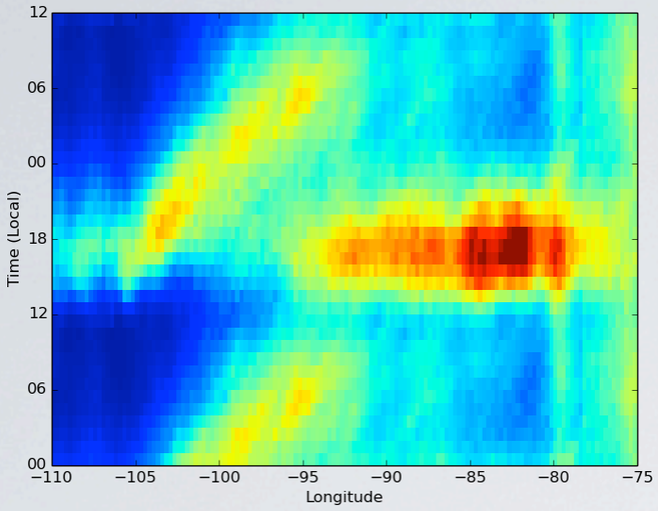
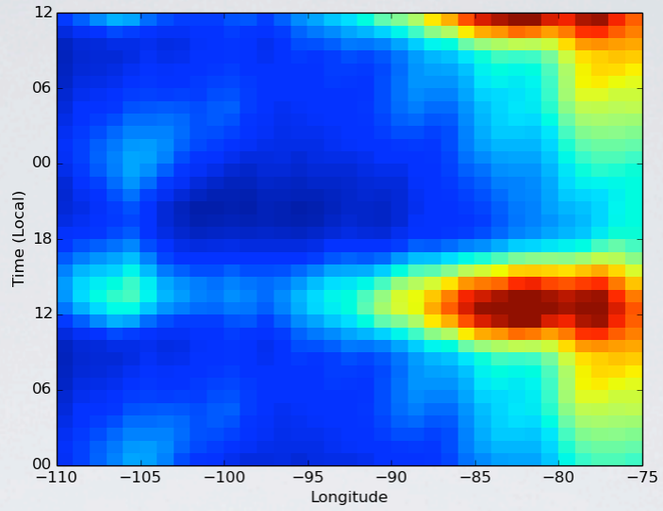
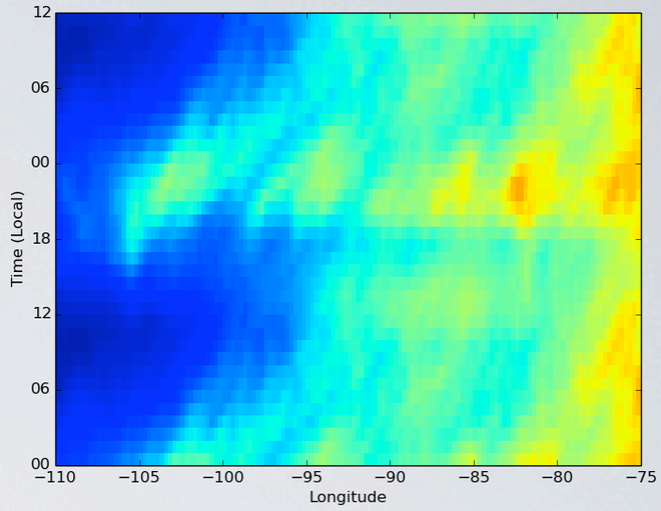






Great Plains Warm-season Precipitation in a Two-way Nested High-resolution GCM

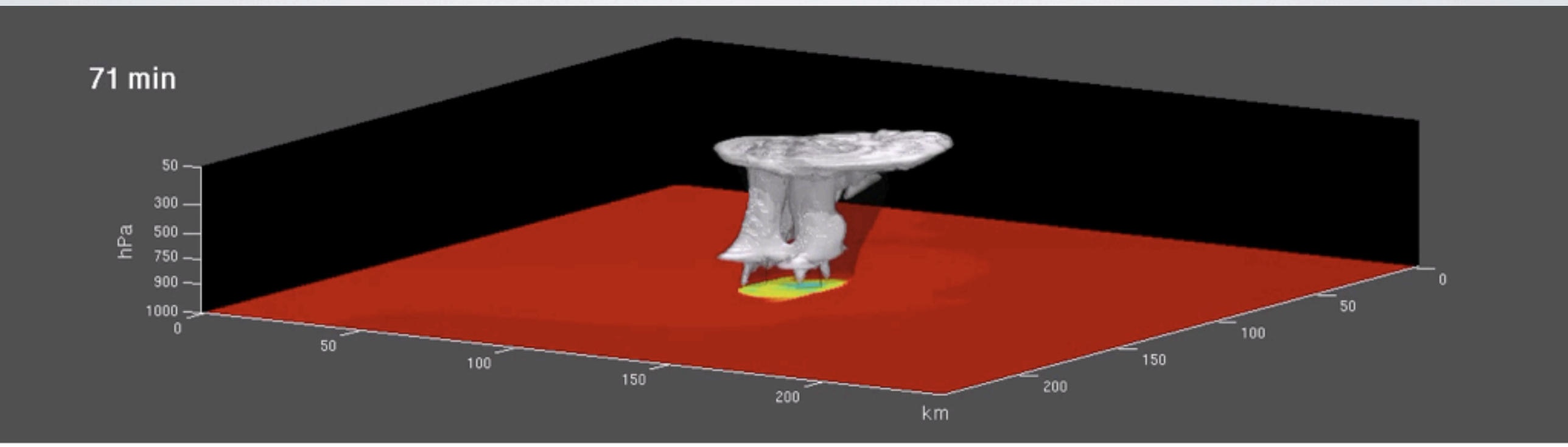
Lucas Harris
with Shian-Jiann Lin and Jan-Huey Chen
NOAA/Geophysical Fluid Dynamics Laboratory

2014 EGU General Assembly
29 April 2014, Vienna, Austria

A message from our sponsor

M. Toy splitting supercell test case

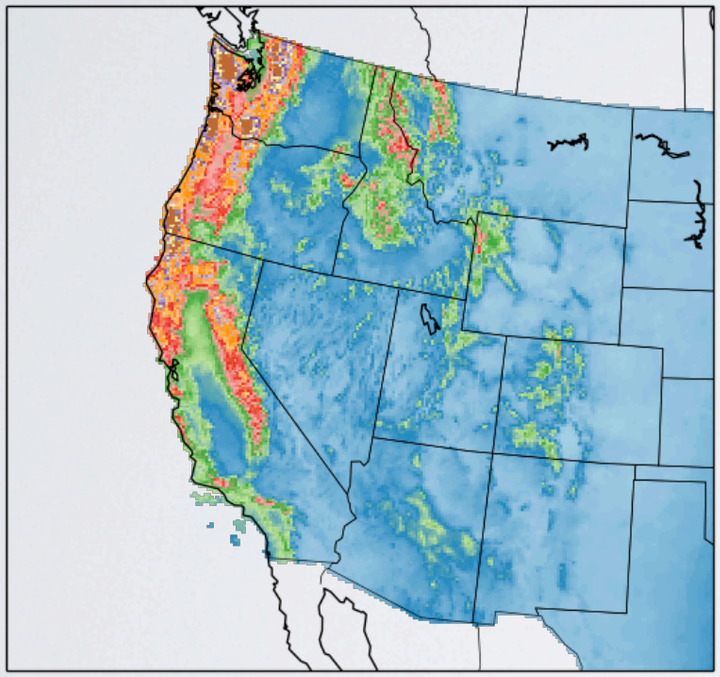
- Nonhydrostatic core
- 1 km: c512 stretched by 20 (global model!!)
- Solo core with warm-rain microphysics

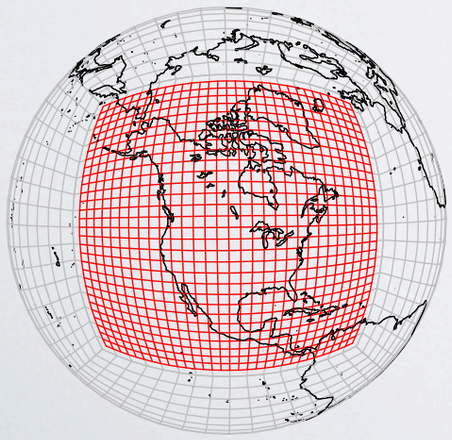


http://www.gfdl.noaa.gov/visualizations-mesoscale-dynamics

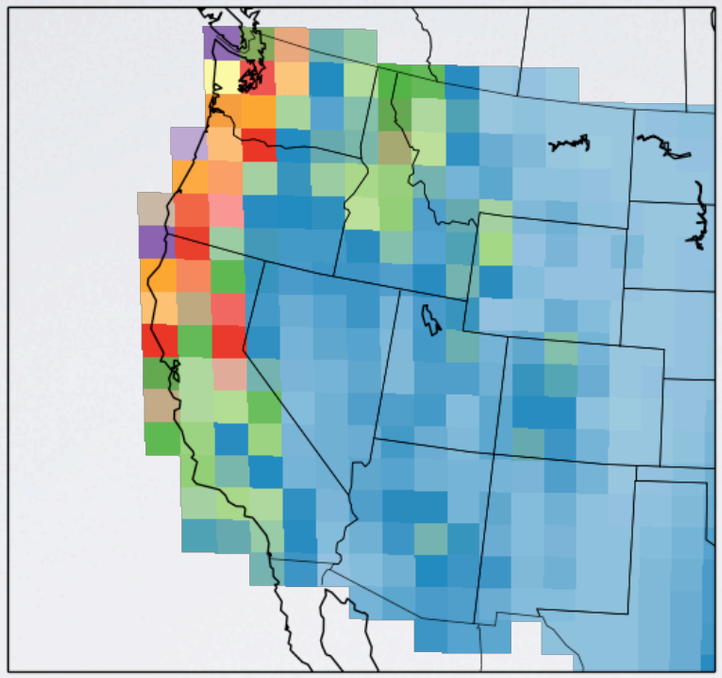
WESTERN US DJF PRECIPITATION

PRISM Observations

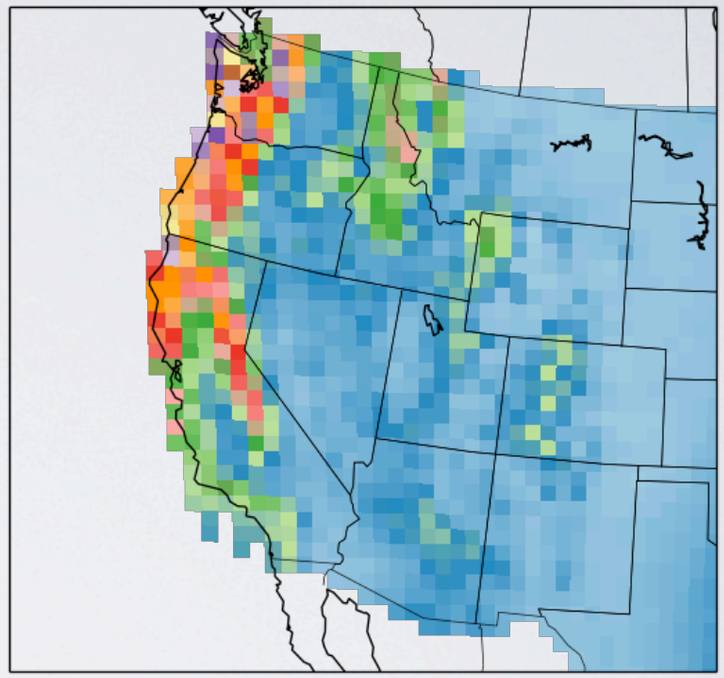




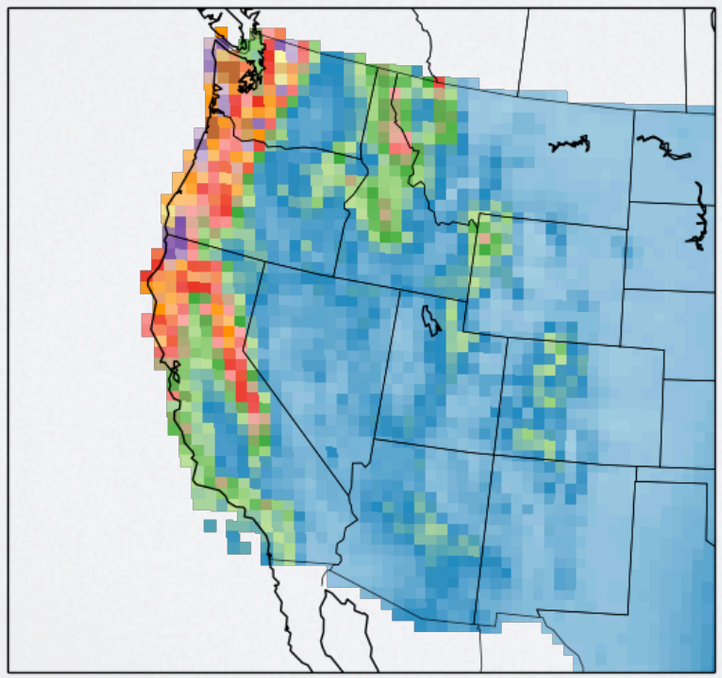
c90 (110 km) single-grid



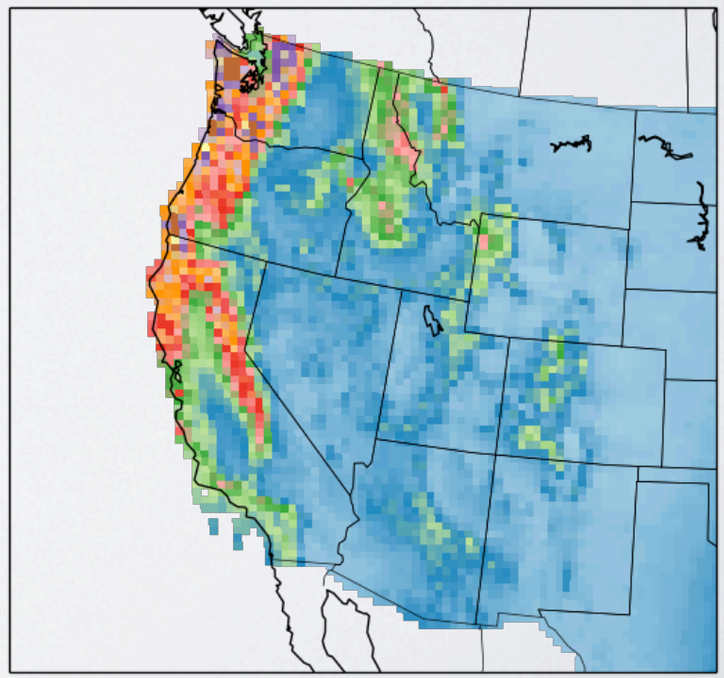
c192 (50 km) single-grid

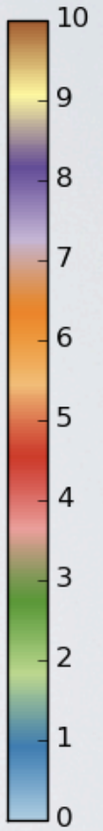


c90n3 (40 km) nest



c192n2 (25 km) nest





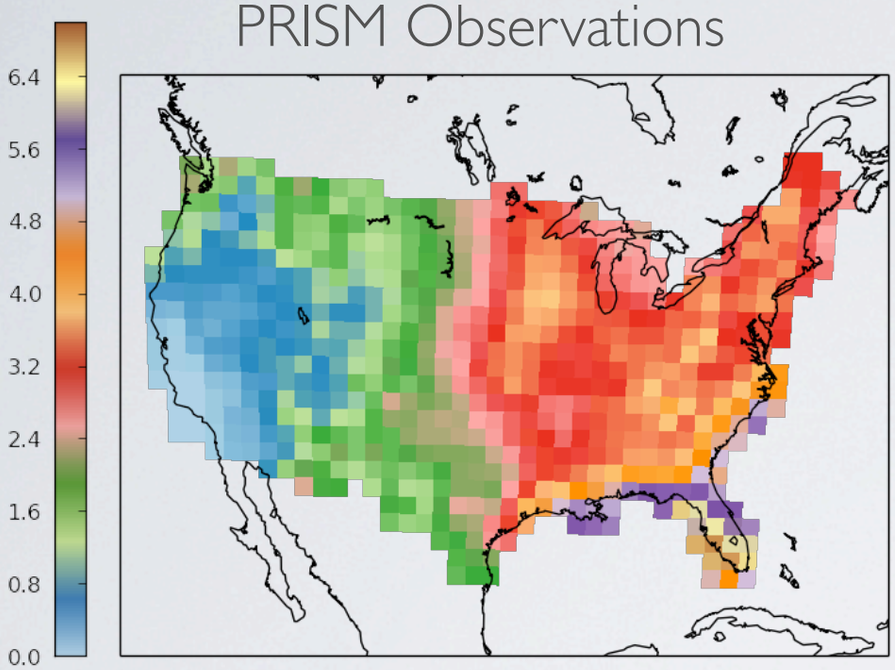
mm/d

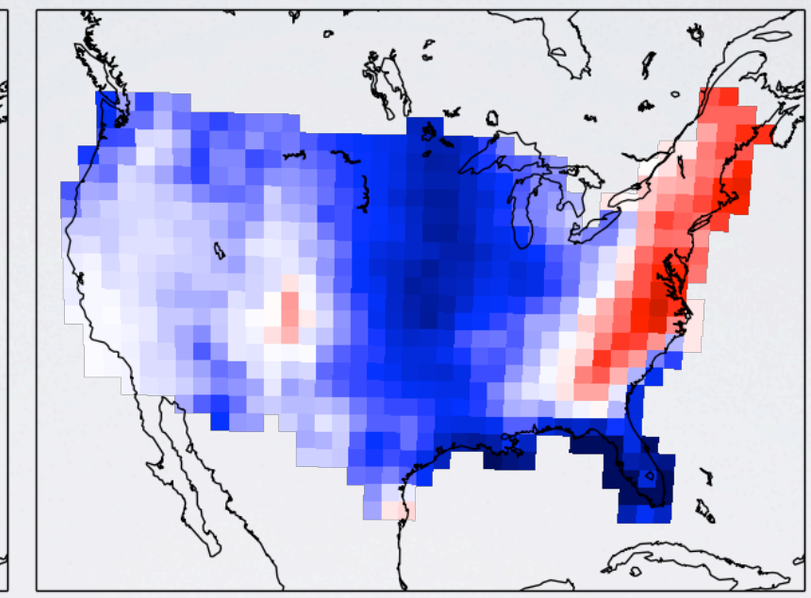
JJA PRECIPITATION

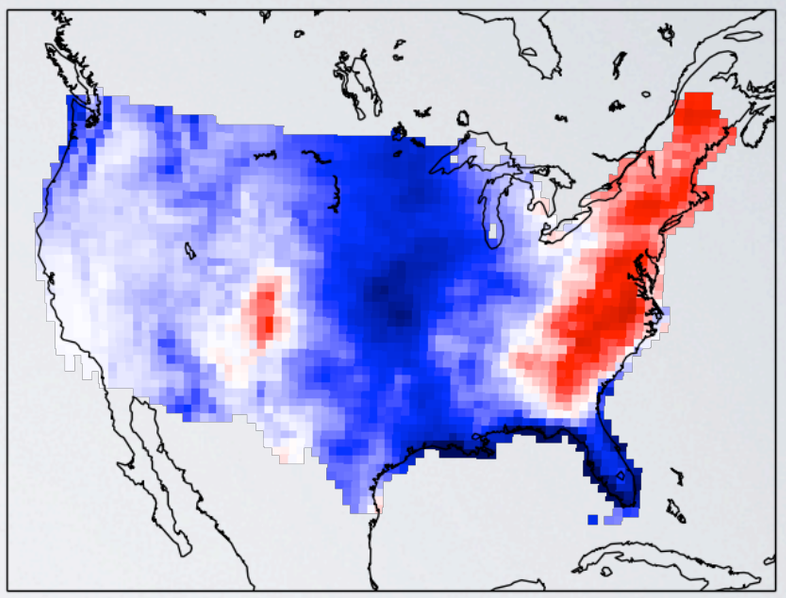
PRISM Observations

c90 (110 km) single-grid

c192 (50 km) single-grid



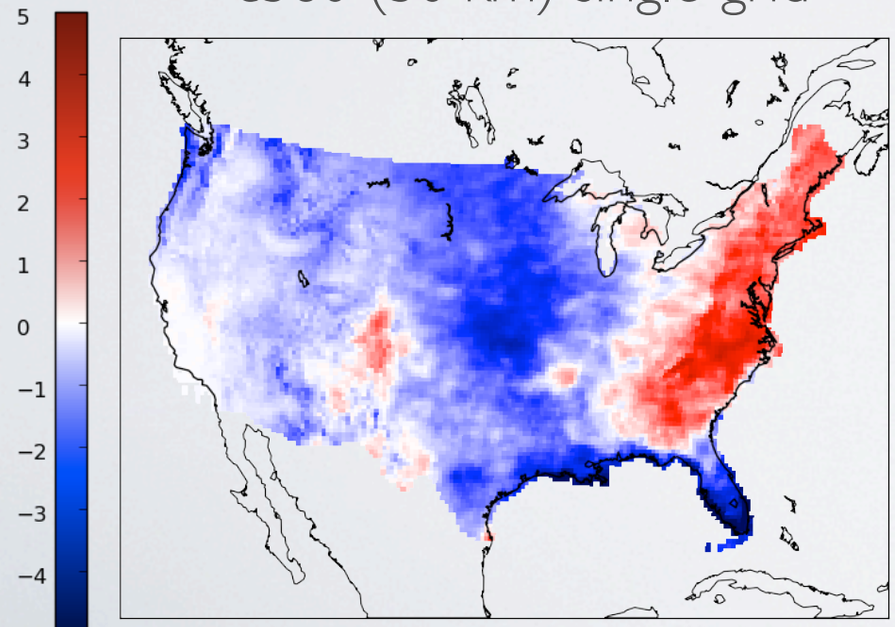


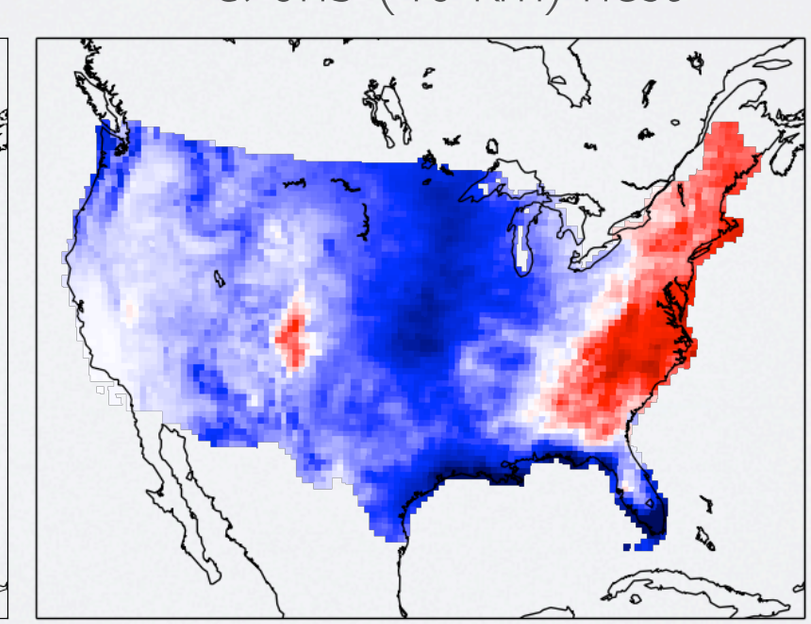


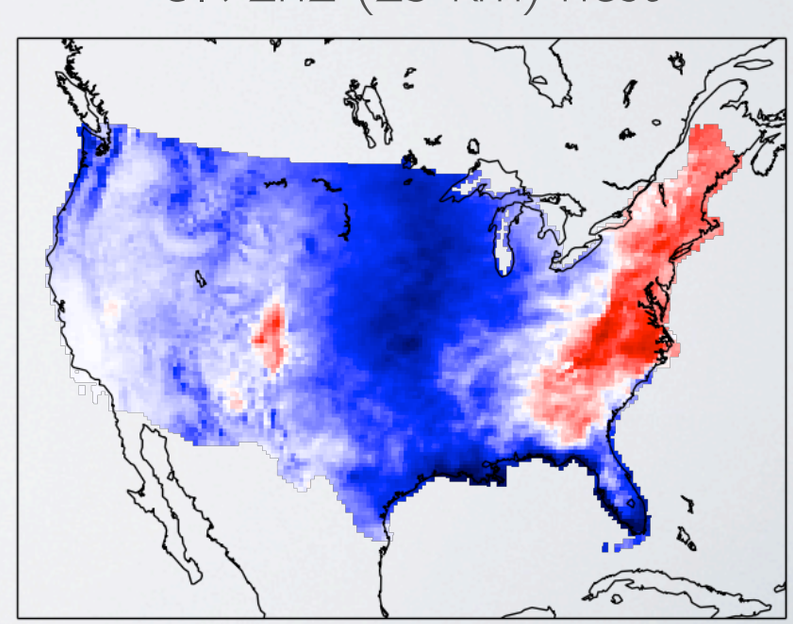
c360 (30 km) single-grid

c90n3 (40 km) nest

c192n2 (25 km) nest

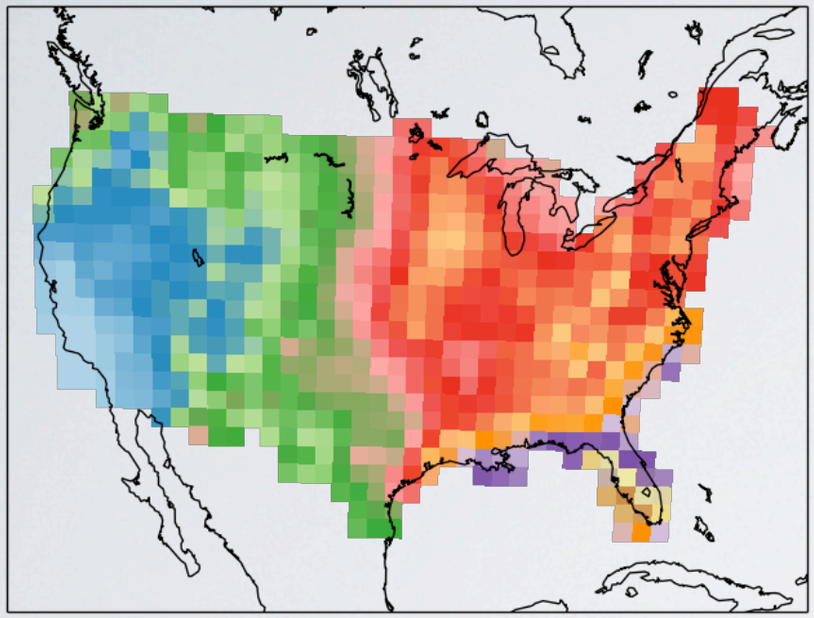




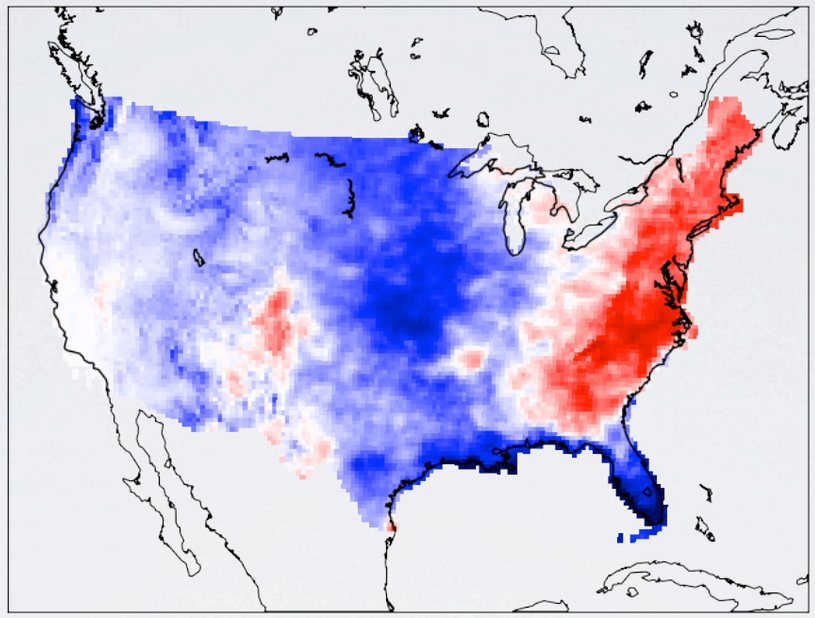


C384 SINGLE-GRID RESULTS

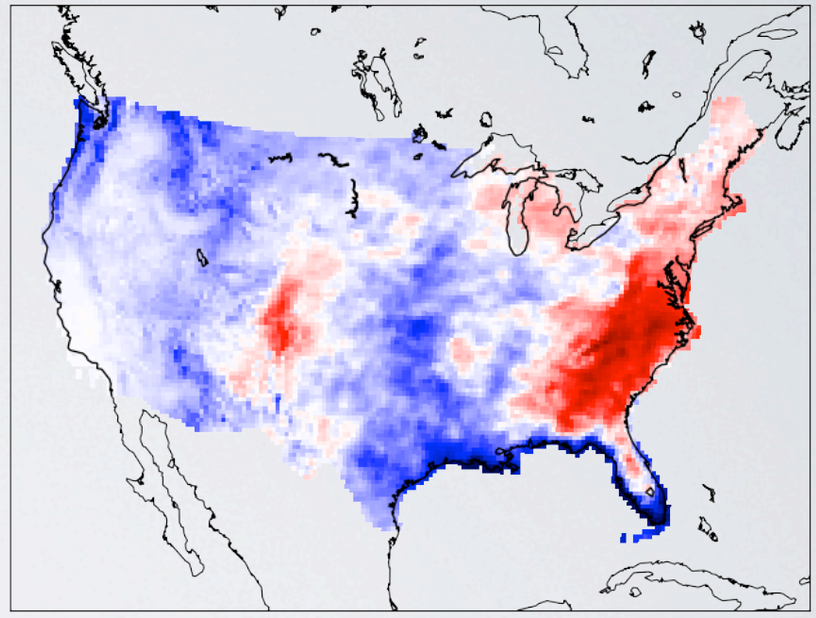
PRISM Observations

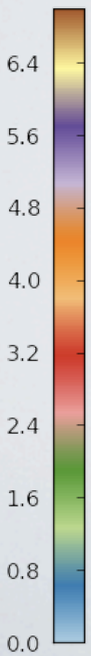


c360 (30 km) single-grid



c384 (25 km) single-grid

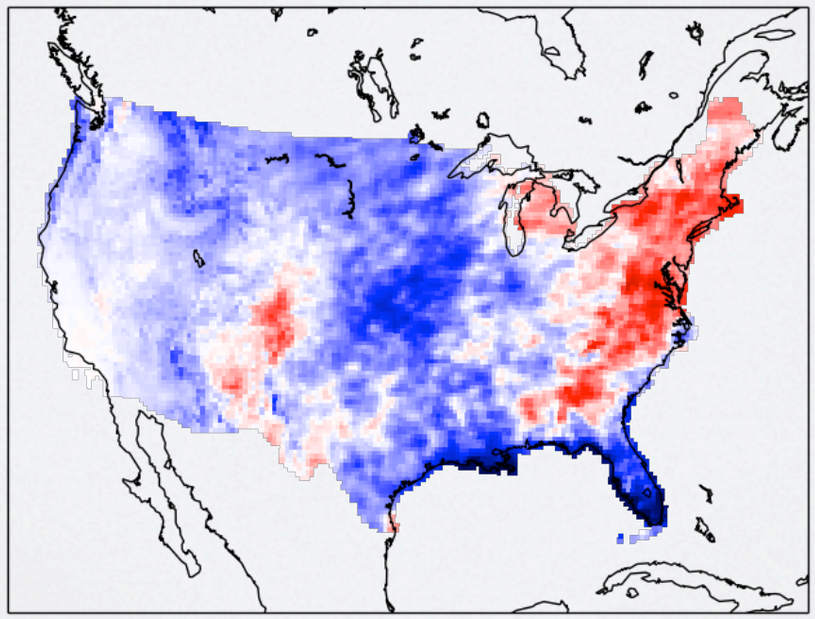




mm/d

mm/d

c384 Alternative configuration

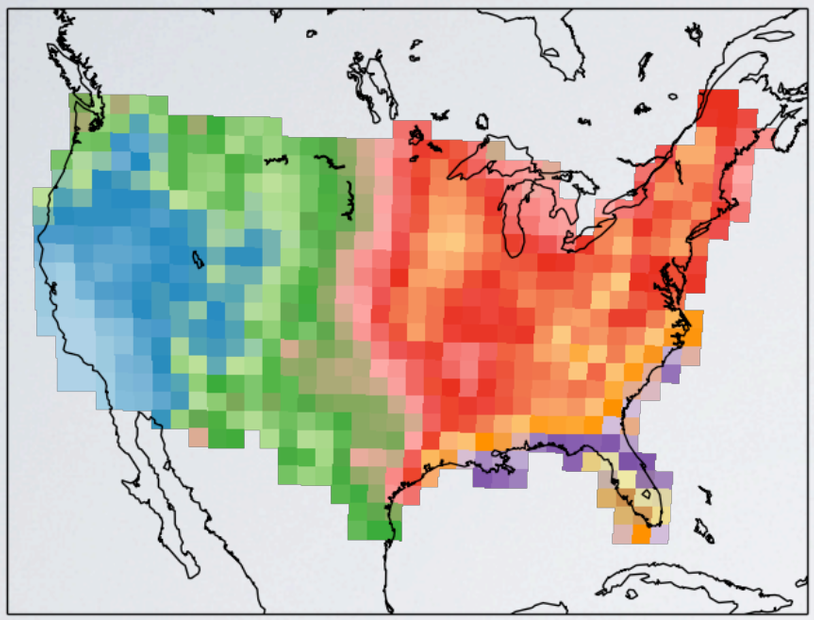


New nest: c384n3

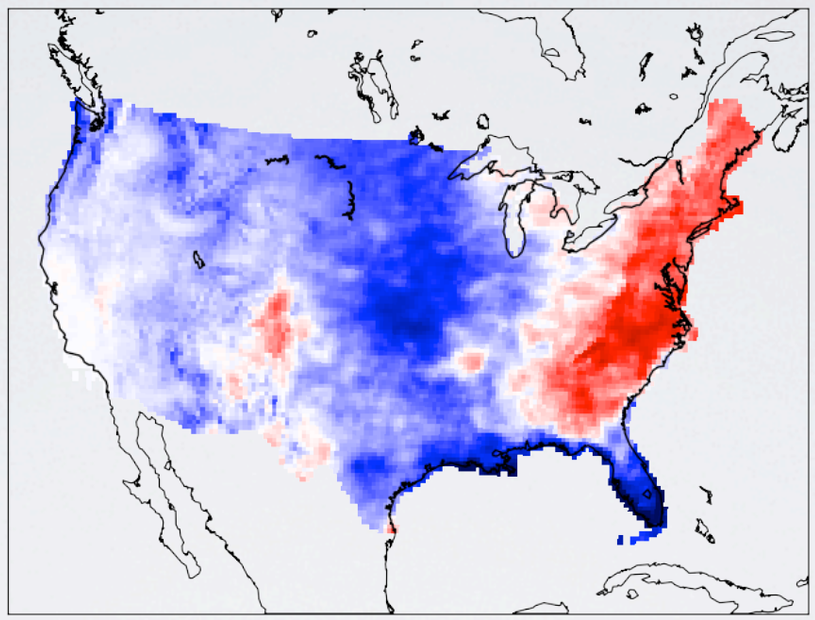
- c384 global grid (25 km)
- Factor-of-three nest (8 km) over CONUS
- 8 mo/day with 4248 cores (c384 single-grid: 19 mo/day with 3456 cores)

C384 AND C384n3

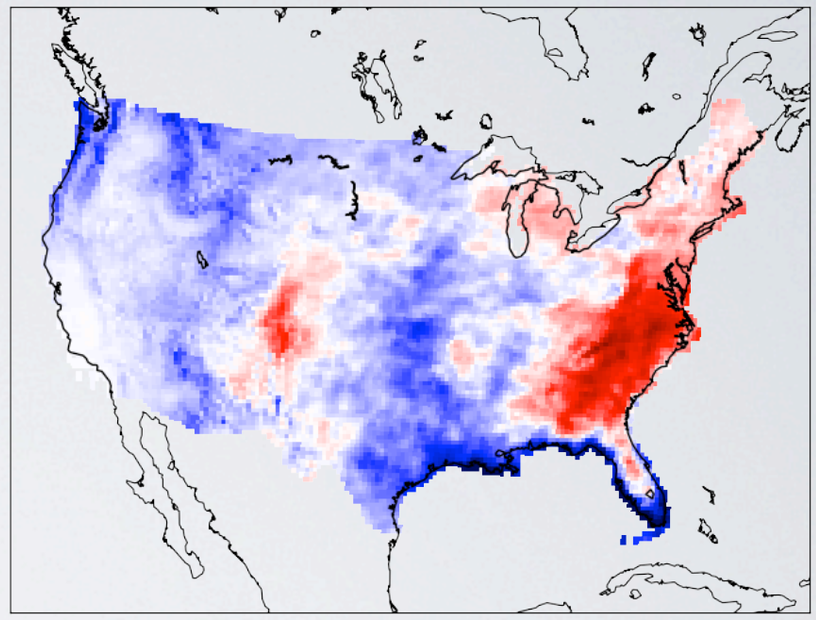
PRISM Observations

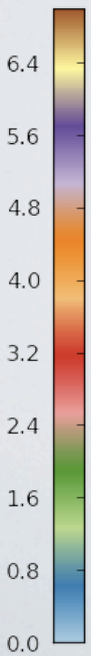


c360 (30 km) single-grid



c384 (25 km) single-grid

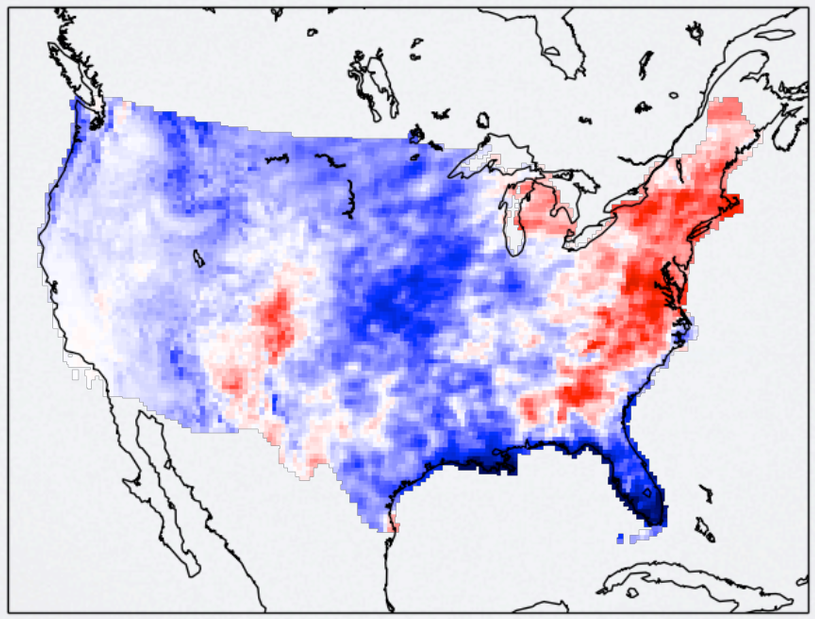




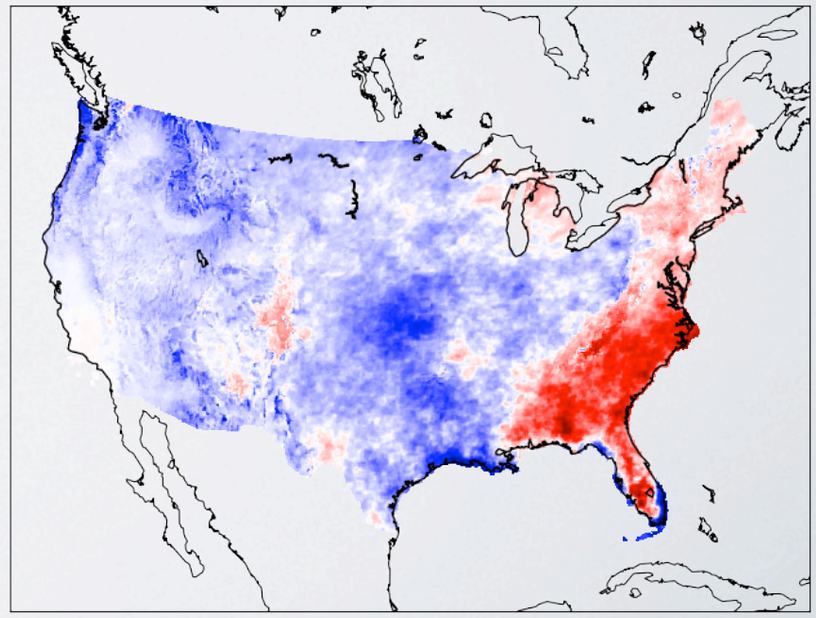
mm/d

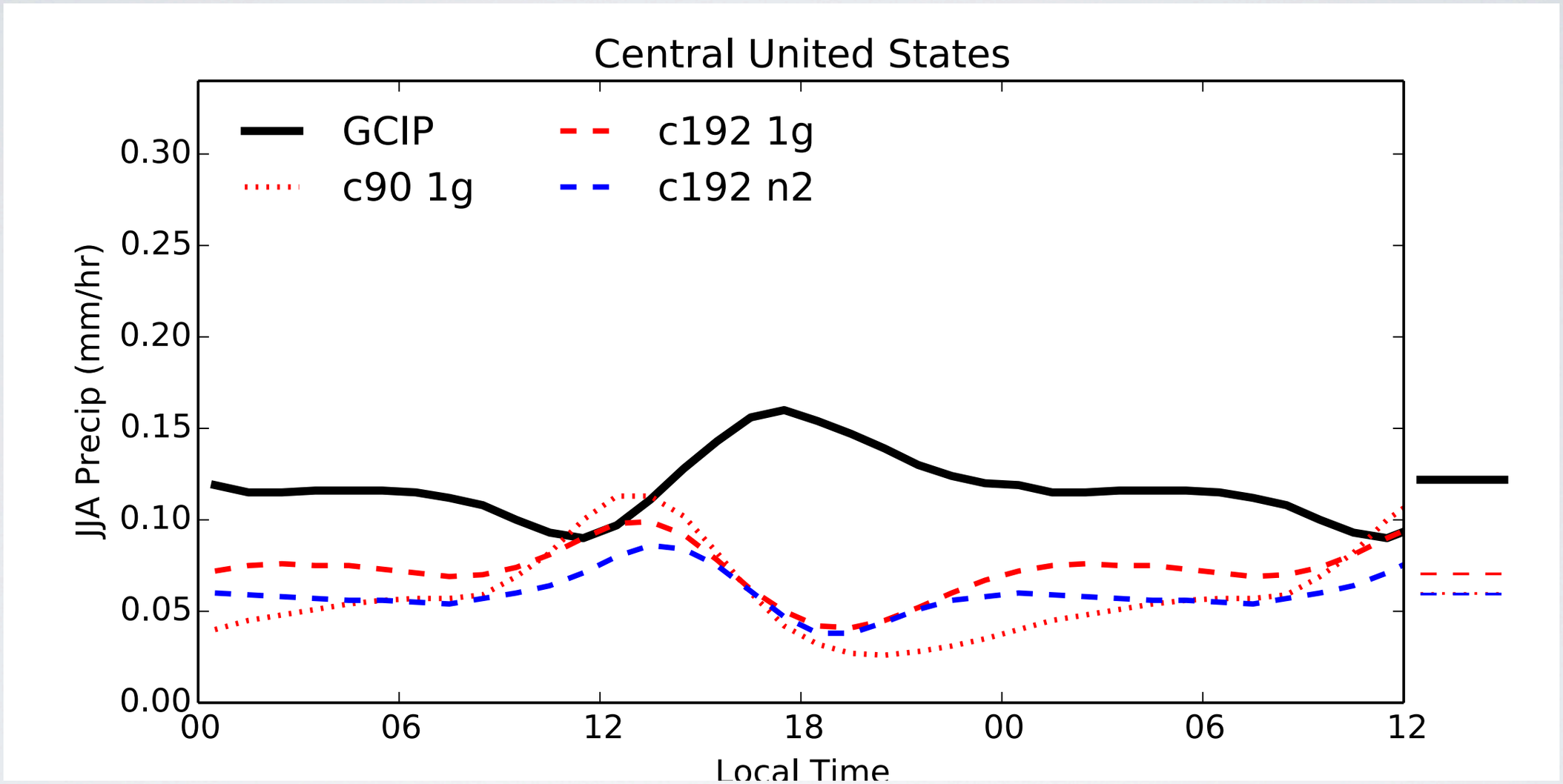
mm/d

c384 Alternative configuration

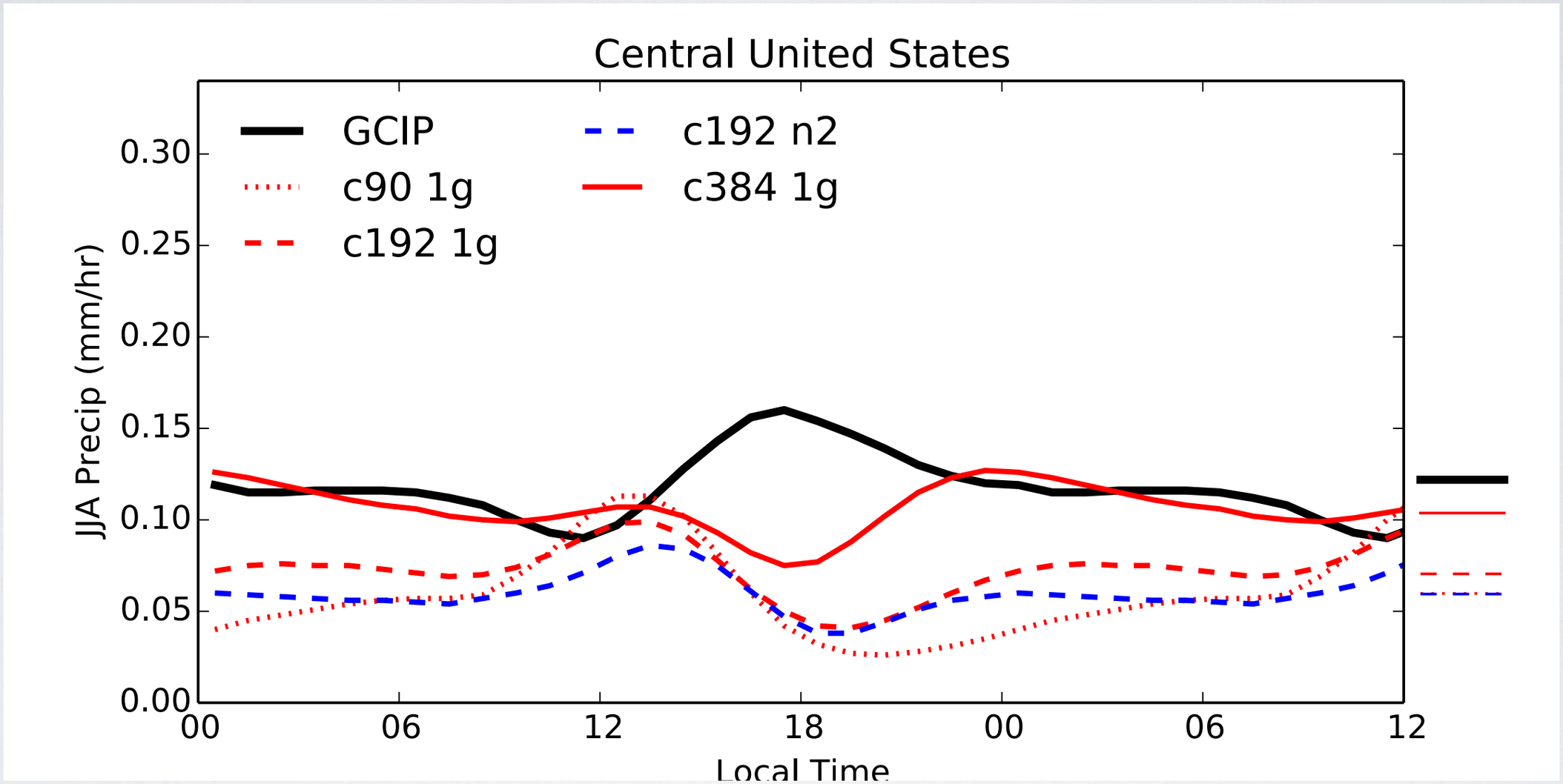


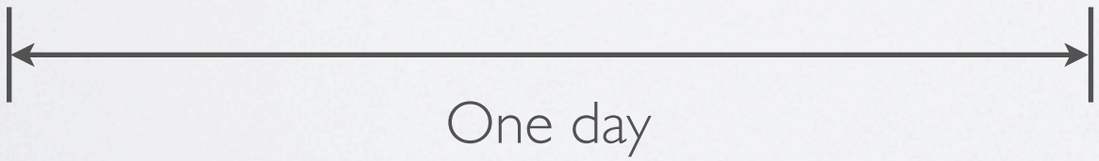
c384n3 (8 km) nested

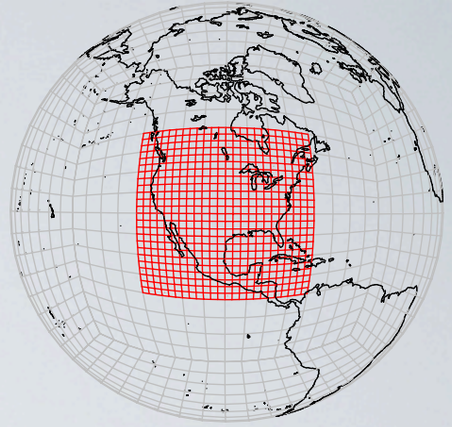


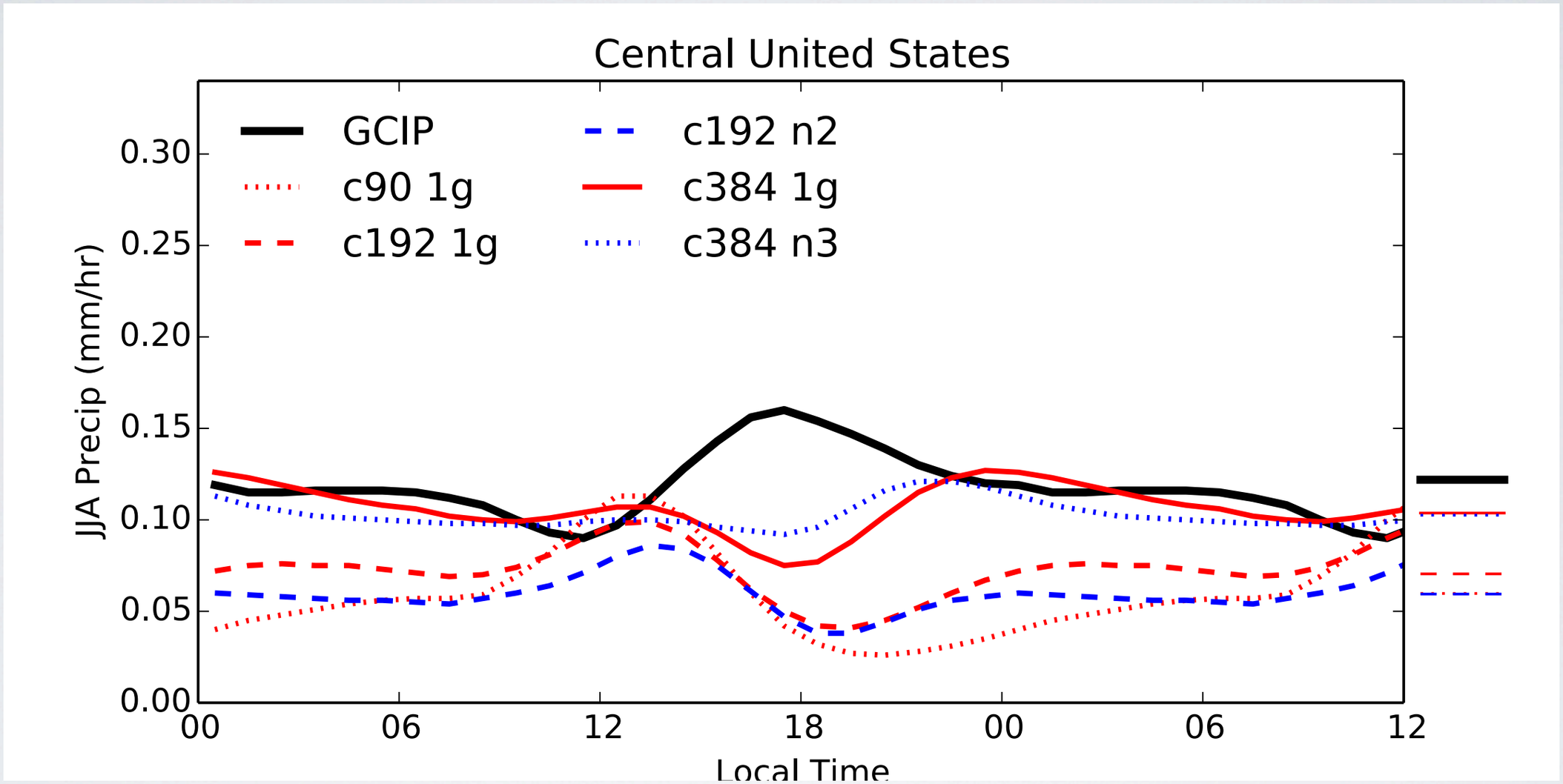

Central United States
GCIP
c90 1g
c192 1g
c192 n2
JJA Precip (mm/hr)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
00
06
12
18
00
06
12
Local Time

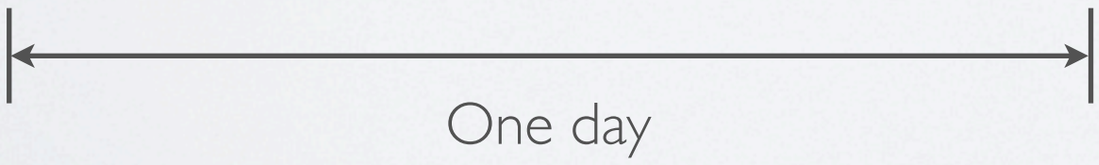
One day

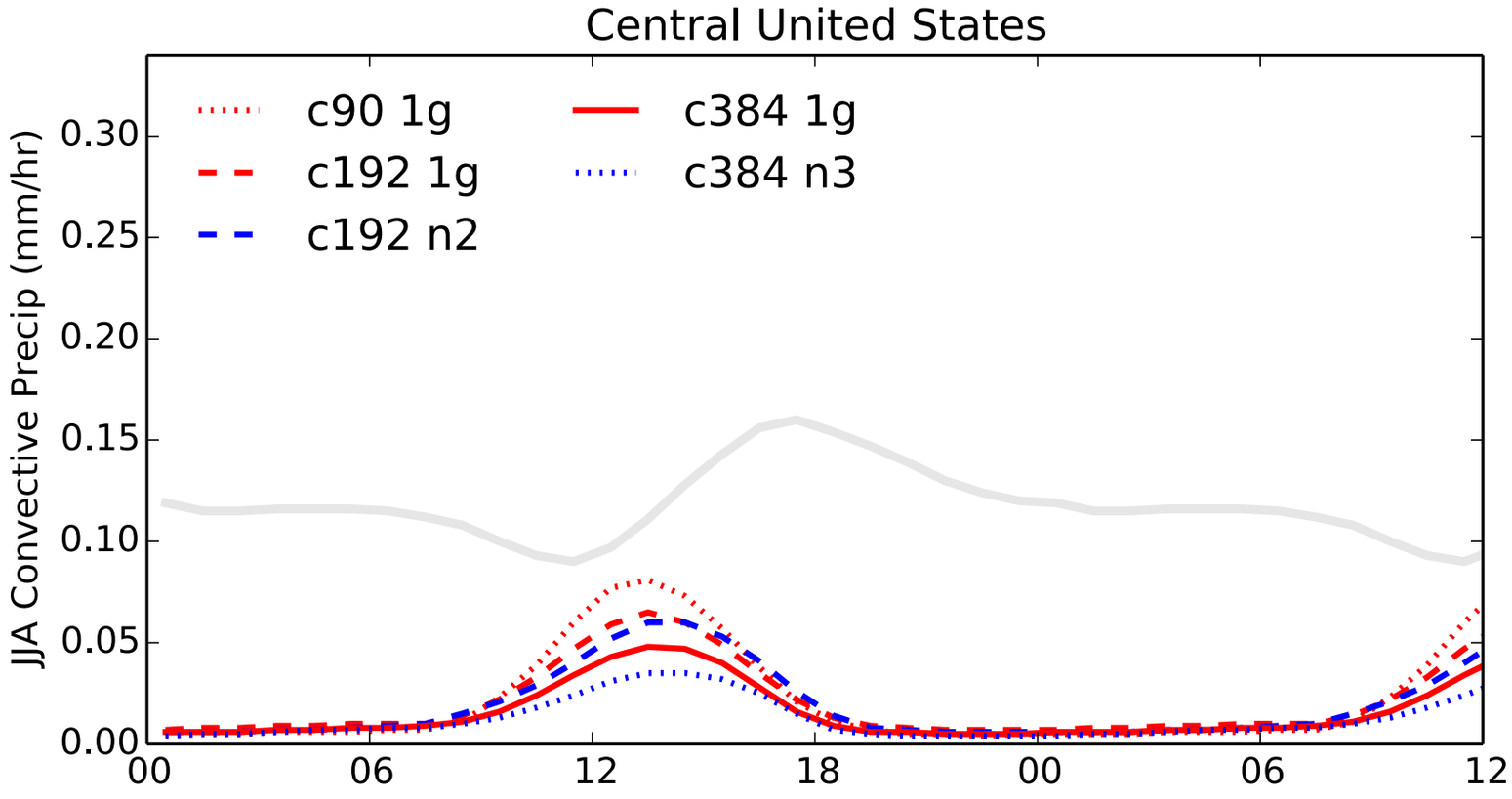

Central United States
GCIP
c90 1g
c192 1g
c192 n2
c384 1g
JJA Precip (mm/hr)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
00
06
12
18
00
06
12
Local Time


One day

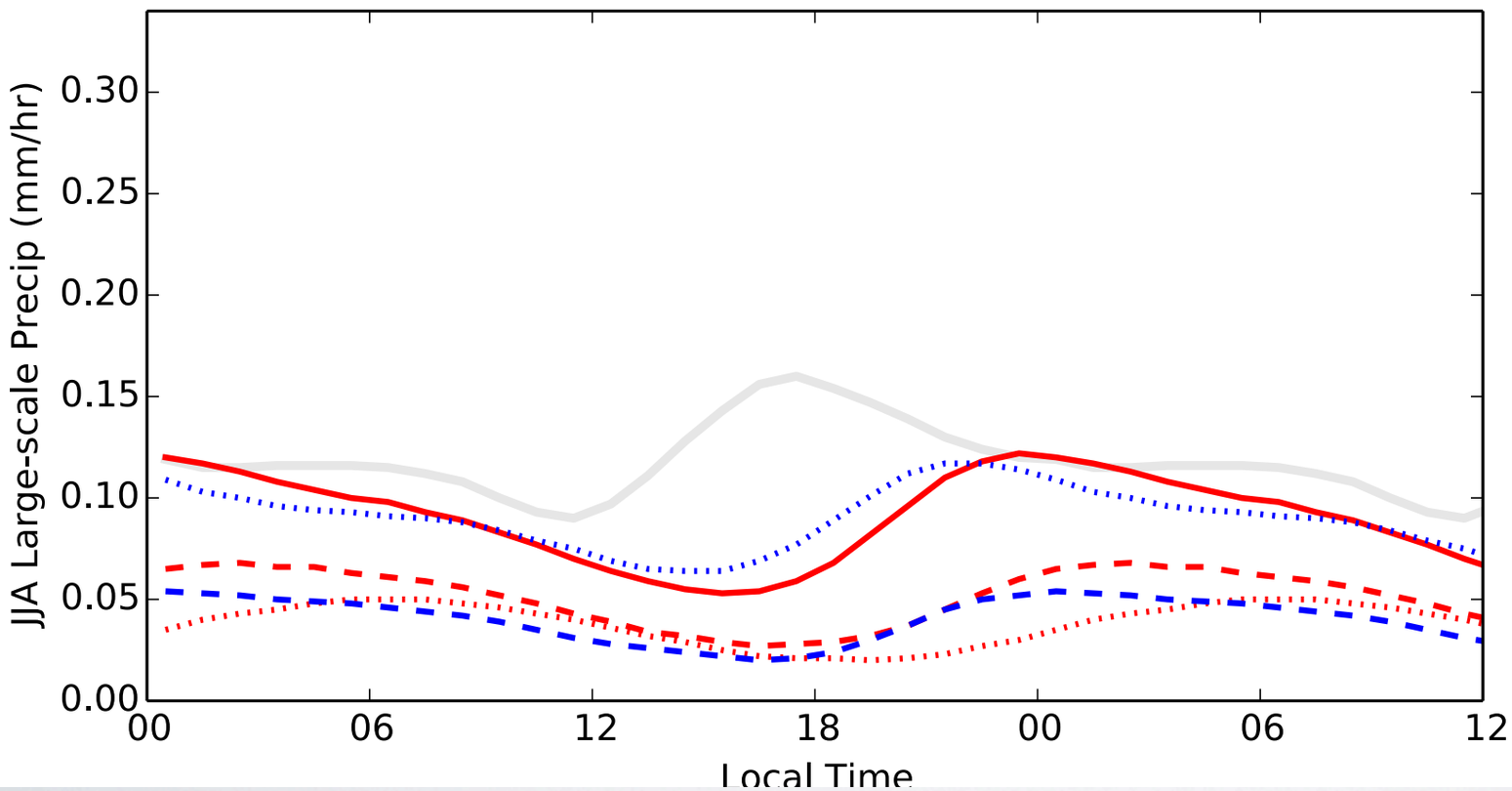



Central United States
GCIP
c90 1g
c192 1g
c192 n2
c384 1g
c384 n3
JJA Precip (mm/hr)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
00
06
12
18
00
06
12
Local Time

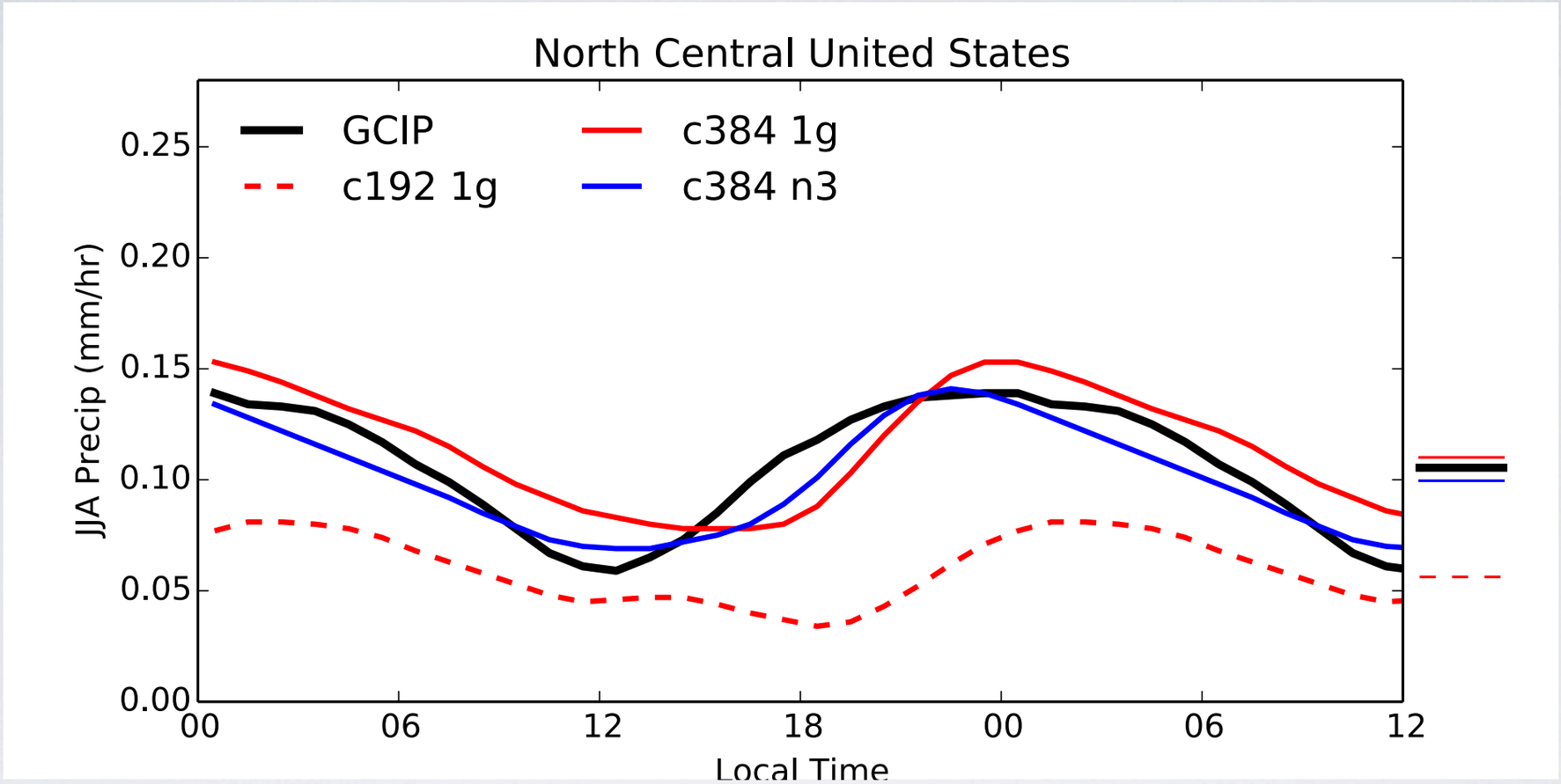

One day

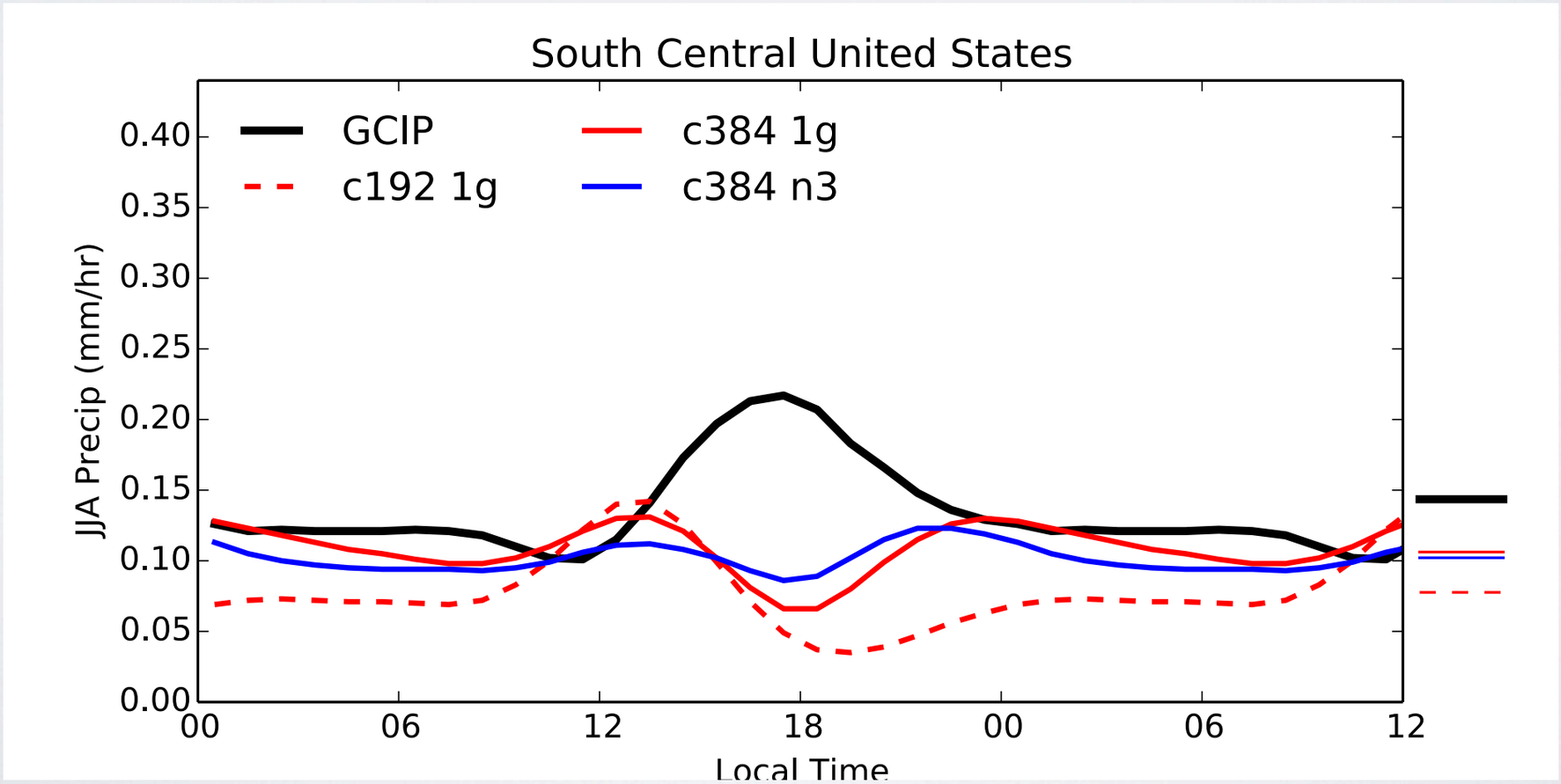


Parameterized Precipitation

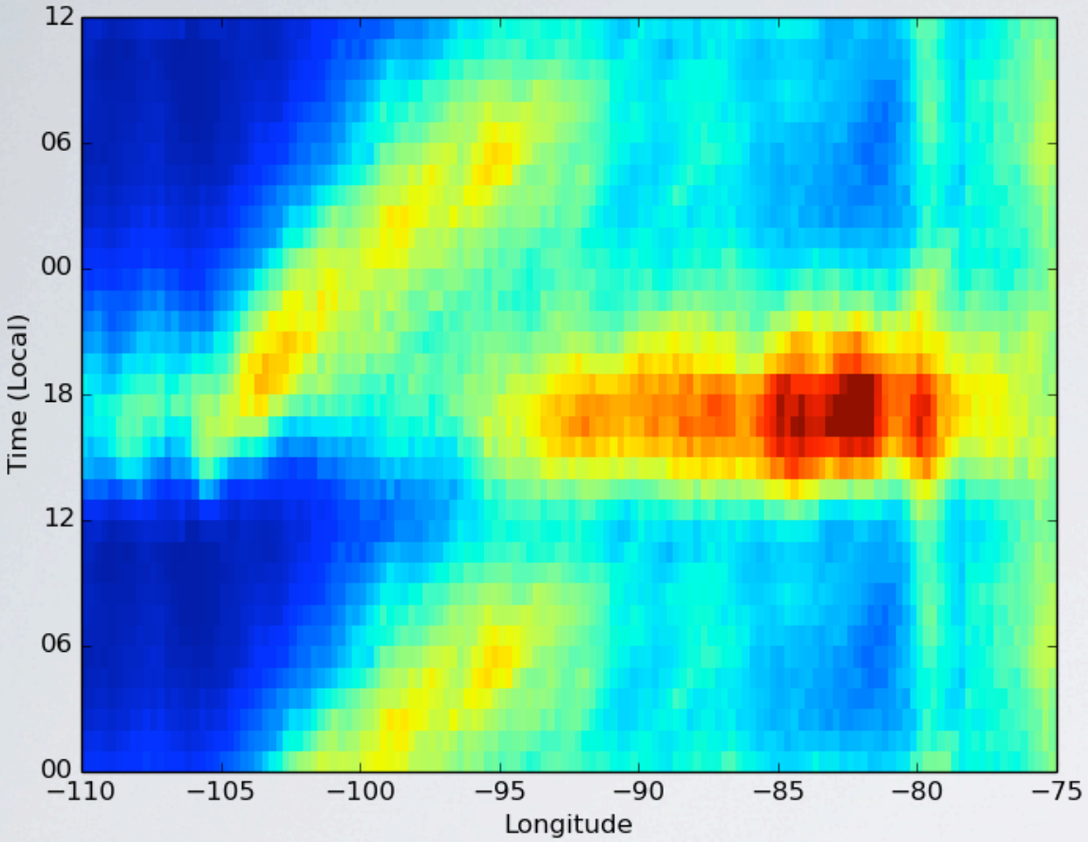


Resolved Precipitation

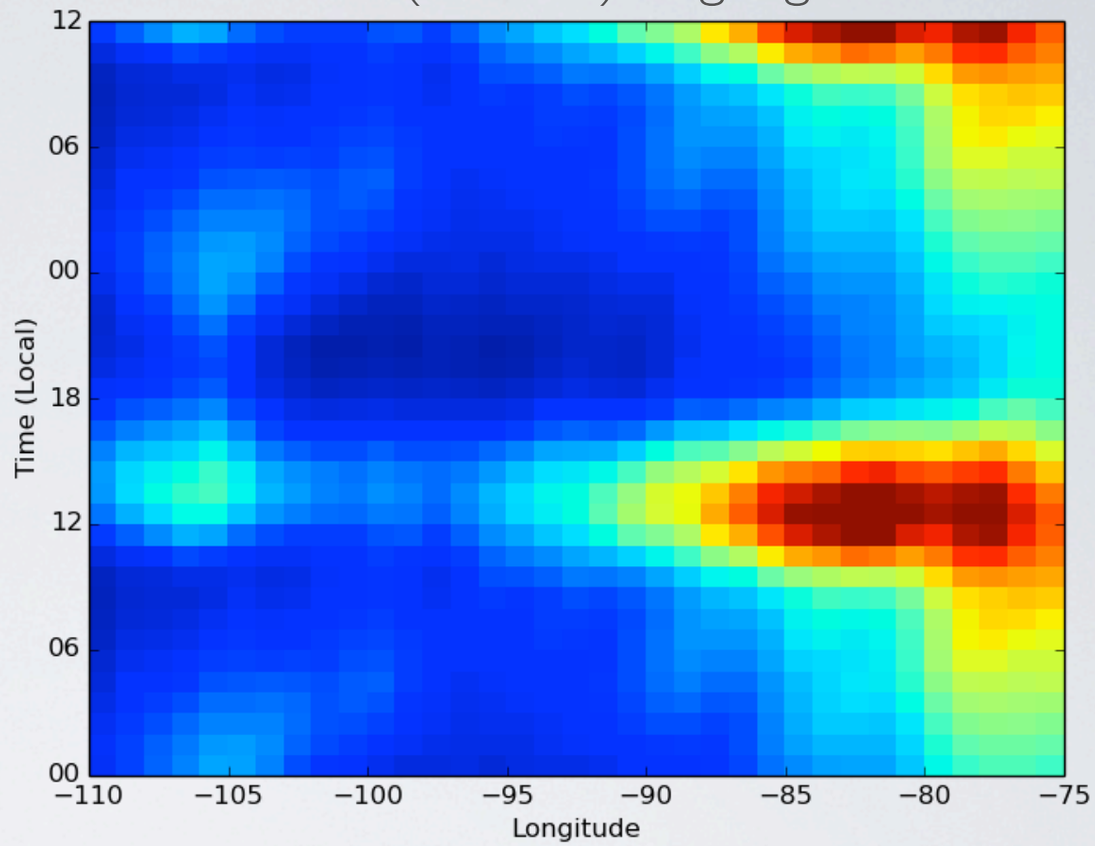

North Central United States
GCIP
c192 1g
c384 1g
c384 n3
JJA Precip (mm/hr)
0.00
0.05
0.10
0.15
0.20
0.25
00
06
12
18
00
06
12
Local Time

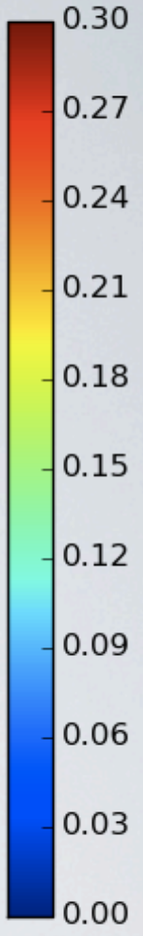

South Central United States
GCIP
c192 1g
c384 1g
c384 n3
JJA Precip (mm/hr)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
00
06
12
18
00
06
12
Local Time

GCIP Observations



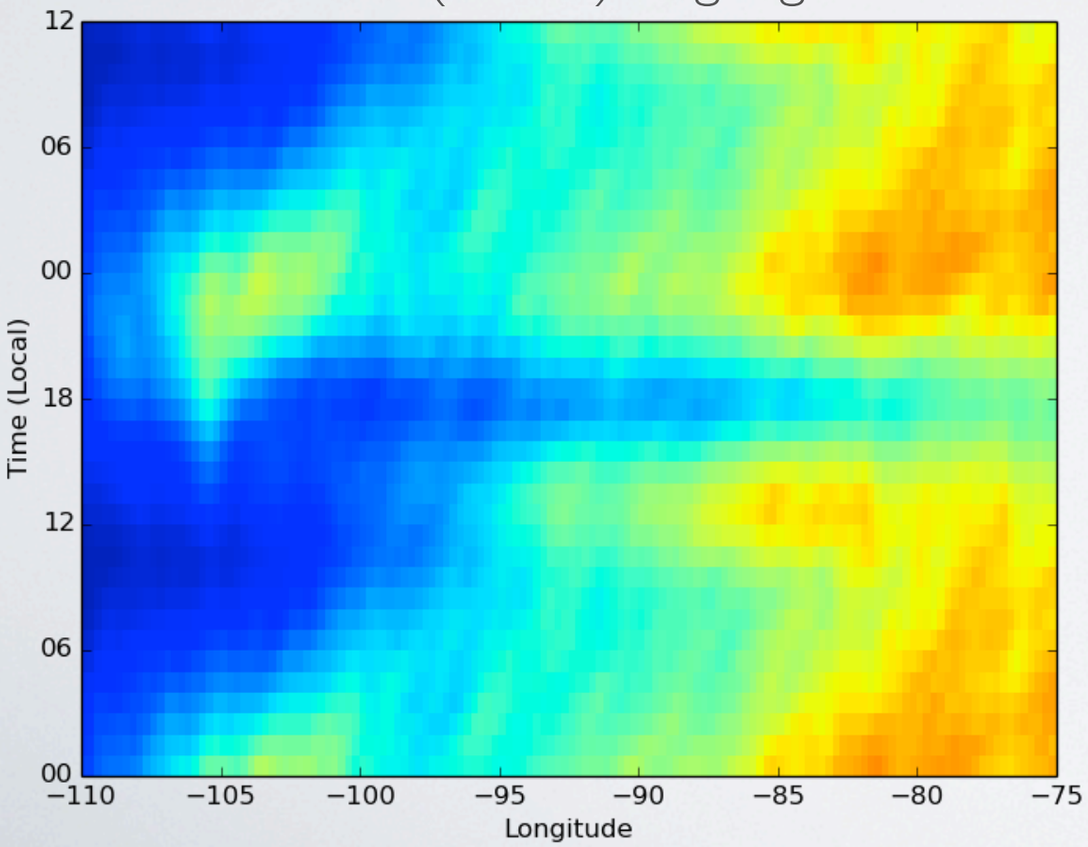
c90 (110 km) single-grid



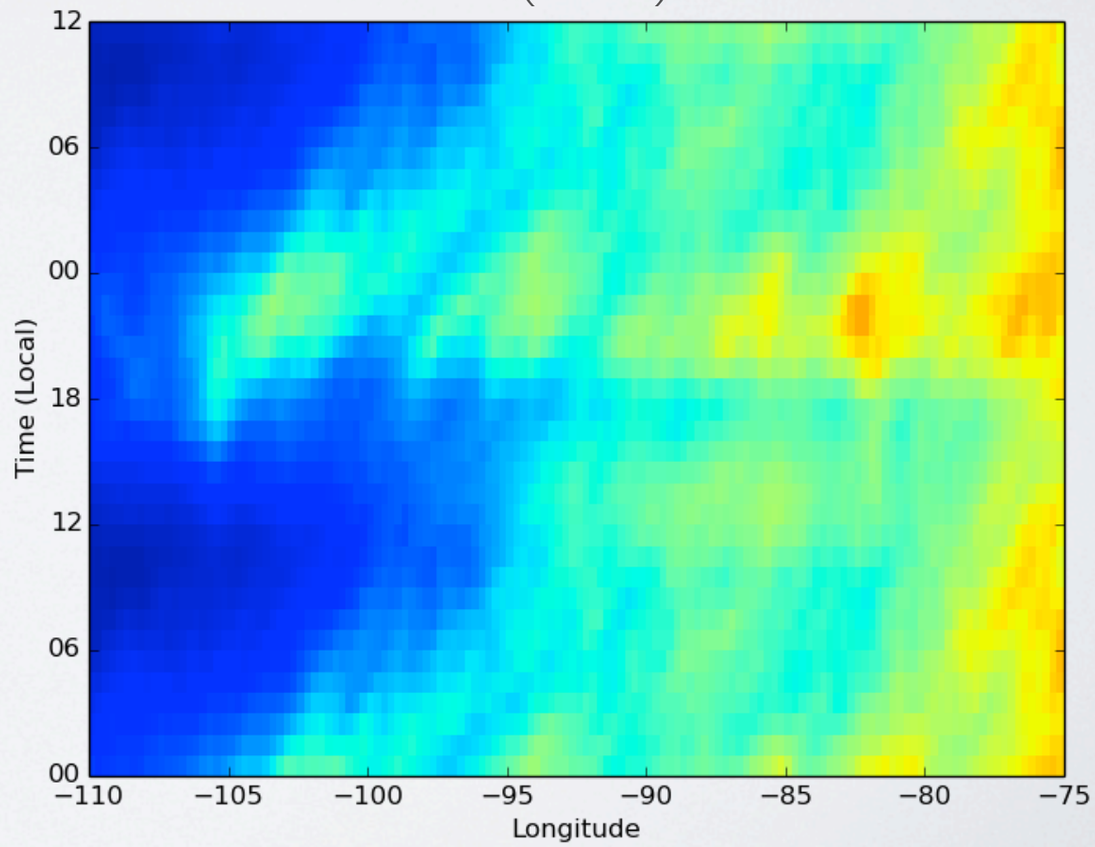


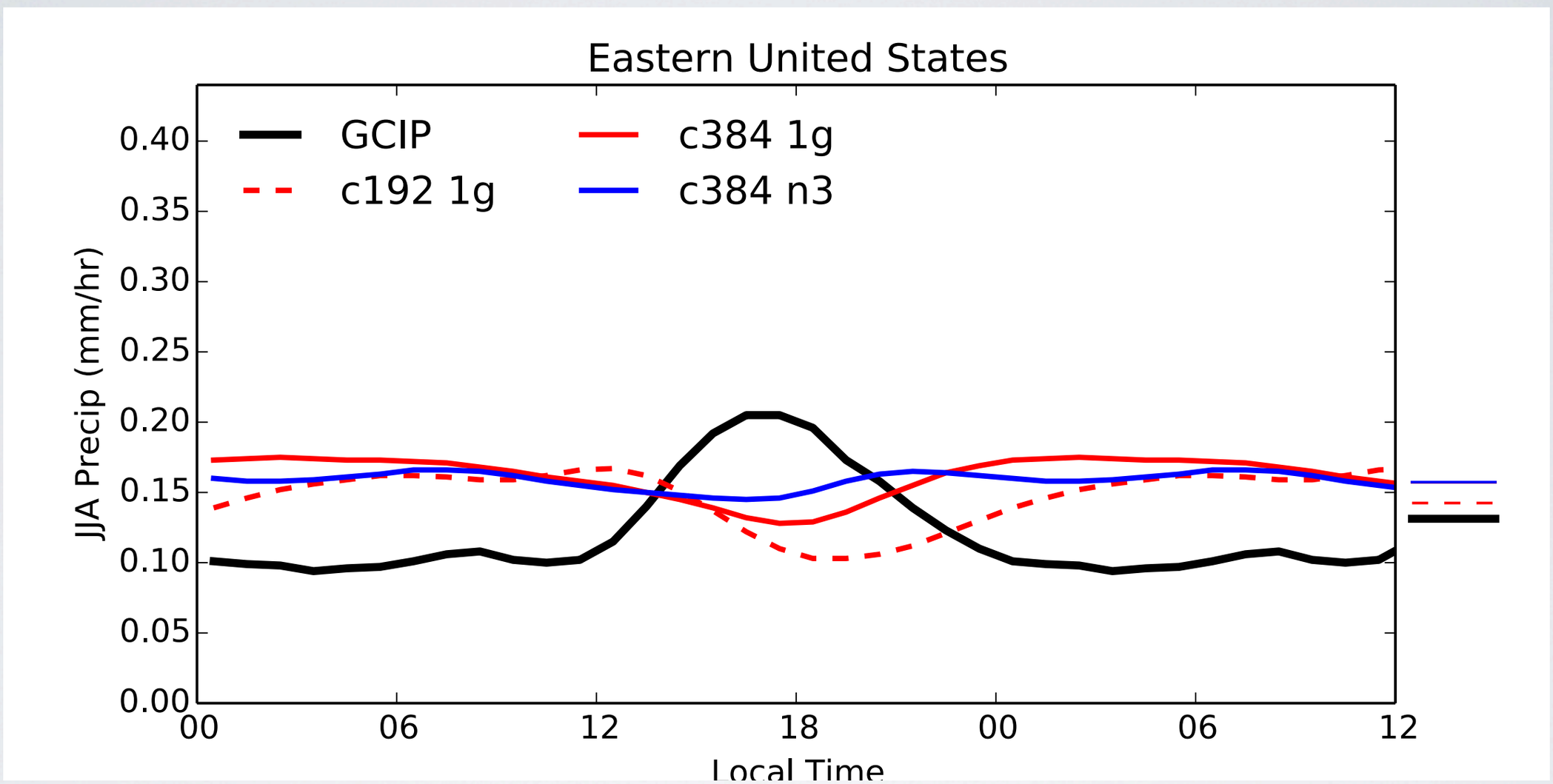
mm/hr

c384 (25 km) single-grid



c384n3 (8 km) nested




Eastern United States
GCIP
c192 1g
c384 1g
c384 n3
JJA Precip (mm/hr)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
00
06
12
18
00
06
12
Local Time

CONCLUSIONS

- Enhanced resolution readily improves representation of orographic precipitation and hurricane intensity
- Great Plains precipitation only improves weakly with increasing resolution
- Nesting to 8 km gets the best results, especially in representing propagating features in the Northern Plains
- Want to avoid parameterization as much as possible to get the diurnal cycle right!!