Properties of Deep Convection in the La Plata Basin as Revealed by Sounding Data

Andrew J. Newman
Richard H. Johnson
Paul E. Ciesielski

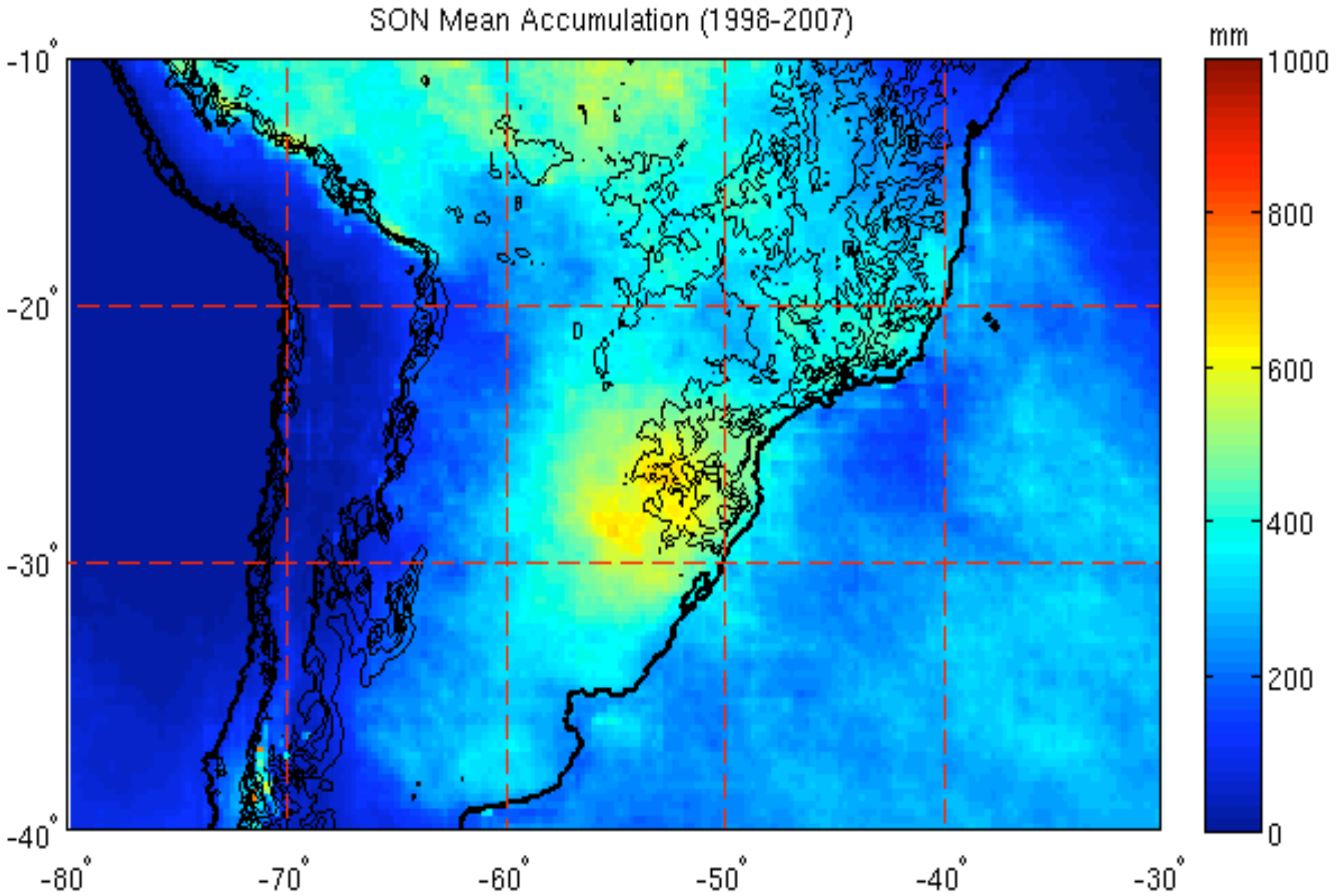
Colorado State University

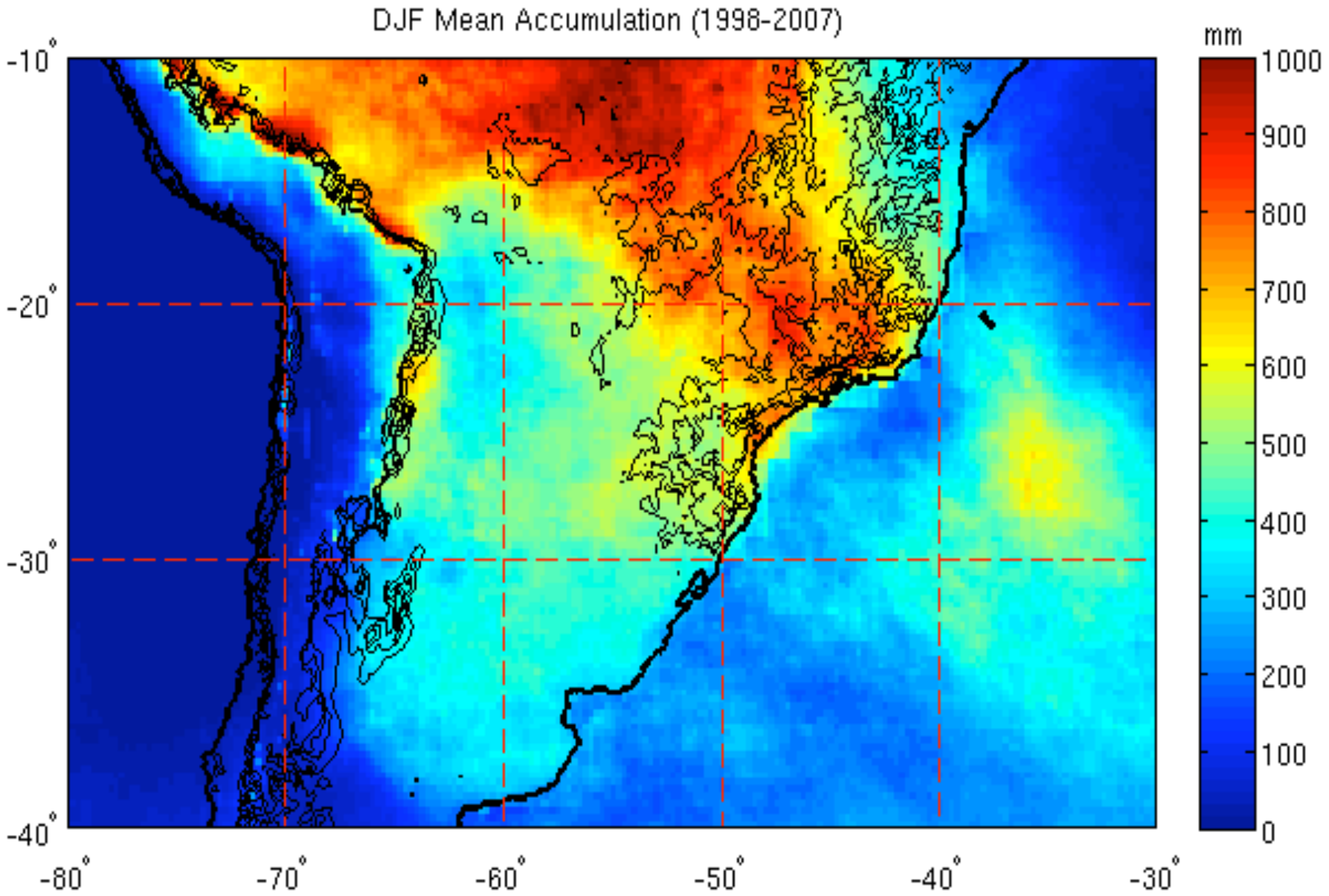
Photo by Peter Rogers

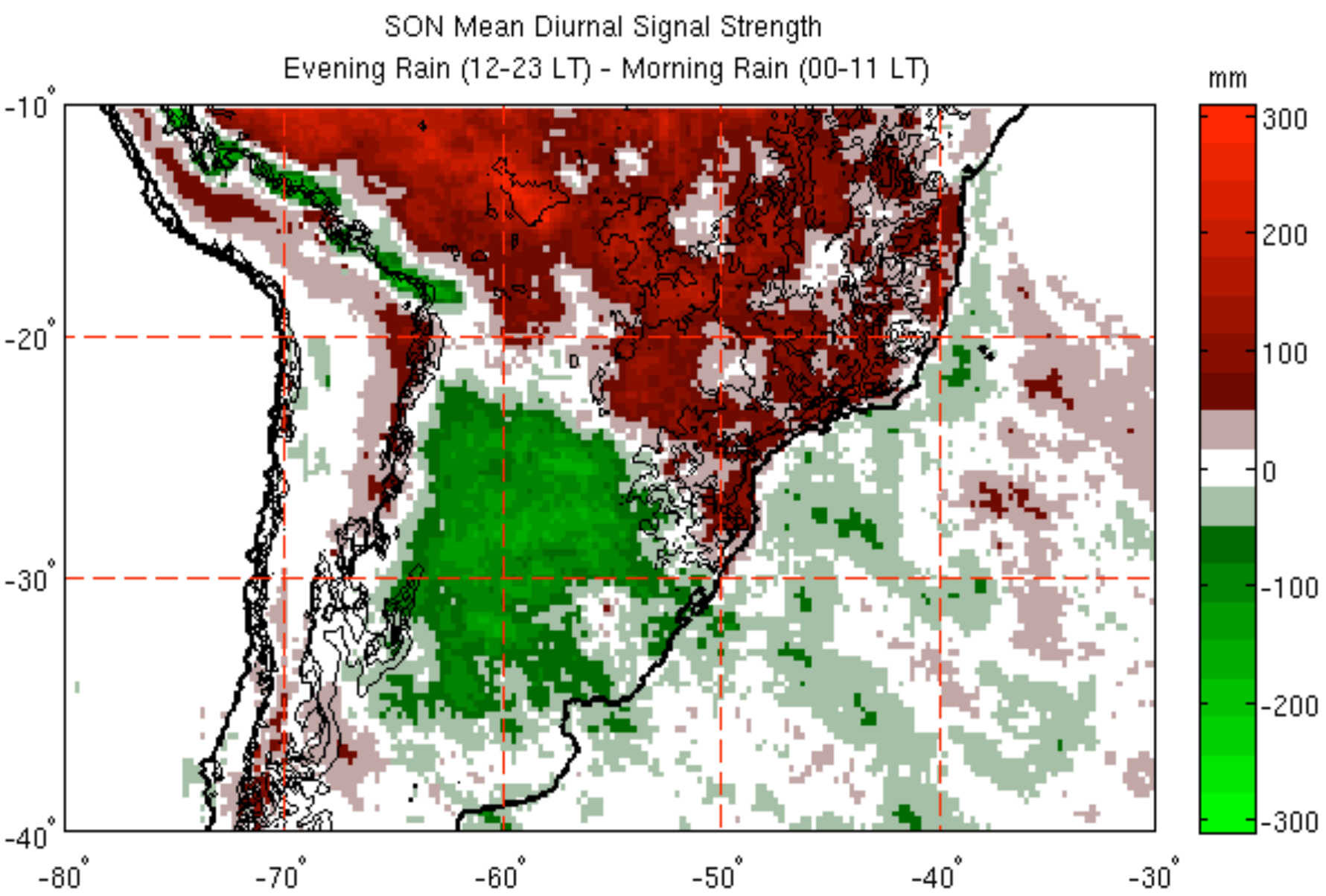
Scientific Objectives

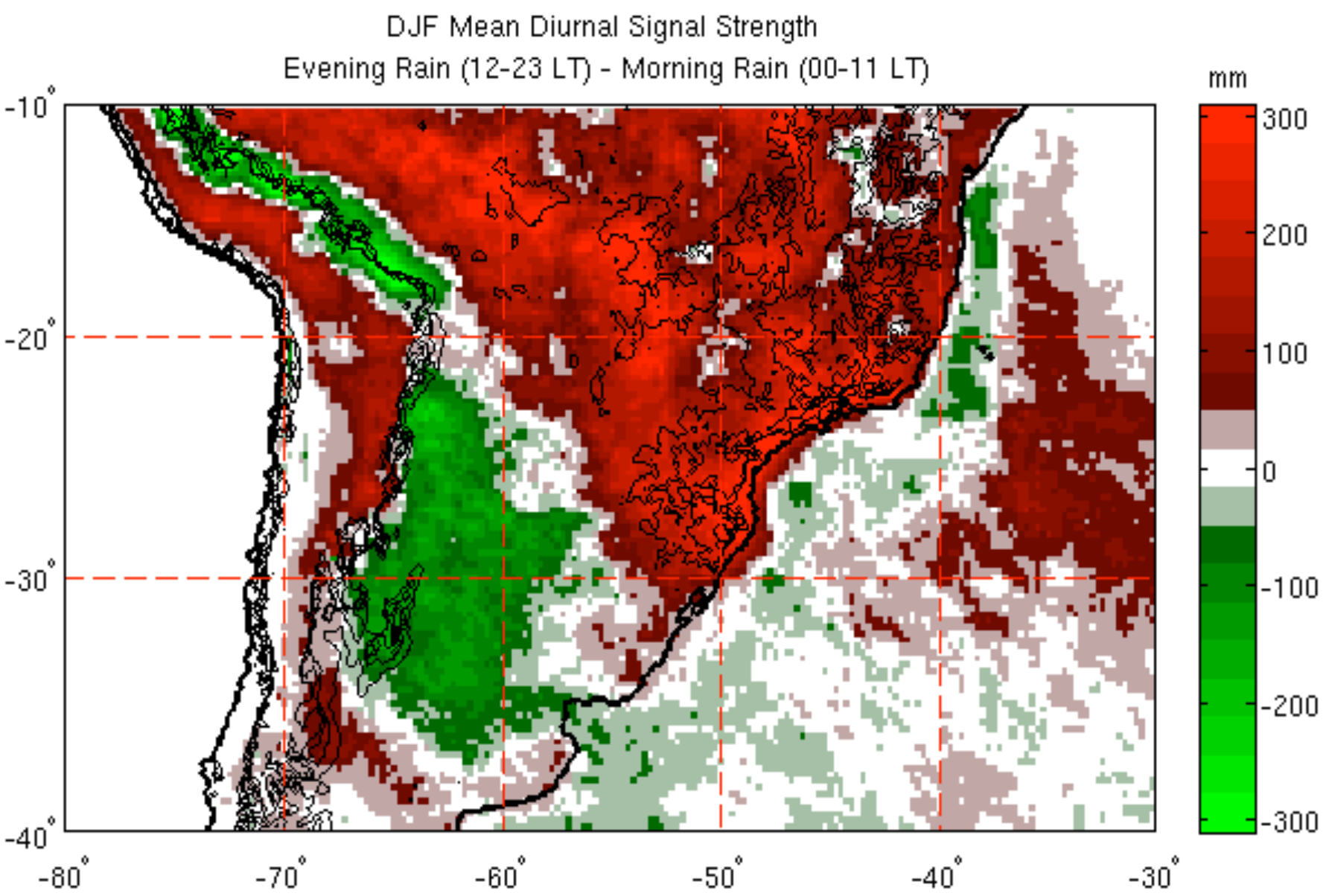
- Heating profiles in deep convection during the LPB Experiment
- The diurnal cycle and propagation characteristics of deep convection in the La Plata Basin
- The structure and evolution of the atmospheric boundary layer in the LPB in relation to convective development

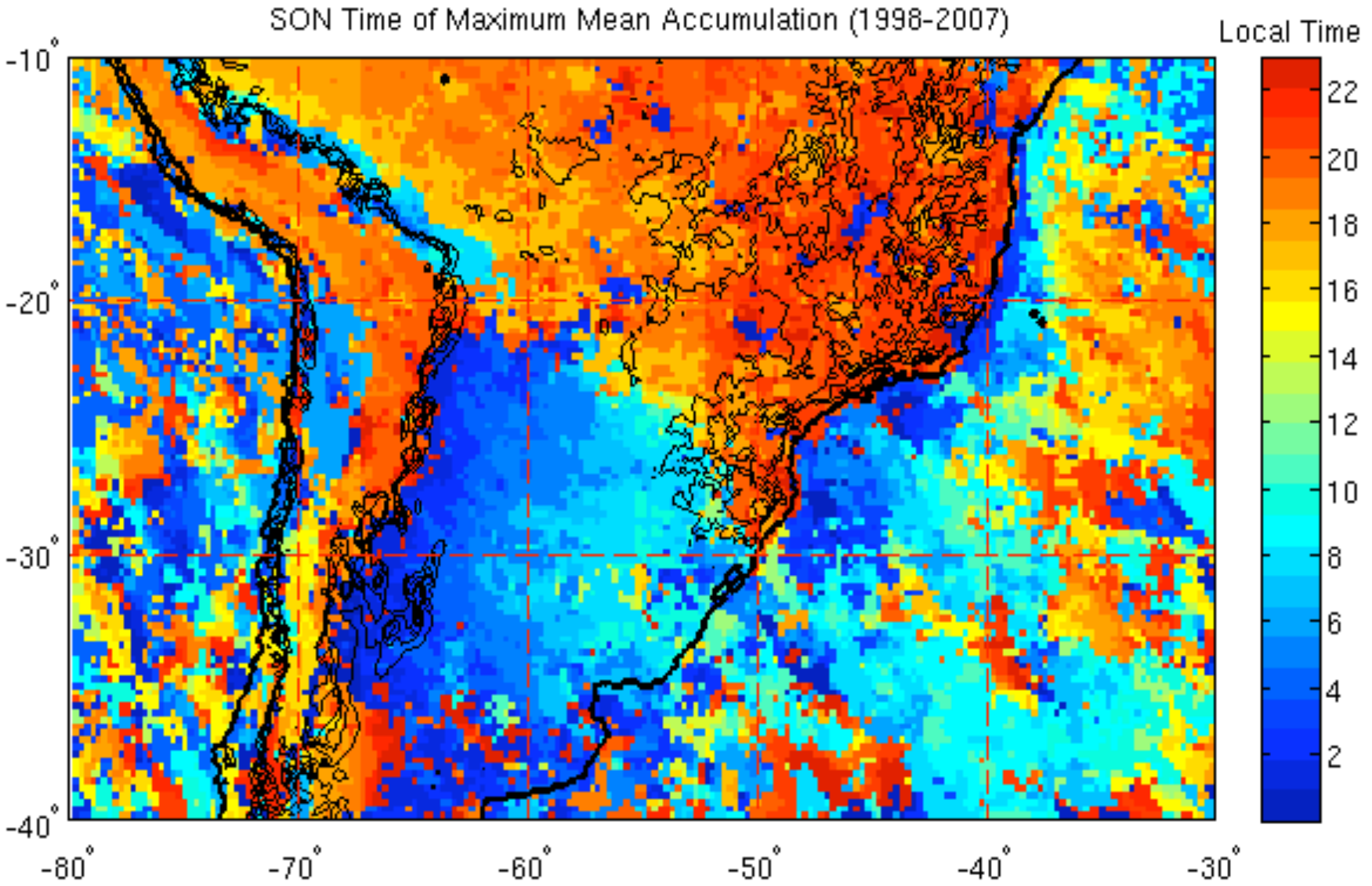
TRMM 3B42

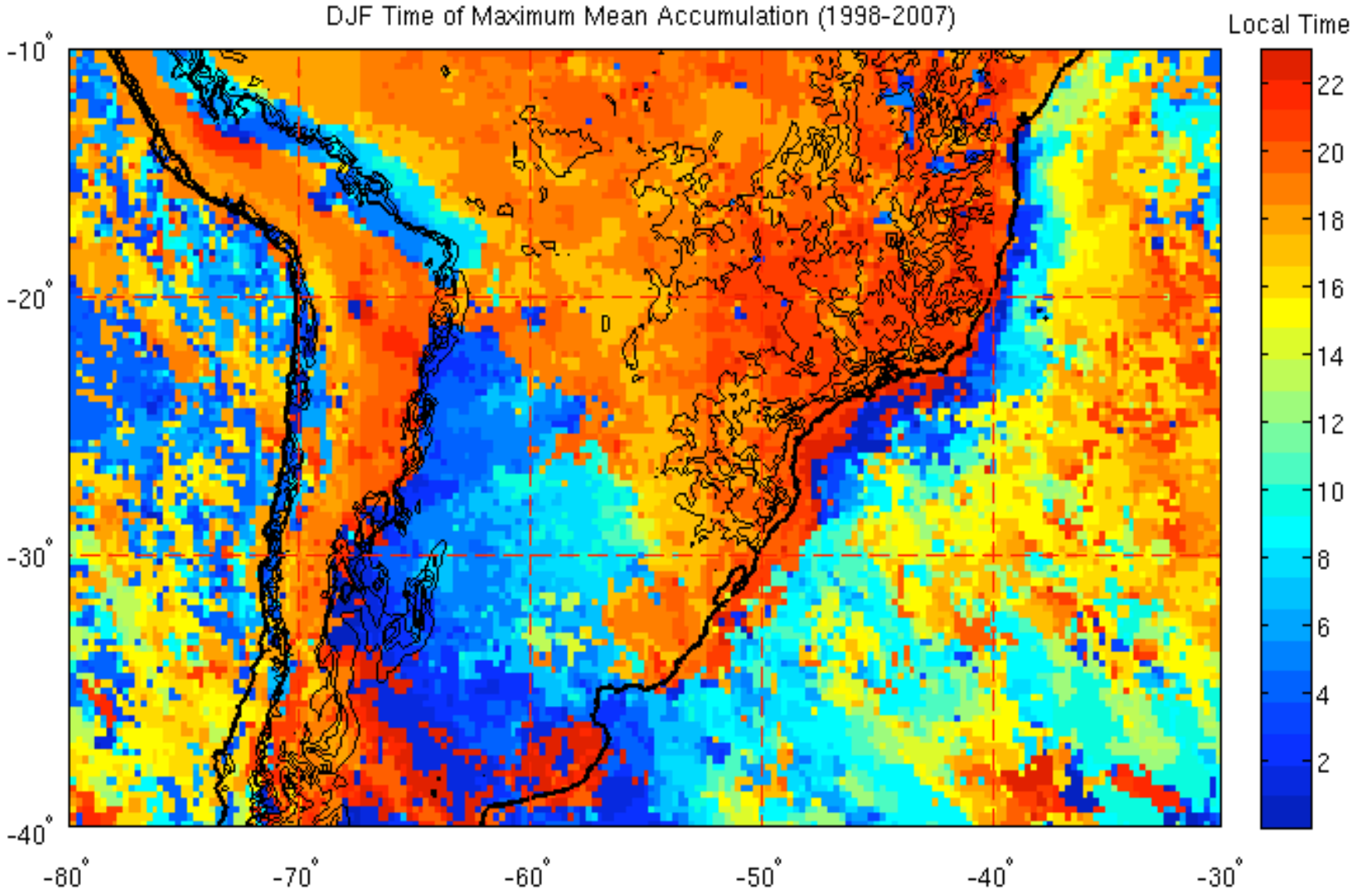

SON Mean Accumulation (1998-2007)
mm
1000
800
600
400
200
0
-10°
-20°
-30°
-40°
-80°
-70°
-60°
-50°
-40°
-30°

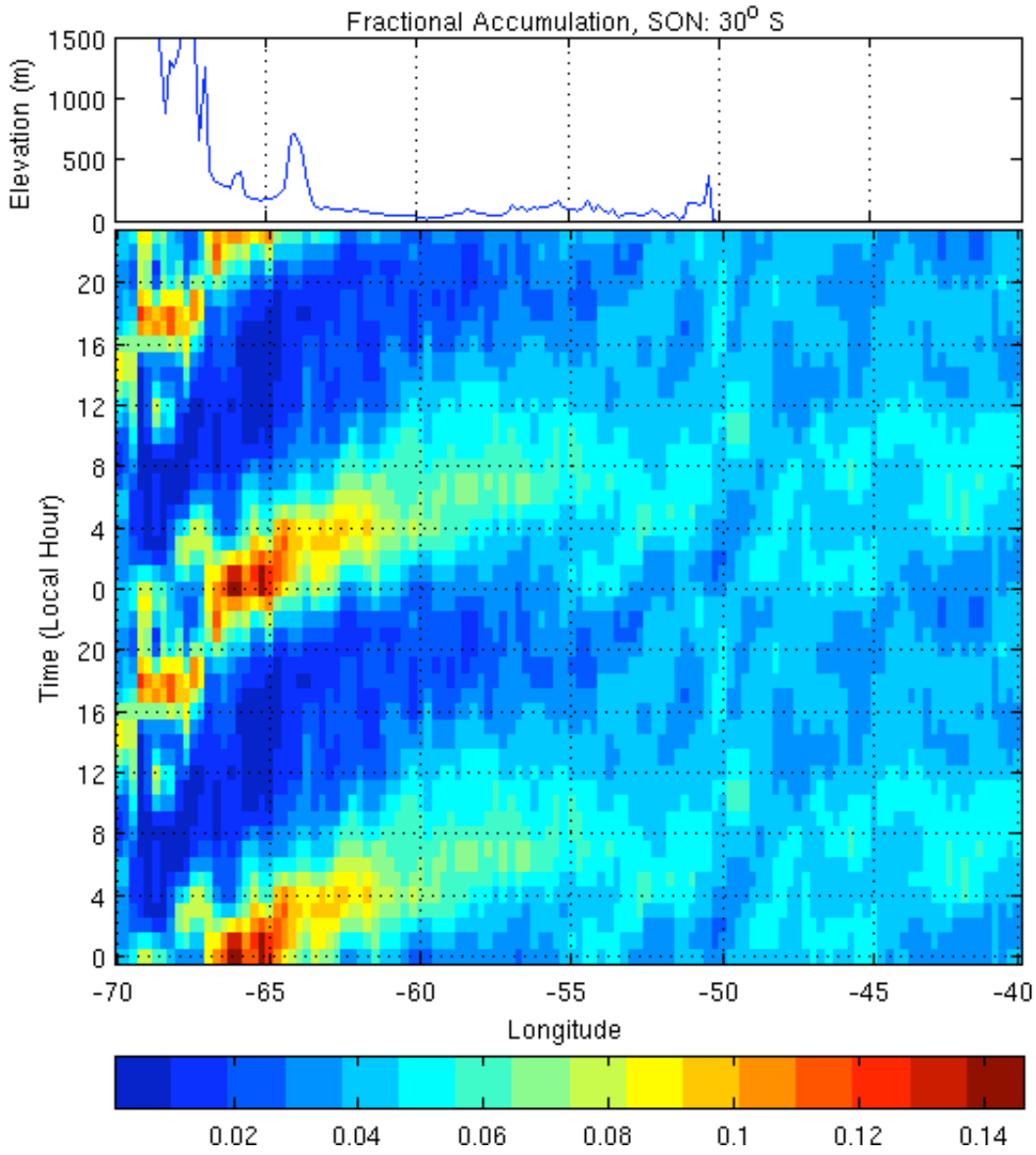

DJF Mean Accumulation (1998-2007)
mm
1000
900
800
700
600
500
400
300
200
100
0
-10°
-20°
-30°
-40°
-80°
-70°
-60°
-50°
-40°
-30°

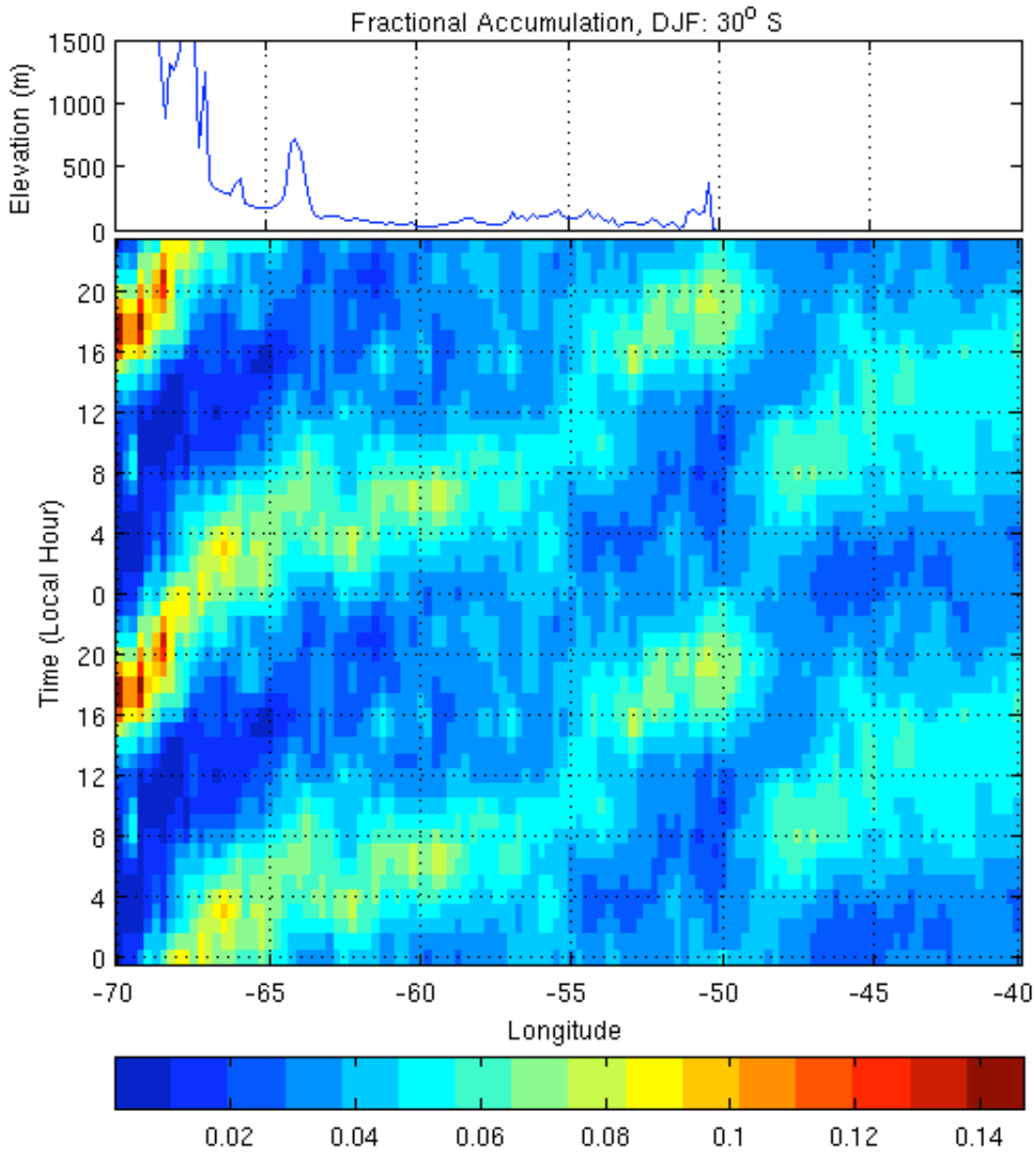

SON Mean Diurnal Signal Strength
Evening Rain (12-23 LT) - Morning Rain (00-11 LT)
mm
300
200
100
0
-100
-200
-300
-10°
-20°
-30°
-40°
-80°
-70°
-60°
-50°
-40°
-30°

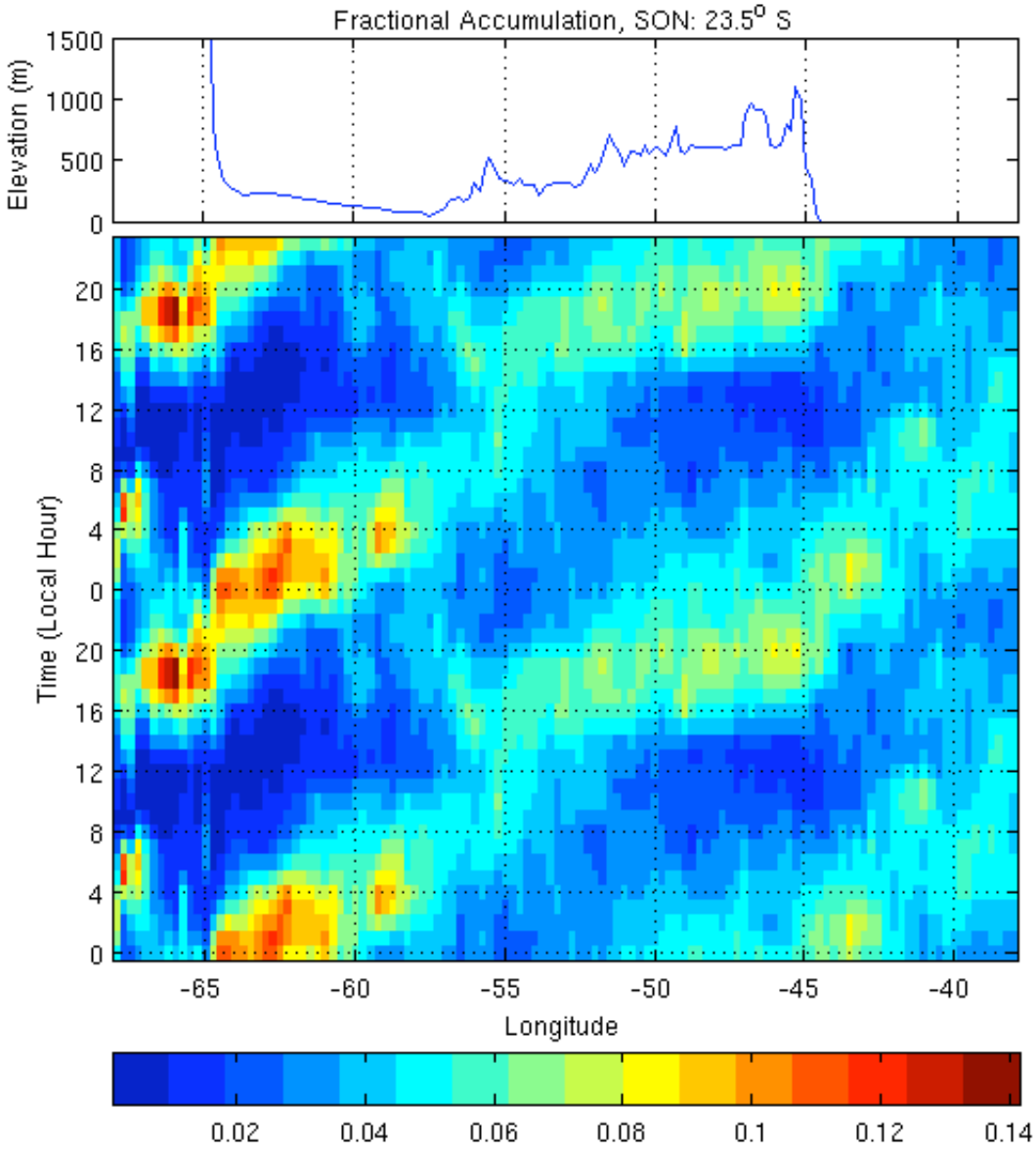

DJF Mean Diurnal Signal Strength
Evening Rain (12-23 LT) - Morning Rain (00-11 LT)
mm
300
200
100
0
-100
-200
-300
-10°
-20°
-30°
-40°
-80°
-70°
-60°
-50°
-40°
-30°

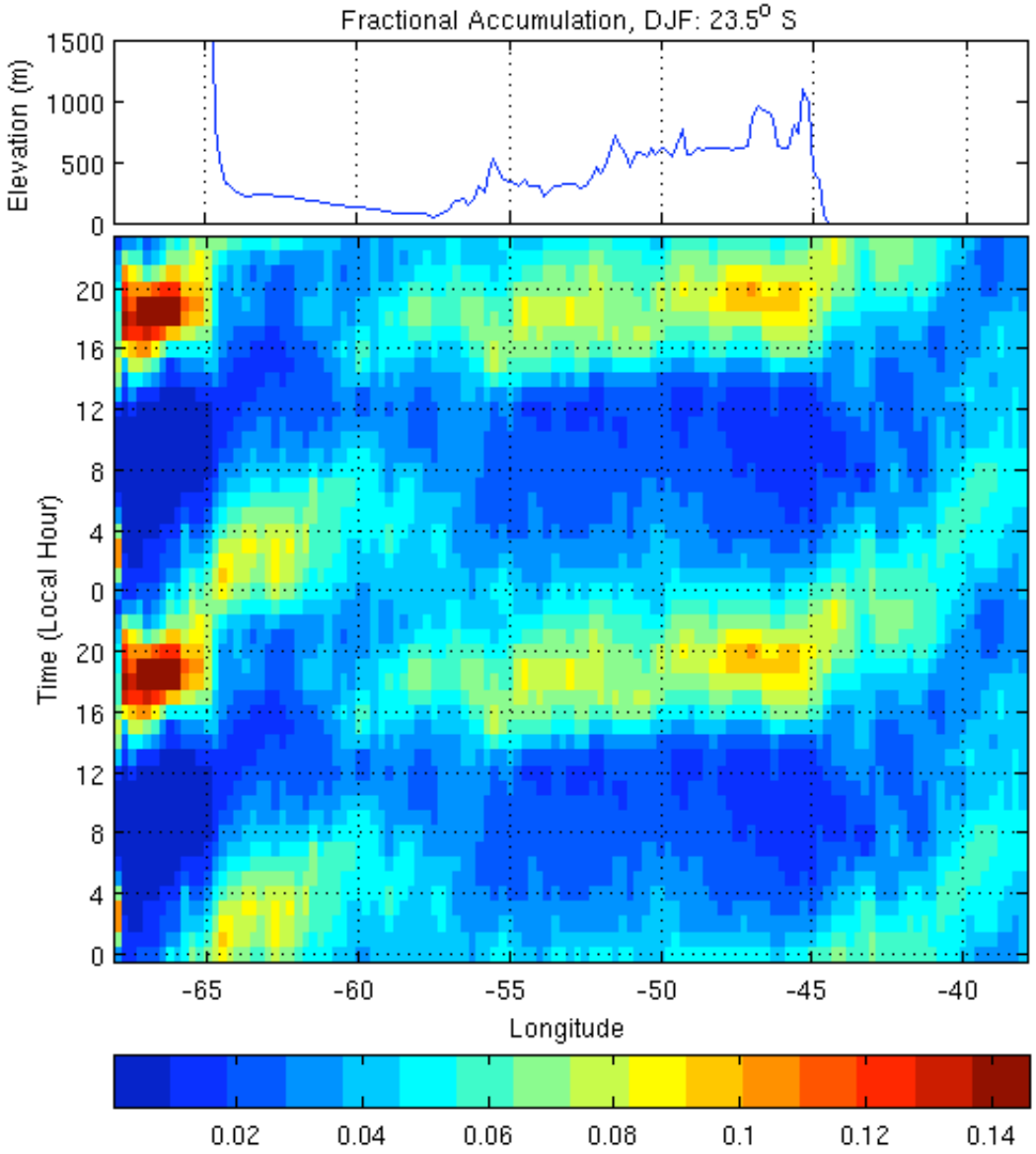

SON Time of Maximum Mean Accumulation (1998-2007)
Local Time
22
20
18
16
14
12
10
8
6
4
2
-10°
-20°
-30°
-40°
-80°
-70°
-60°
-50°
-40°
-30°


DJF Time of Maximum Mean Accumulation (1998-2007)
Local Time
22
20
18
16
14
12
10
8
6
4
2
-10°
-20°
-30°
-40°
-80°
-70°
-60°
-50°
-40°
-30°


Fractional Accumulation, SON: 30° S
Elevation (m)
1500
1000
500
0
Time (Local Hour)
20
16
12
8
4
0
-70
-65
-60
-55
-50
-45
-40
Longitude
0.02
0.04
0.06
0.08
0.1
0.12
0.14

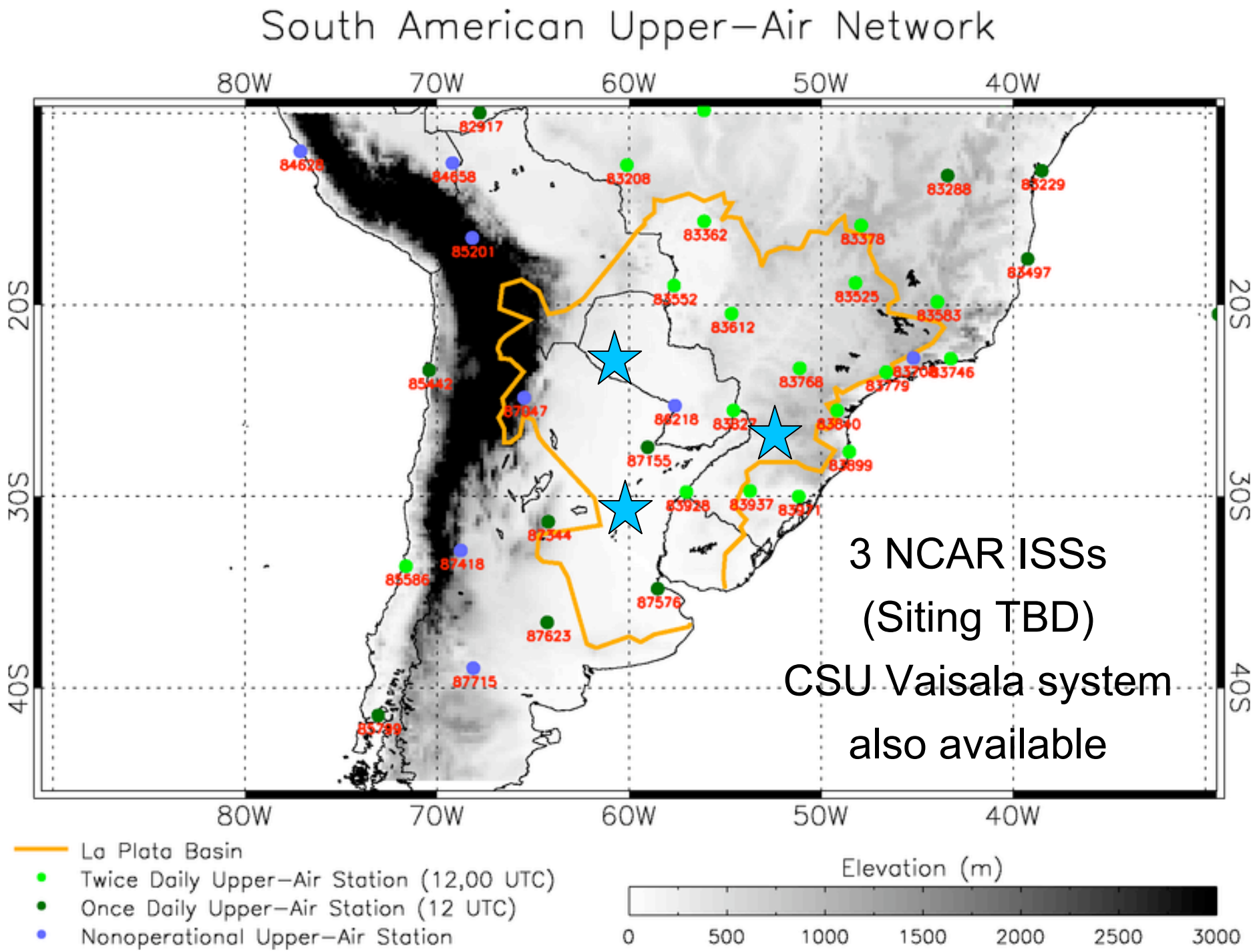

Fractional Accumulation, DJF: 30° S
Elevation (m)
1500
1000
500
0
Time (Local Hour)
0
20
16
12
8
4
0
20
16
12
8
4
0
-70
-65
-60
-55
-50
-45
-40
Longitude
0.02
0.04
0.06
0.08
0.1
0.12
0.14


Fractional Accumulation, SON: 23.5° S
Elevation (m)
1500
1000
500
0
Time (Local Hour)
20
16
12
8
4
0
-65
-60
-55
-50
-45
-40
Longitude
0.02
0.04
0.06
0.08
0.1
0.12
0.14


Fractional Accumulation, DJF: 23.5° S
Elevation (m)
1500
1000
500
0
Time (Local Hour)
20
16
12
8
4
0
-65
-60
-55
-50
-45
-40
Longitude
0.02
0.04
0.06
0.08
0.1
0.12
0.14

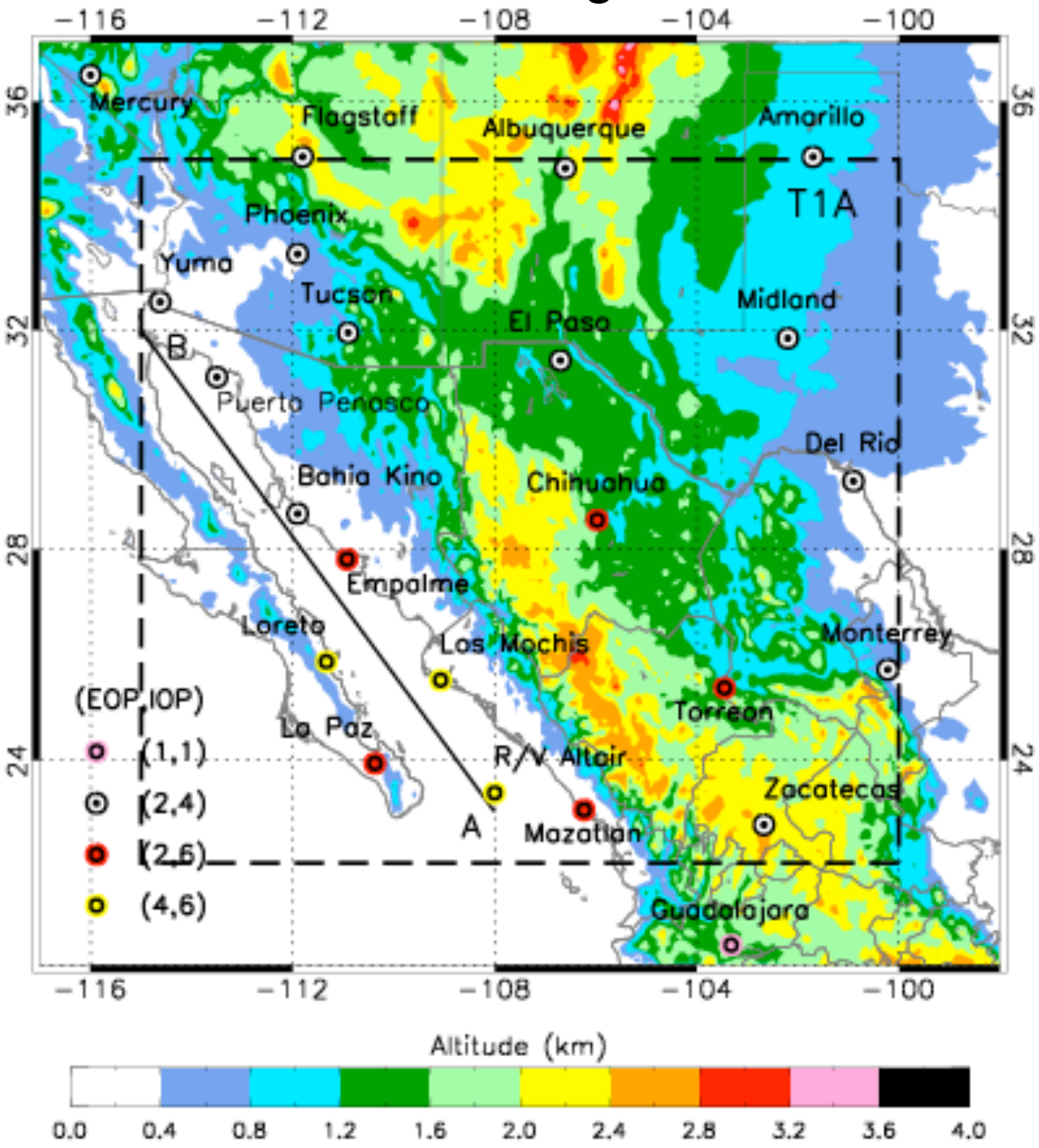
ISS Proposal for PLATEX

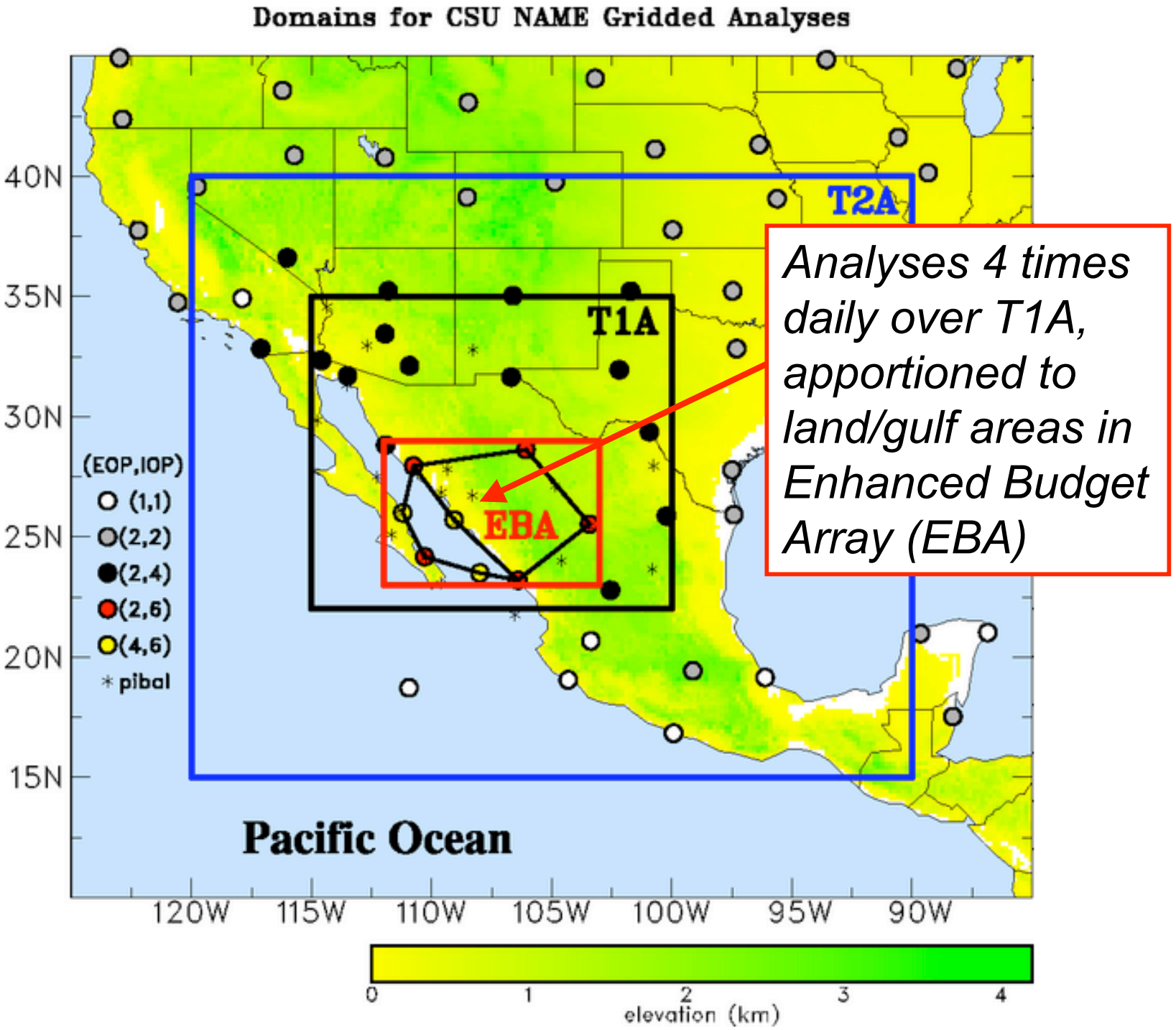
- Three ISSs proposed (915 MHz wind profiler, RASS, soundings, sfc met station)
- Siting to be determined based on radar siting, operational sounding inventory, and location of other experiment platforms
- Establish Enhanced Budget Array (EBA) in S-Pol domain to coordinate with radar measurements
- Surface fluxes (heat, moisture) needed to close budgets


South American Upper–Air Network
80W
70W
60W
50W
40W
20S
30S
40S
82917
84628
84658
83208
83288
83229
83362
83378
85201
83497
83552
83525
83583
83612
85442
83768
83746
87047
88218
87155
83899
82344
87418
85586
87576
87623
87715
85799
3 NCAR ISSs
(Siting TBD)
CSU Vaisala system
also available
La Plata Basin
Twice Daily Upper–Air Station (12,00 UTC)
Once Daily Upper–Air Station (12 UTC)
Nonoperational Upper–Air Station
Elevation (m)
0
500
1000
1500
2000
2500
3000

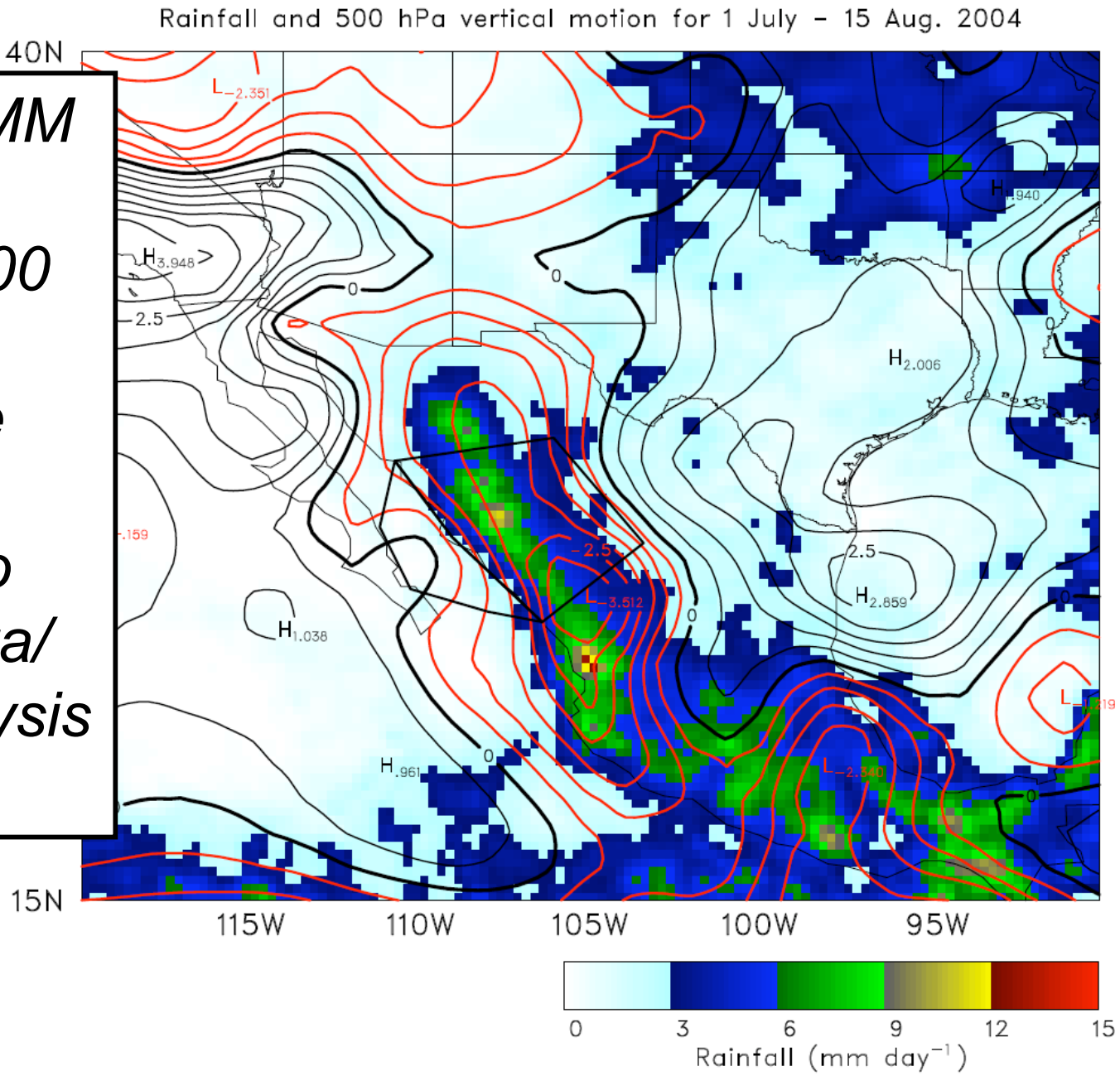
NAME Sounding Network

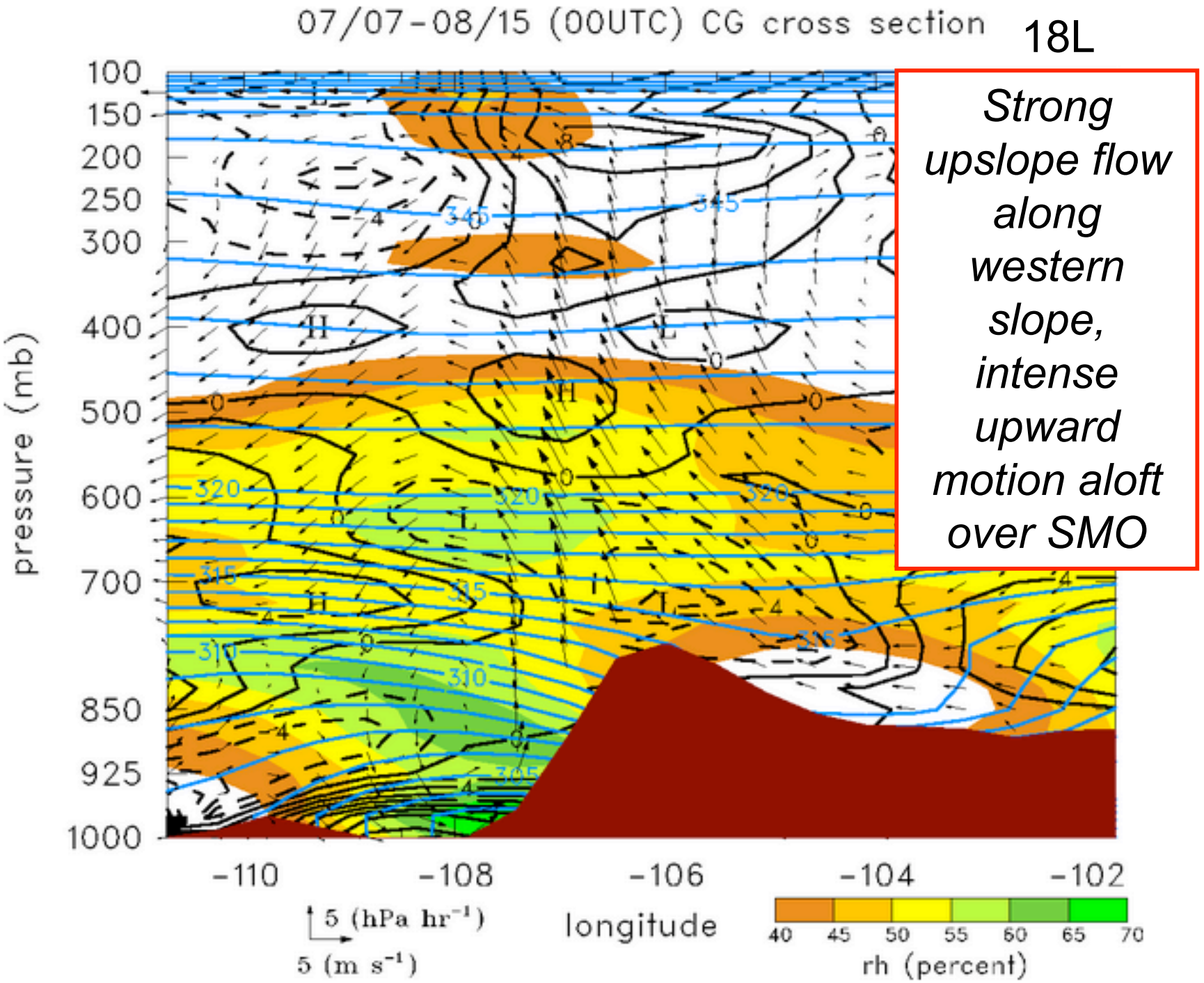
- *Enhanced sounding network, up to 6/day launches during IOPs*
- *Extensive quality control procedure*
- *Gridded data set produced (1º, 25 hPa resolution)*
- *No model data included!*
- *Continuing work underway to correct for RH errors*

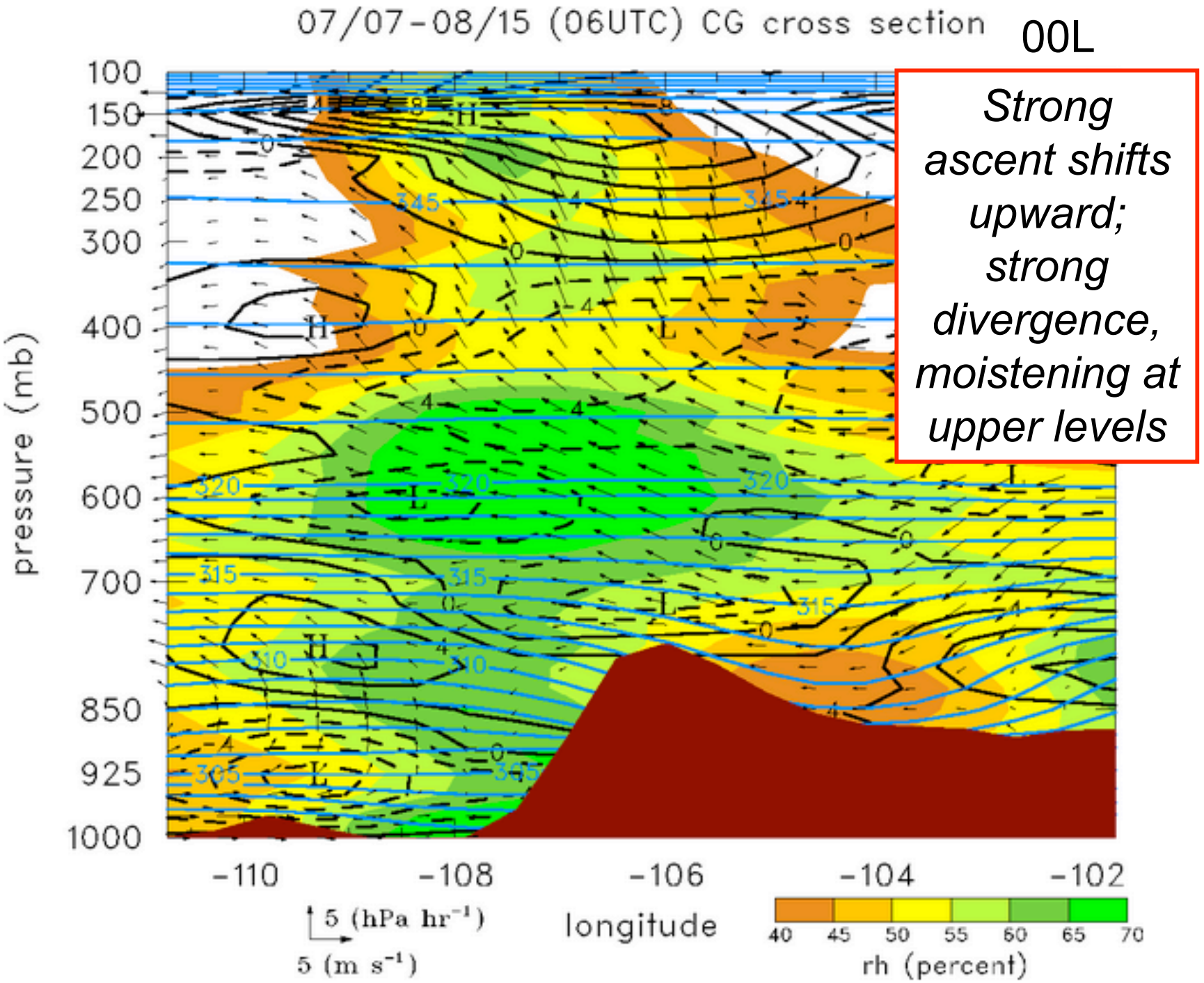



Domains for CSU NAME Gridded Analyses
T2A
T1A
EBA
Pacific Ocean
(EOP,IOP)
(1,1)
(2,2)
(2,4)
(2,6)
(4,6)
pibal
40N
35N
30N
25N
20N
15N
120W
115W
110W
105W
100W
95W
90W
0
1
2
3
4
elevation (km)
Analyses 4 times daily over T1A, apportioned to land/gulf areas in Enhanced Budget Array (EBA)

Rainfall (TRMM 3B42v6) and diagnosed 500 hPa vertical motion agree well, lending confidence to sounding data/ gridded analysis product




07/07-08/15 (00UTC) CG cross section
18L
Strong upslope flow along western slope, intense upward motion aloft over SMO
pressure (mb)
100
150
200
250
300
400
500
600
700
850
925
1000
-110
-108
-106
-104
-102
longitude
5 (hPa hr⁻¹)
5 (m s⁻¹)
40 45 50 55 60 65 70
rh (percent)

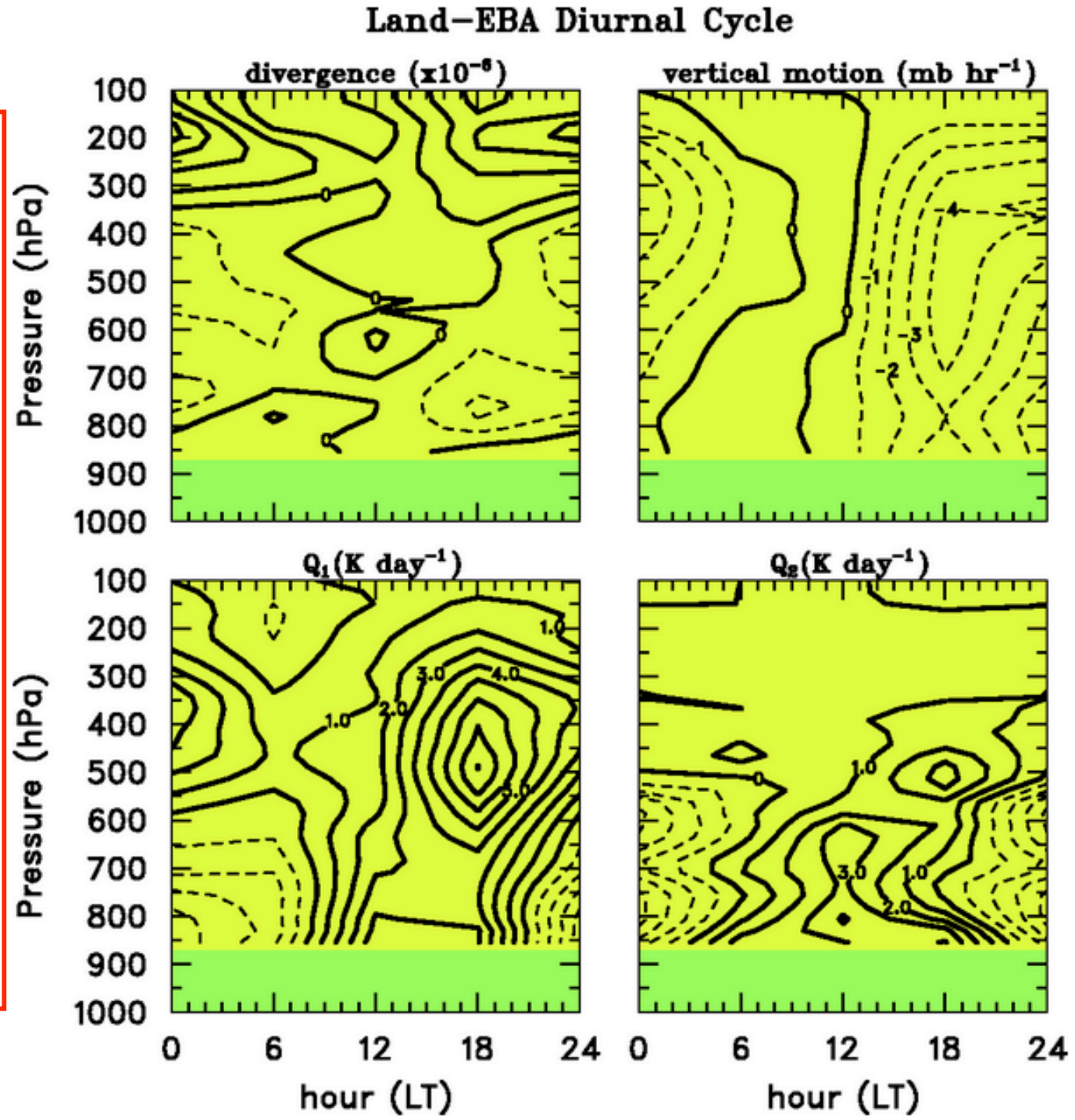

07/07-08/15 (06UTC) CG cross section
00L
Strong ascent shifts upward; strong divergence, moistening at upper levels
pressure (mb)
100
150
200
250
300
400
500
600
700
850
925
1000
-110
-108
-106
-104
-102
longitude
5 (hPa hr⁻¹)
5 (m s⁻¹)
40 45 50 55 60 65 70
rh (percent)

- *Maxima shift upward during day*

$\Rightarrow$

developing convection

- *Transition to stratiform precipitation during nighttime hours*



Questions?