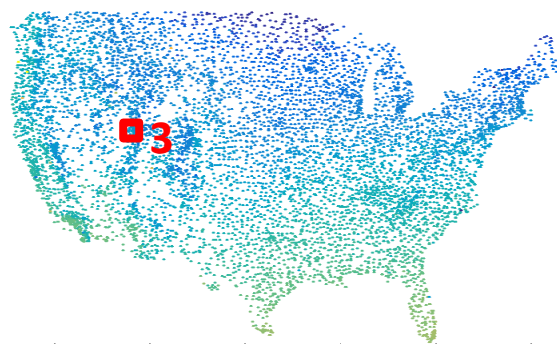
Daily Temperature



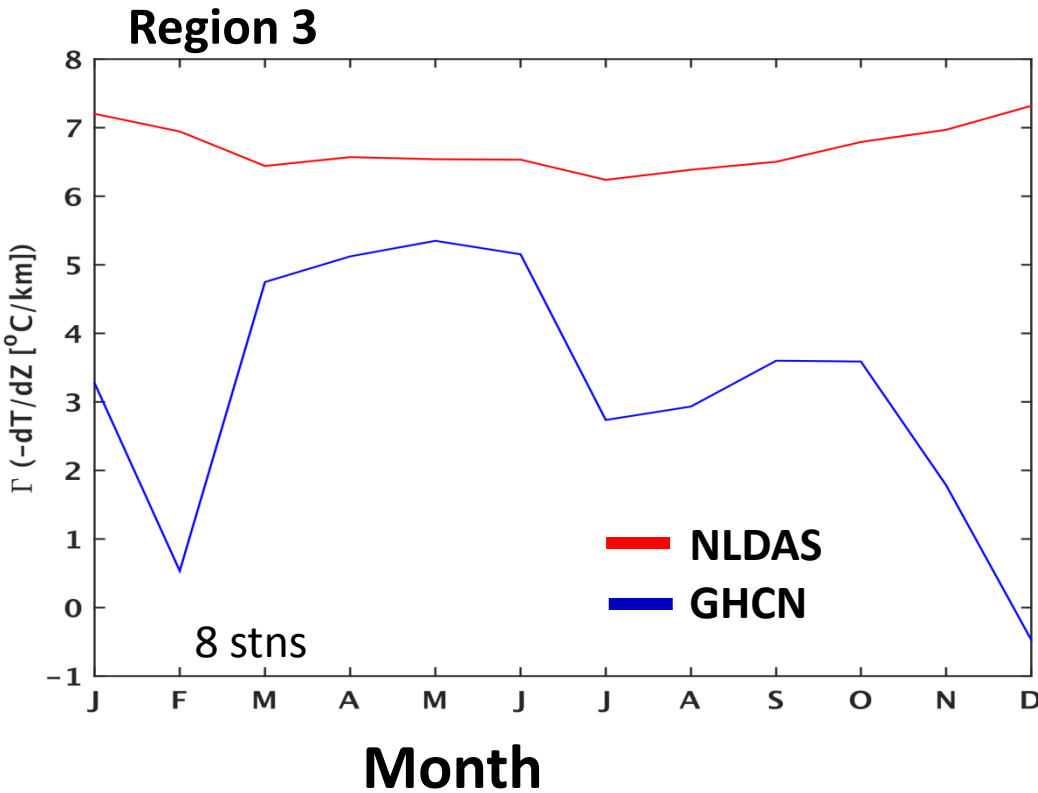
Daily Temperature



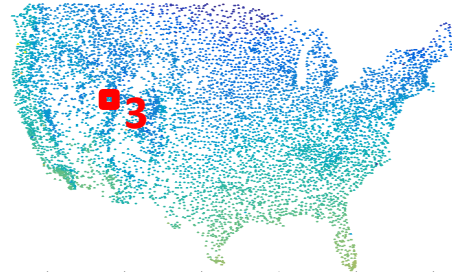
- **NLDAS-3 temperature performs worst over rocky mountains during the winter. Possible problem with snow(?)**



Lapse Rate



- Lapse rate of monthly average temperature
- Slope from linear regression
- 5X5 three kilometer grid boxes
- NLDAS-3 Z from GTOPO30 (may change in future)
- GHCN Z = station elevation



Conclusions

- NLDAS temperature estimation may suffer significant bias in the rocky mountains during the winter.
- Temperature biases across the mountainous regions may be related to elevation difference between points and pixels
- NLDAS-3 overestimates lapse rate in rocky mountains