AMSR Rainfall Algorithm

Status, Issues and Prospects

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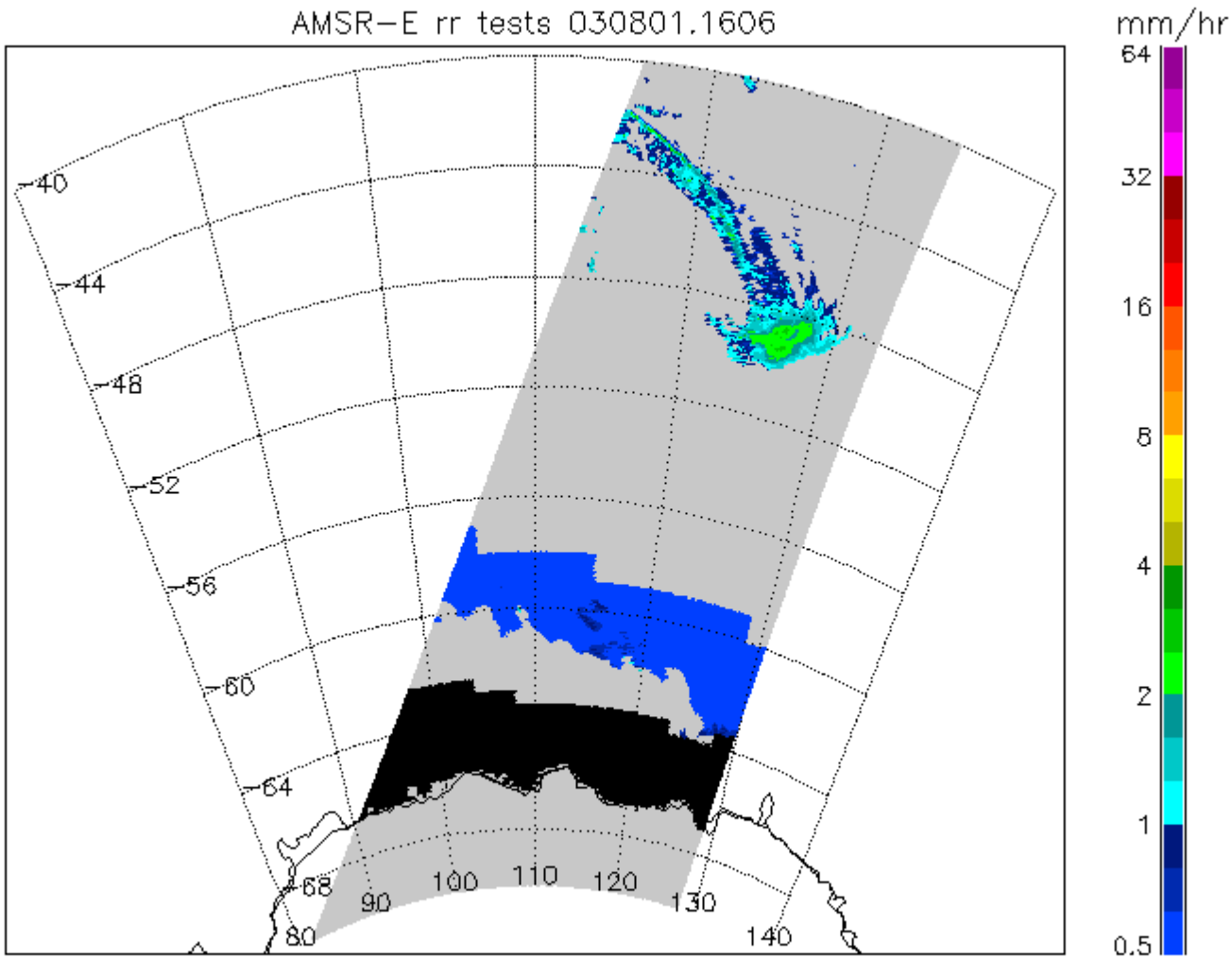
Issues (from previous meeting)

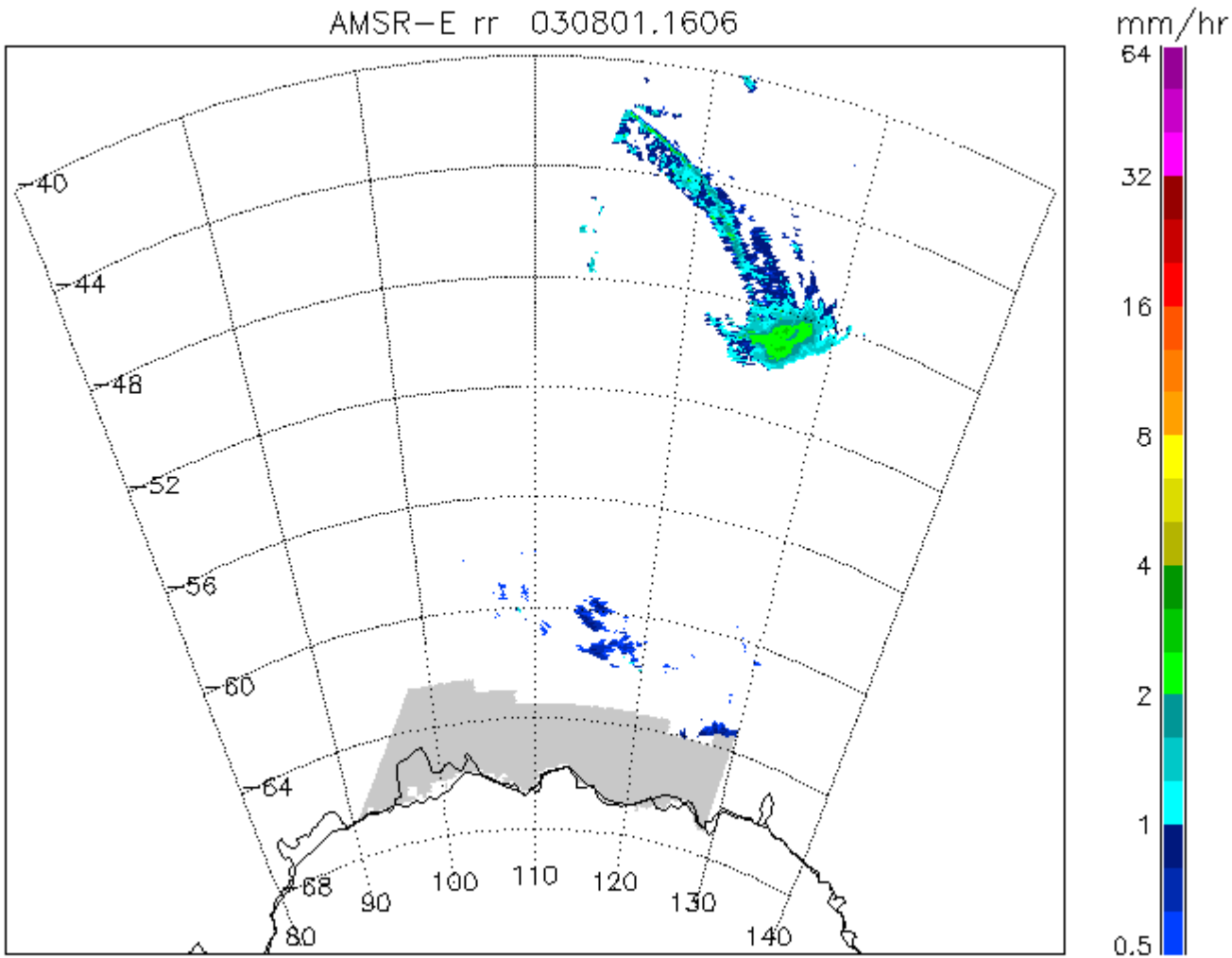
- Rare “missing” pixels in the middle of raining regions.
  Still open: LWP error. So rare that fix is worse than problem.

- “Sea ice” flag logic is implemented incorrectly.
  Resolved: Sea ice “possible” mask was creating problems

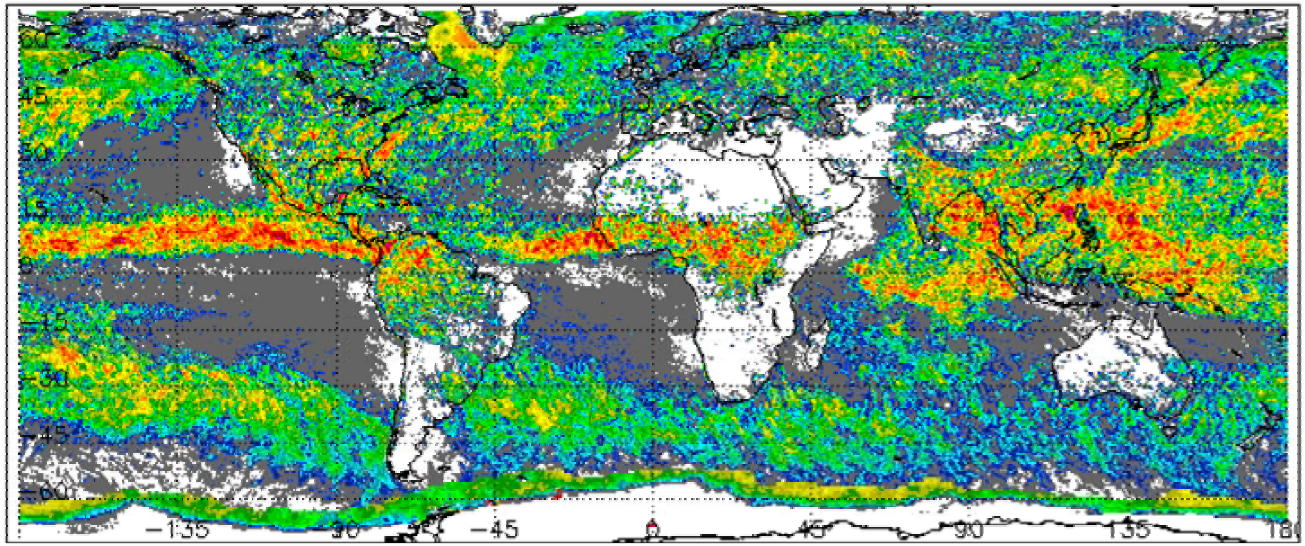
- Potential dropout of 85V channel
  Action: Add orbit number check to switch from A scan to B scan data if orbit no. > than hard-coded value.

- Data structure has no place for identifying “ambiguous” pixels retrieved primarily over land. Currently set to “missing” but we can set to (-rain).
  Resolved: Dawn Conway helped modify output format

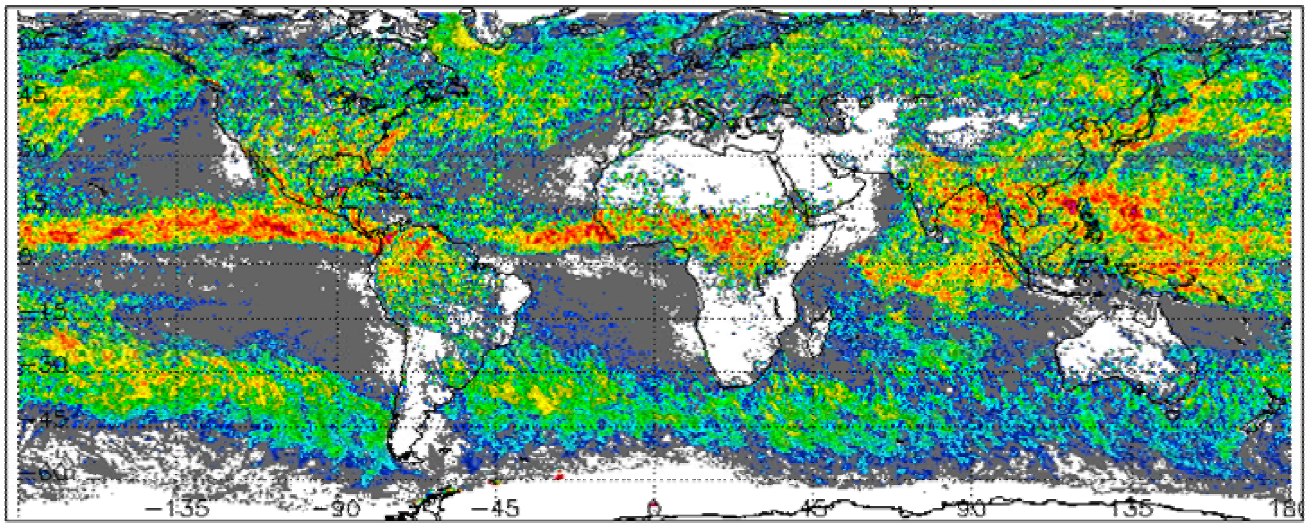

AMSR-E rr tests 030801.1606
mm/hr
64
32
16
8
4
2
1
0.5
-40
-44
-48
-52
-56
-60
-64
-68
80
90
100
110
120
130
140

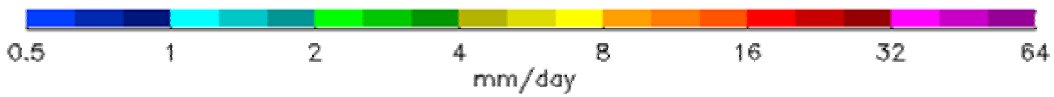

AMSR-E rr 030801.1606
mm/hr
64
32
16
8
4
2
1
0.5
-40
-44
-48
-52
-56
-60
-64
-68
80
90
100
110
120
130
140

Unconditional Rain t.0.250000 all 0308

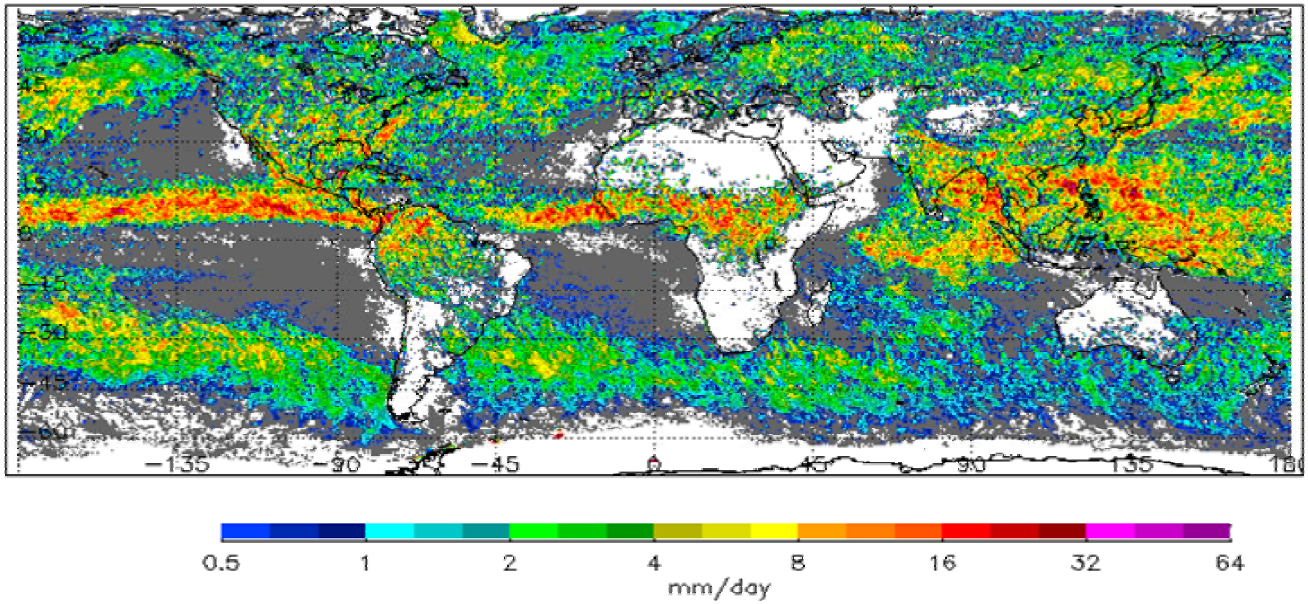


Unconditional Rain t.1.00000 all 0308

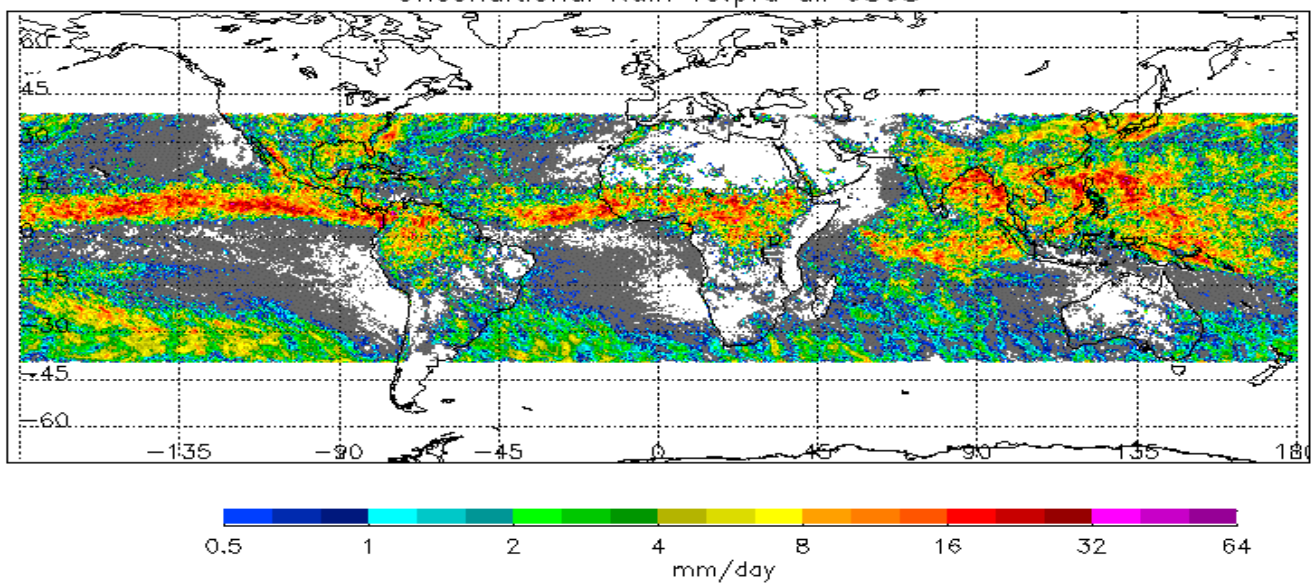


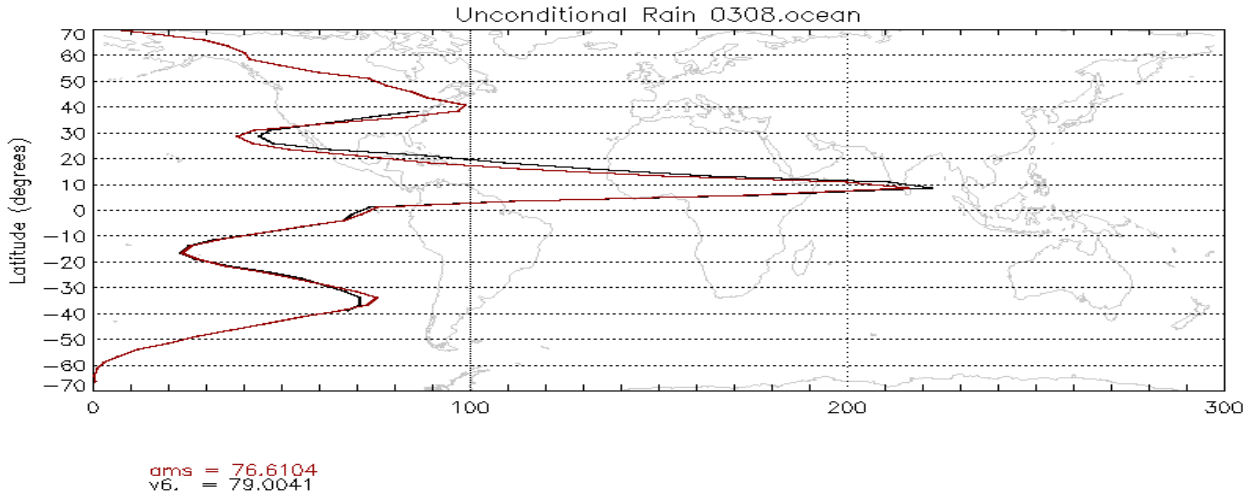


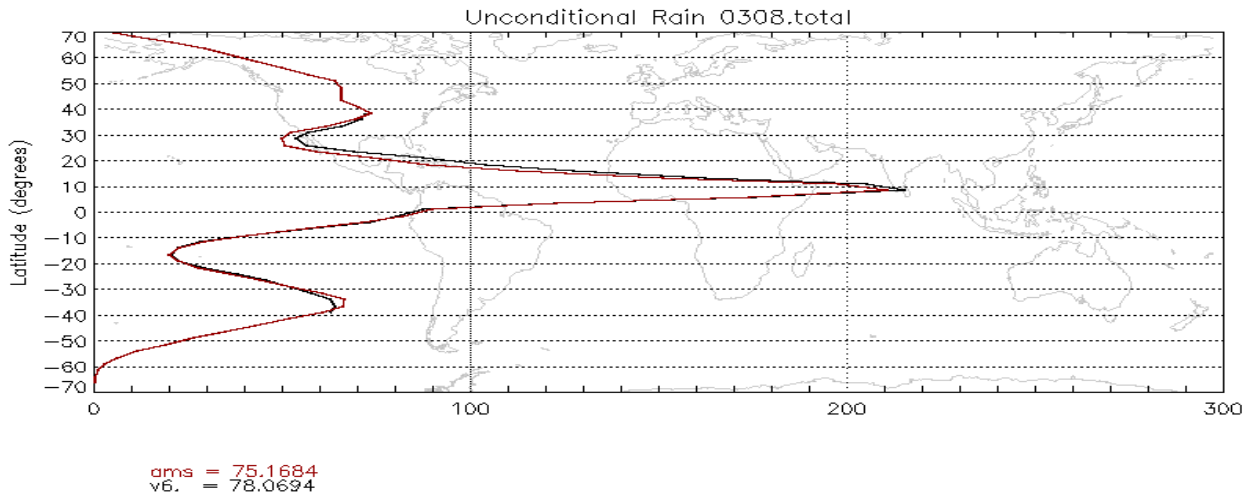
Unconditional Rain t.1.00000 all 0308



Unconditional Rain v6.pra all 0308



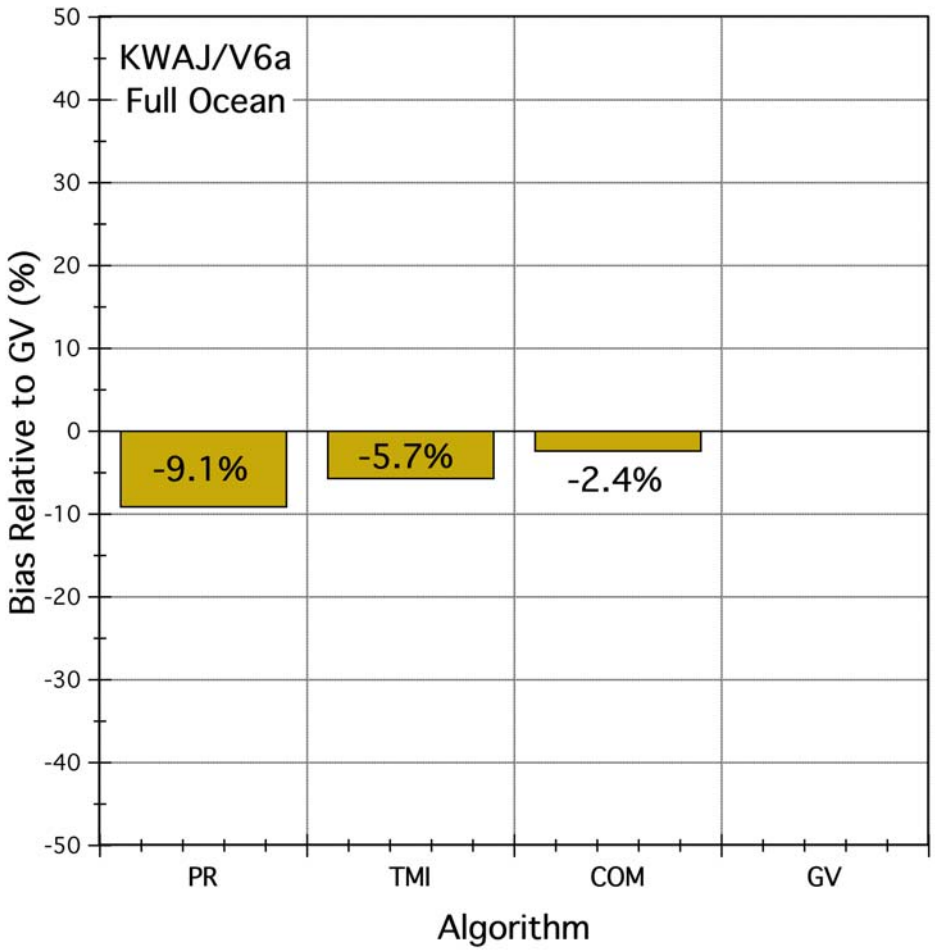

Unconditional Rain 0308.ocean
Latitude (degrees)
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
0
100
200
300
ams = 76.6104
v6. = 79.0041


Unconditional Rain 0308.total
Latitude (degrees)
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
0
100
200
300
ams = 75.1684
v6. = 78.0694

Kwajalein Biases “Ocean”

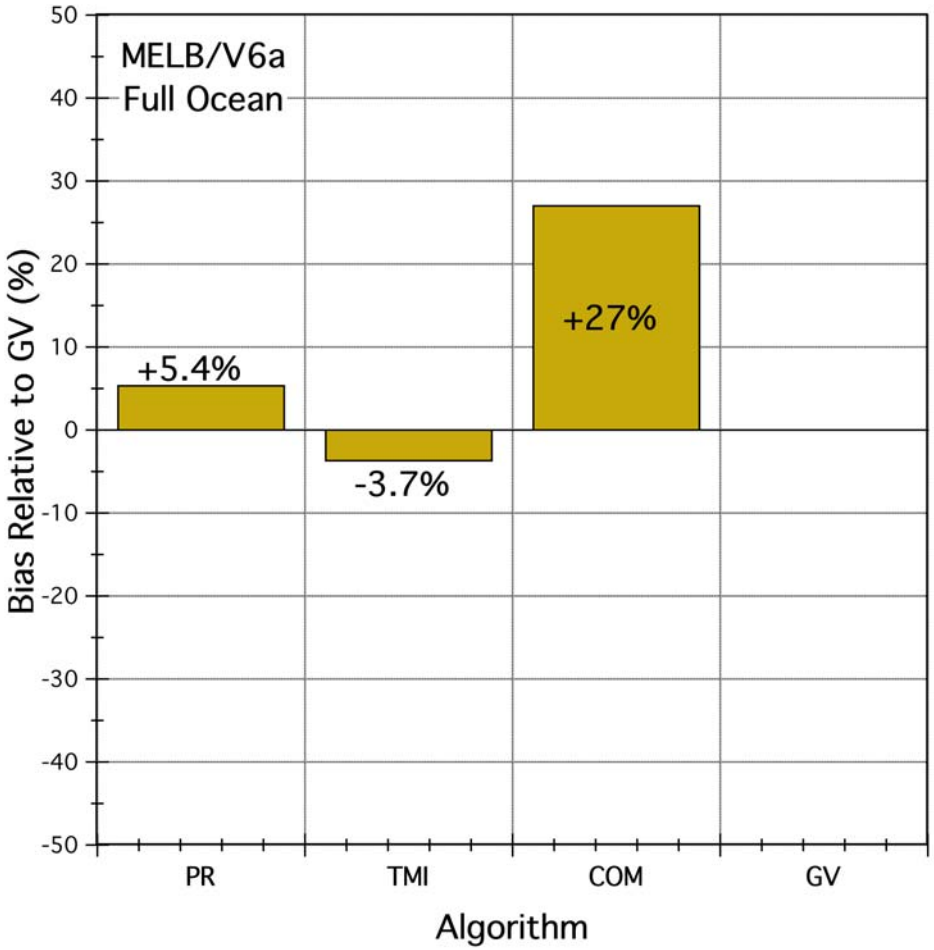
Biases relative to GV

B = 100%*(GV-Alg)/GV



Courtesy of Dave Wolff, NASA/GSFC

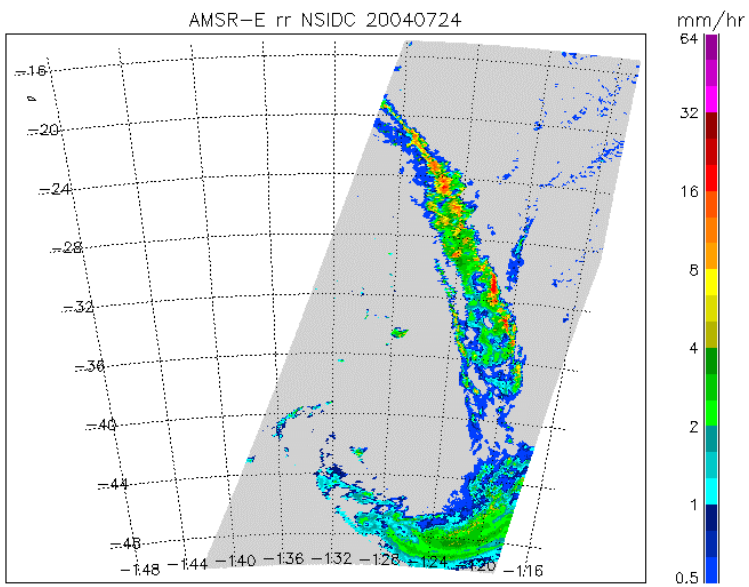
MELB "Full Ocean" Bulk Biases

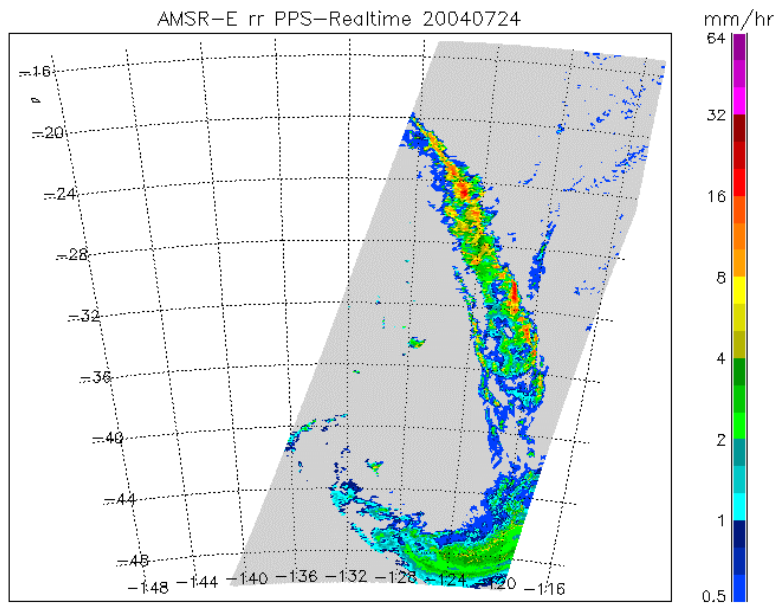


Courtesy of Dave Wolff, NASA/GSFC

AMSR algorithm summary

- Algorithm is running w/o issues at the moment
- Implemented real-time version of it at GSFC for use by multi-satellite product developed by Adler et al. Version numbers becoming an issue among different data centers/sensors.
- Continue to make minor modifications in coast algorithm


AMSR-E rr NSIDC 20040724
mm/hr
64
32
16
8
4
2
1
0.5
-16
-20
-24
-28
-32
-36
-40
-44
-48
-148
-144
-140
-136
-132
-128
-124
-120
-116


AMSR-E rr PPS-Realtime 20040724
mm/hr
64
32
16
8
4
2
1
0.5
-16
-20
-24
-28
-32
-36
-40
-44
-48
-148
-144
-140
-136
-132
-128
-124
-120
-116

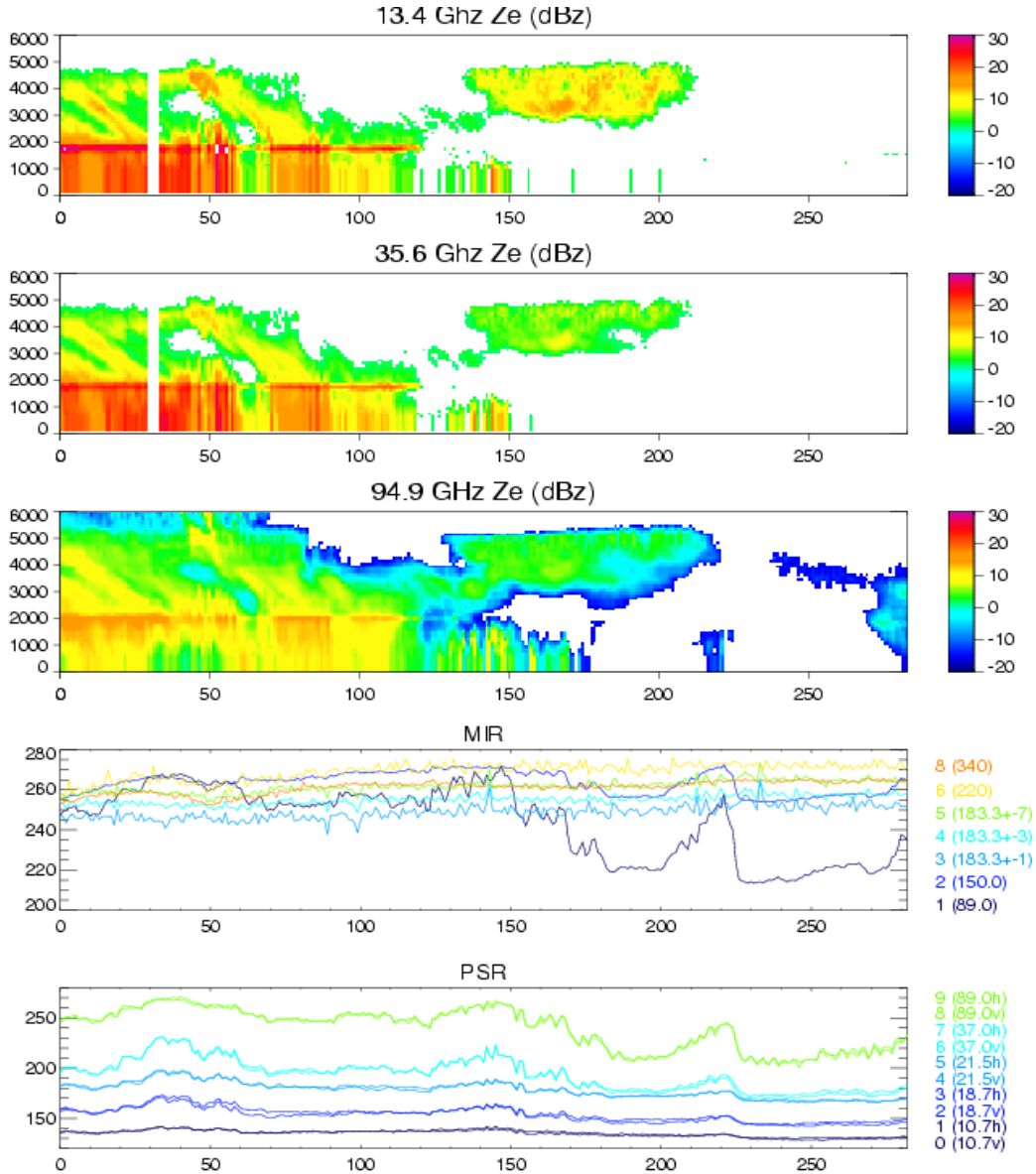
Wakasa Bay Campaign

The issue: Different validation sites come up with different biases. There are not enough sites to interpret inter-site biases in a statistically meaningful manner

The plan: Switch to a physical validation paradigm

- identify assumptions in algorithm
- measure assumed parameters
- verify that algorithm with additional parameters yields results that are correct and site independent
- develop methodologies for estimating assumed parameters

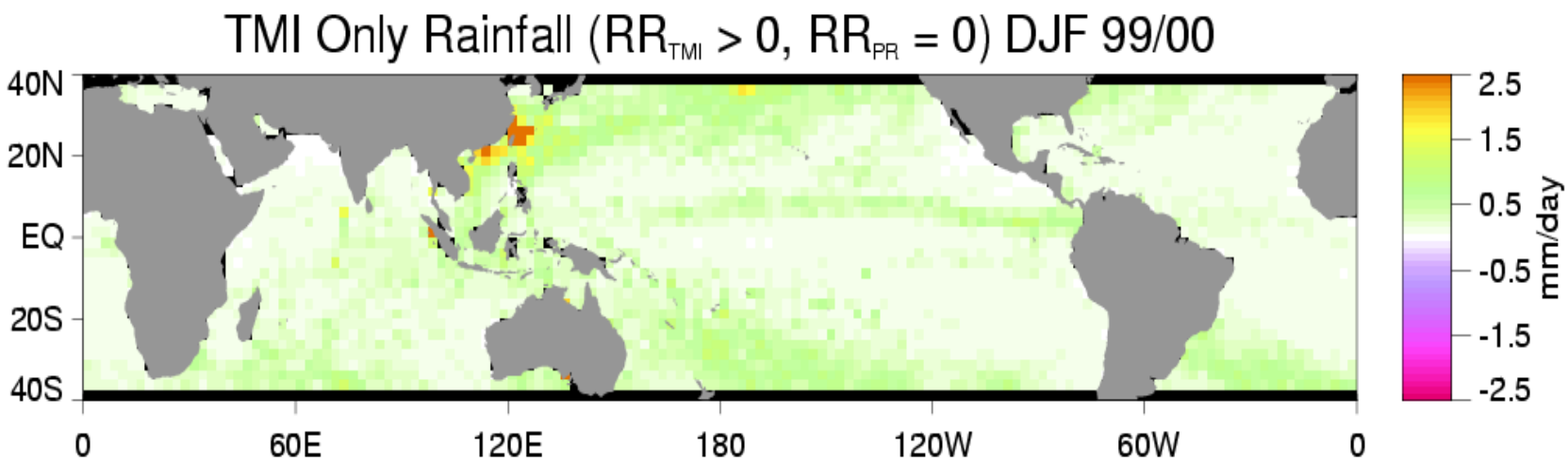
The first step: Use Wakasa Bay observations to determine the extent to which geophysical parameters are constrained when all available radar and radiometer measurements are made simultaneously.

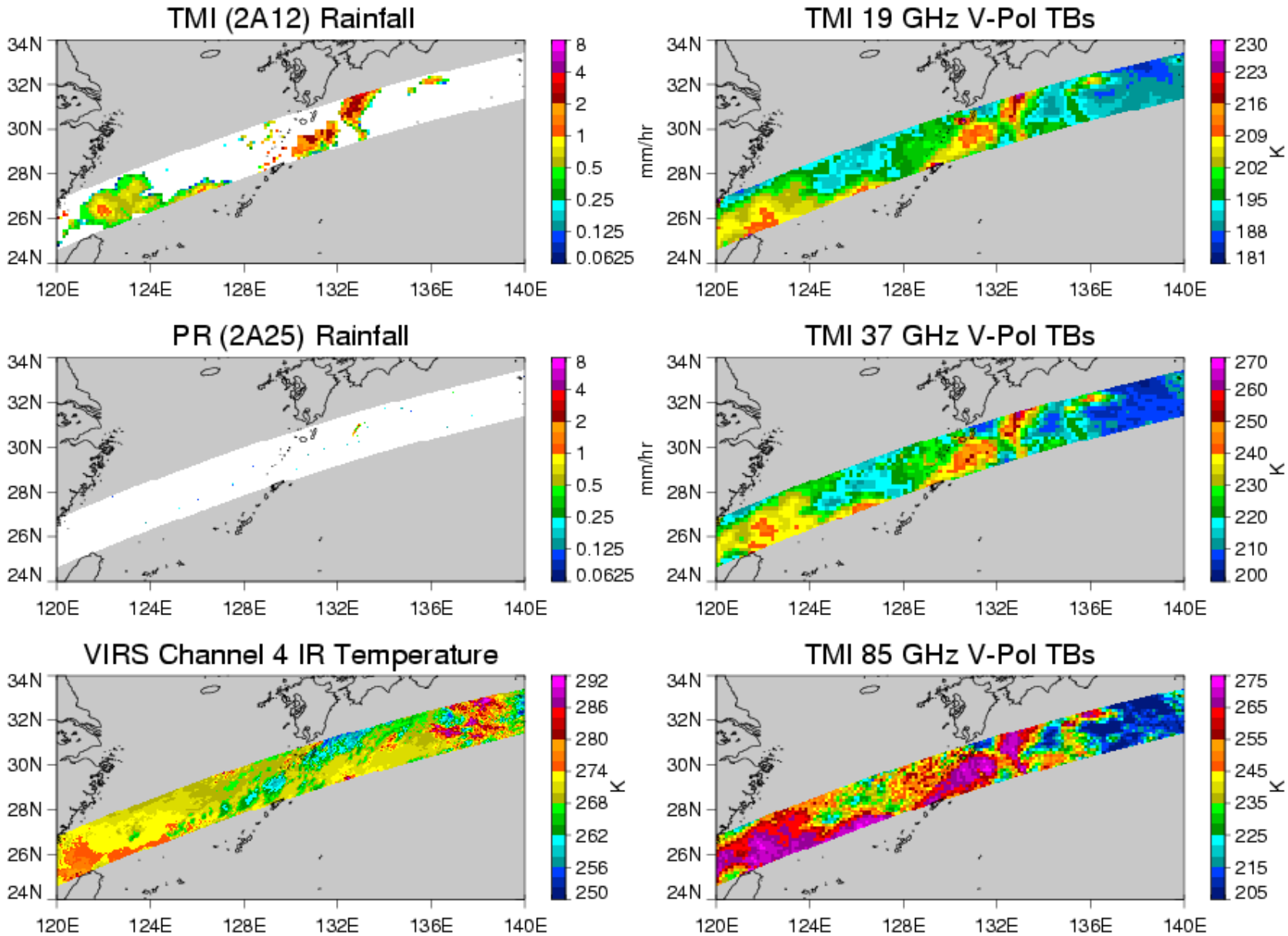

13.4 Ghz Ze (dBz)
35.6 Ghz Ze (dBz)
94.9 GHz Ze (dBz)
MIR
8 (340)
6 (220)
5 (183.3+-7)
4 (183.3+-3)
3 (183.3+-1)
2 (150.0)
1 (89.0)
PSR
9 (89.0h)
8 (89.0v)
7 (37.0h)
6 (37.0v)
5 (21.5h)
4 (21.5v)
3 (18.7h)
2 (18.7v)
1 (10.7h)
0 (10.7v)

GPROF algorithm science

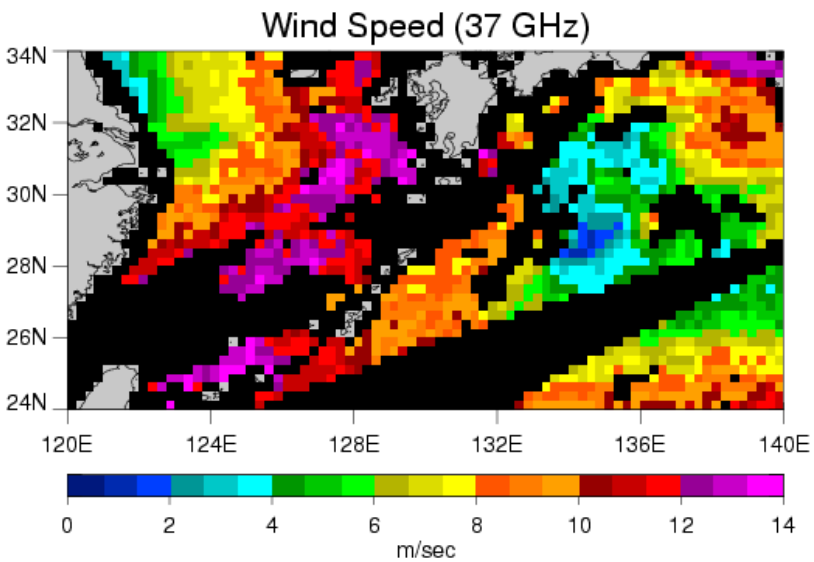
- Version 7 under development. Use TRMM PR w. Cloud Models to construct much more robust a-priori database that reflects observed distributions of clouds (AMSR solution will benefit in tropics but not regions of SST colder than ~15°C)

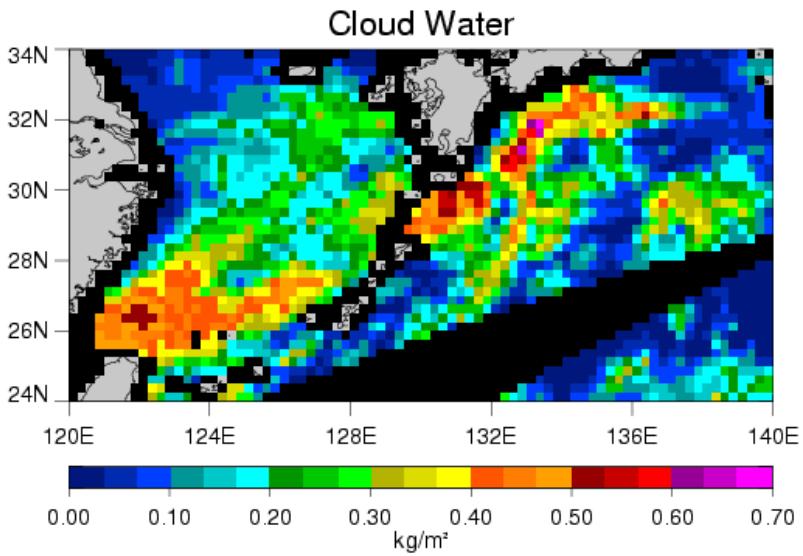
- Must understand current difference between radar and radiometer

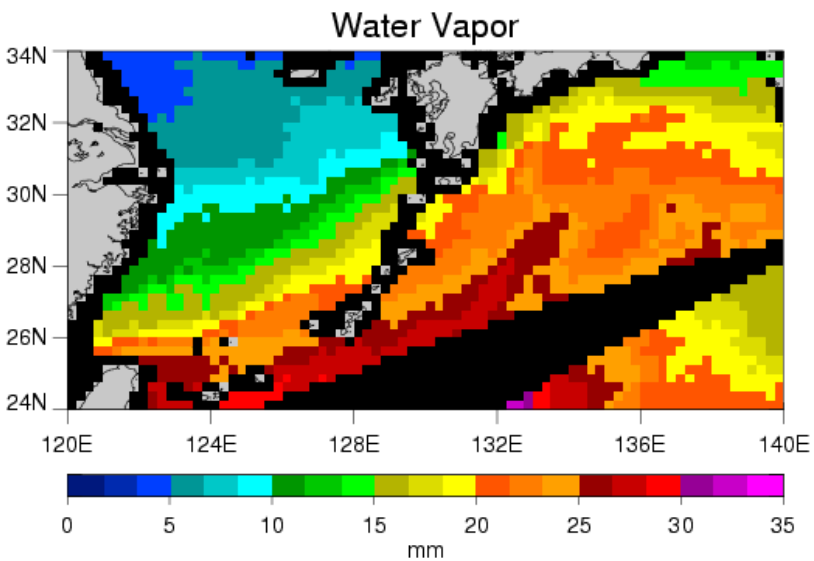

TMI Only Rainfall (RR$_{TMI}$ > 0, RR$_{PR}$ = 0) DJF 99/00
40N
20N
EQ
20S
40S
0
60E
120E
180
120W
60W
0
2.5
1.5
0.5
-0.5
-1.5
-2.5
mm/day

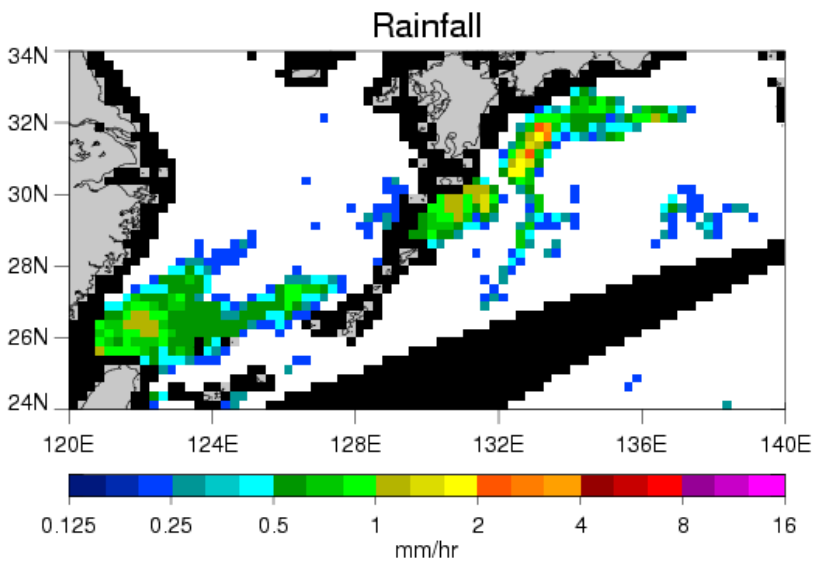

TMI (2A12) Rainfall
mm/hr
8
4
2
1
0.5
0.25
0.125
0.0625
TMI 19 GHz V-Pol TBs
K
230
223
216
209
202
195
188
181
PR (2A25) Rainfall
TMI 37 GHz V-Pol TBs
270
260
250
240
230
220
210
200
VIRS Channel 4 IR Temperature
292
286
280
274
268
262
256
250
TMI 85 GHz V-Pol TBs
275
265
255
245
235
225
215
205
34N
32N
30N
28N
26N
24N
120E
124E
128E
132E
136E
140E

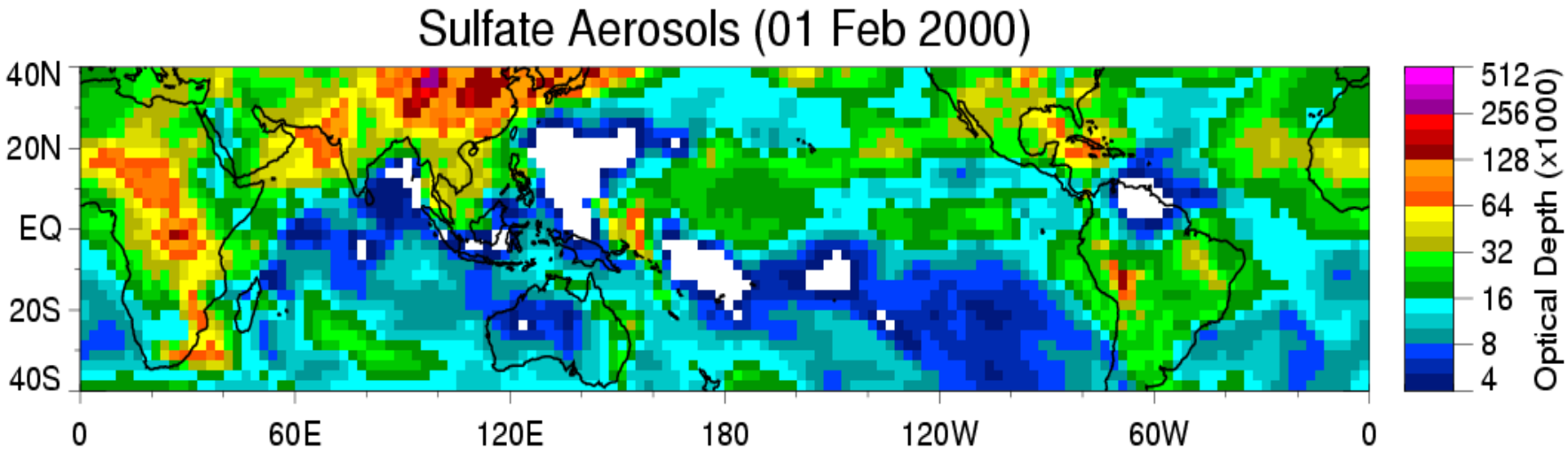
RSS Products

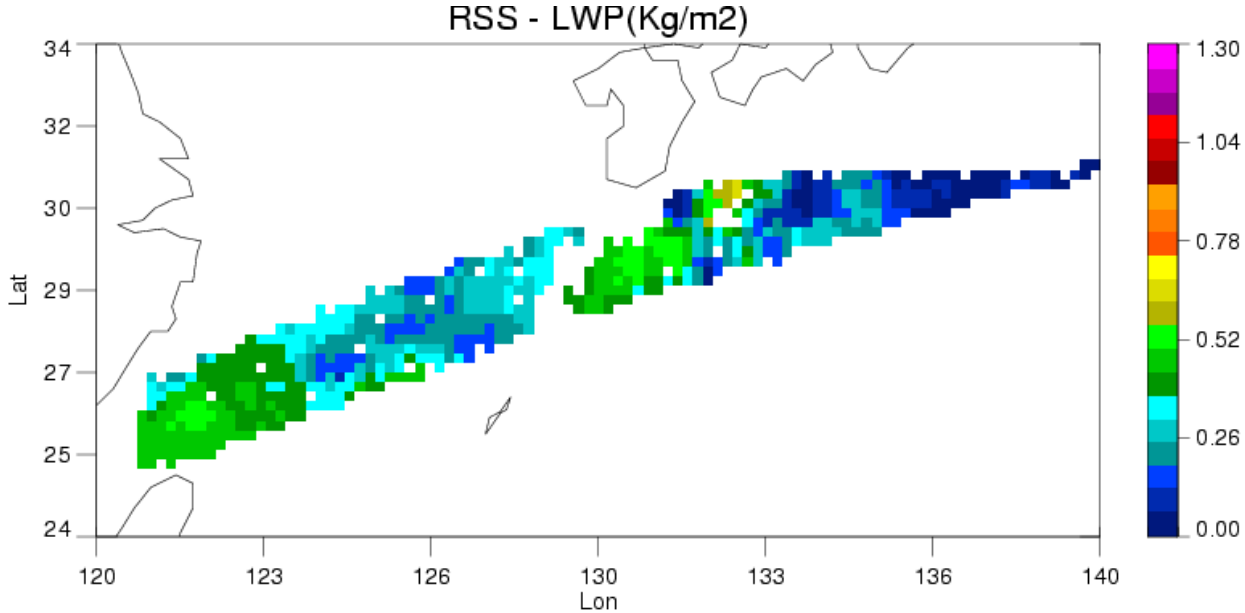


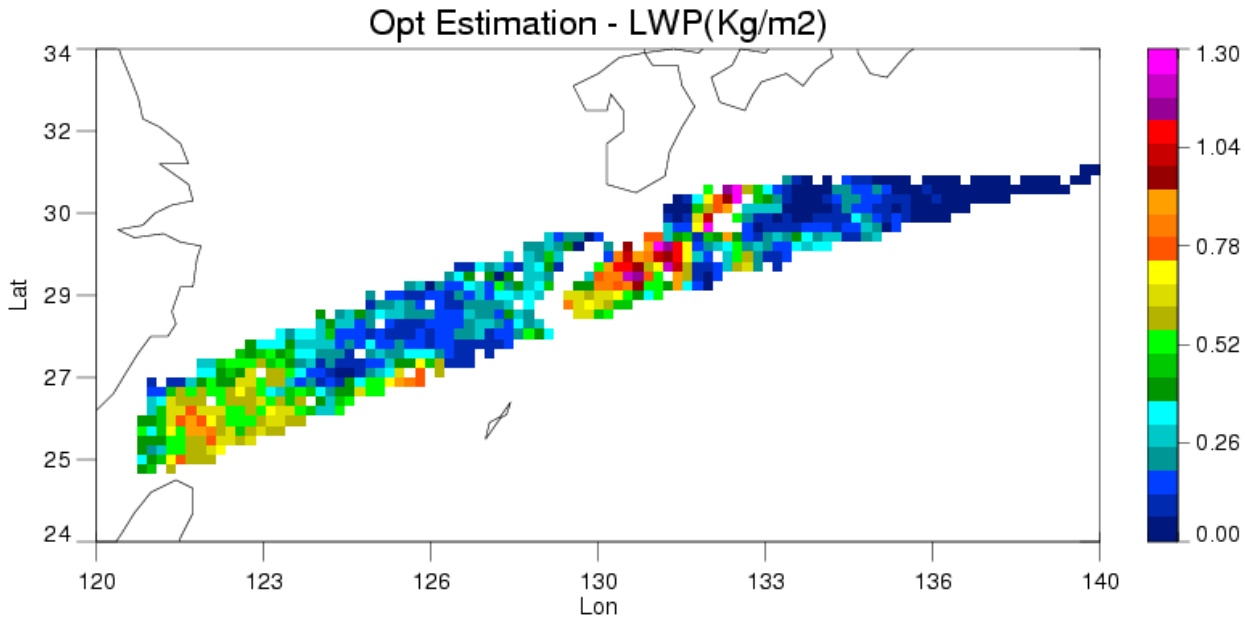


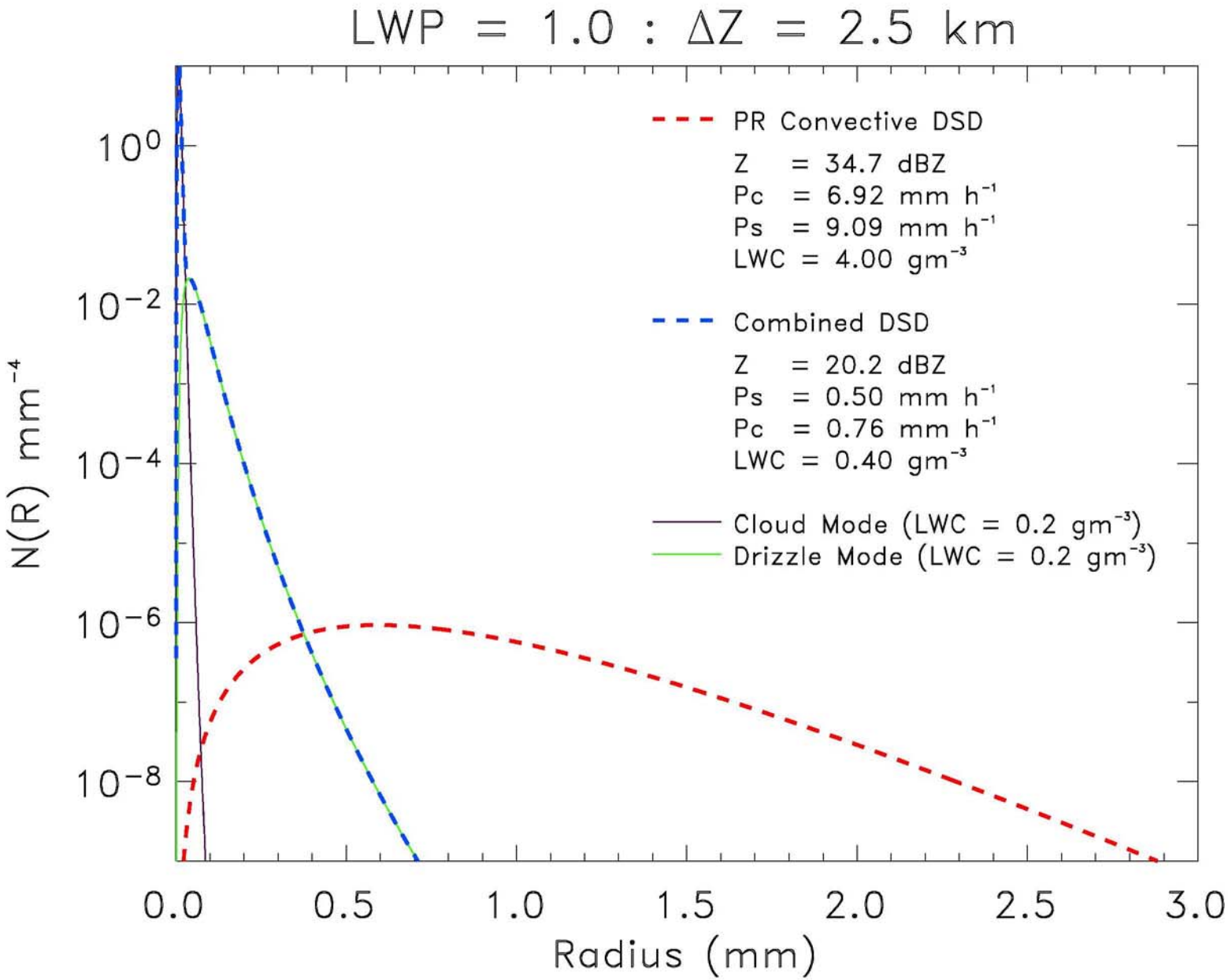


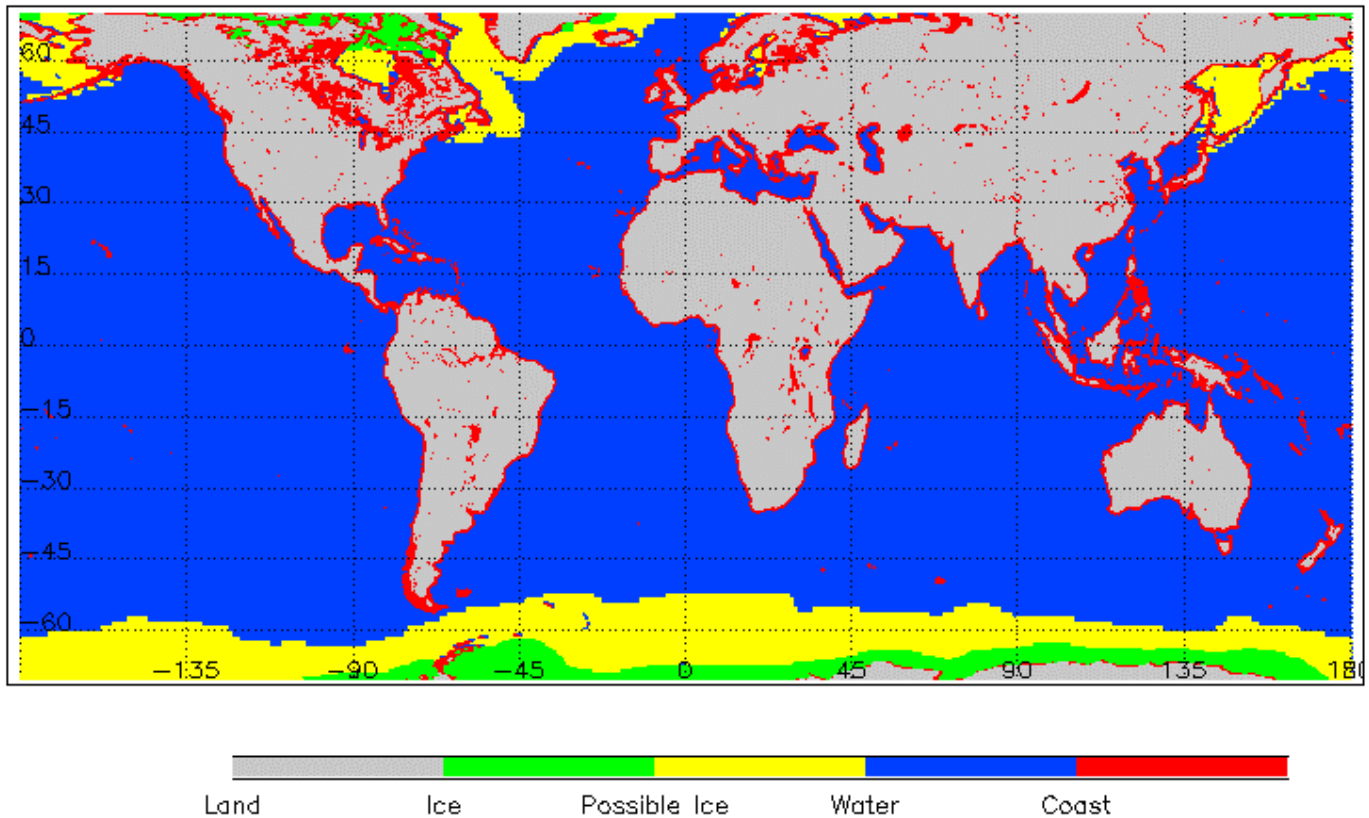


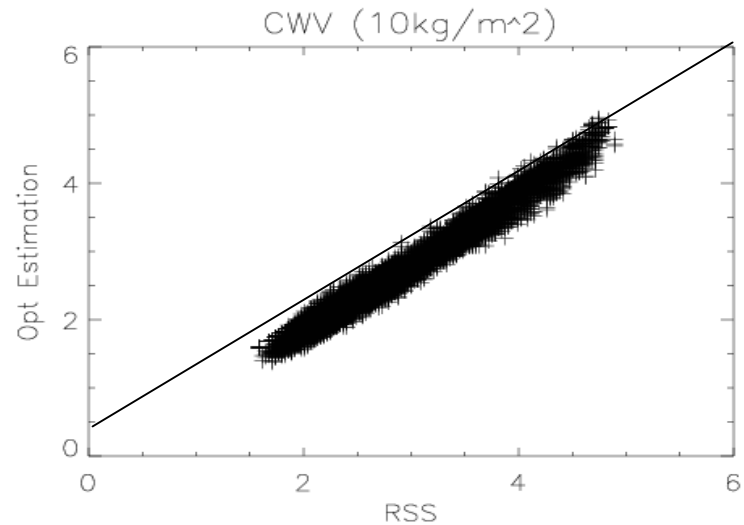

Sulfate Aerosols (01 Feb 2000)
40N
20N
EQ
20S
40S
0
60E
120E
180
120W
60W
0
512
256
128
64
32
16
8
4
Optical Depth (x1000)

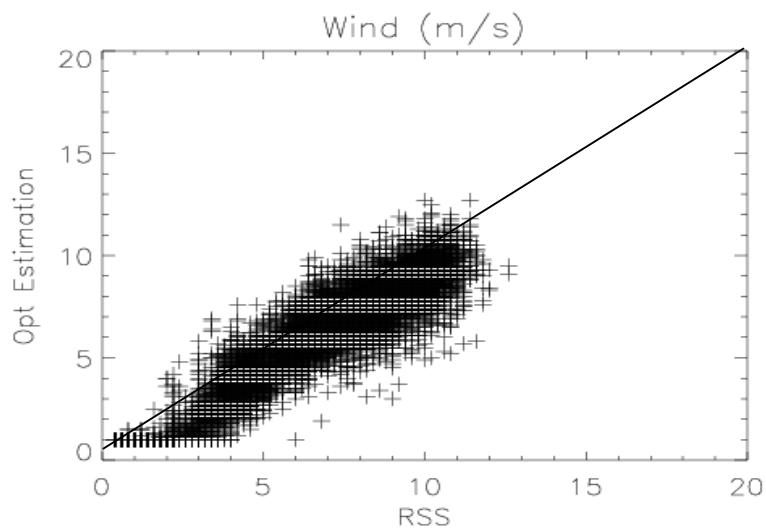

RSS - LWP(Kg/m2)
Lat
34
32
30
29
27
25
24
120
123
126
130
133
136
140
Lon
1.30
1.04
0.78
0.52
0.26
0.00

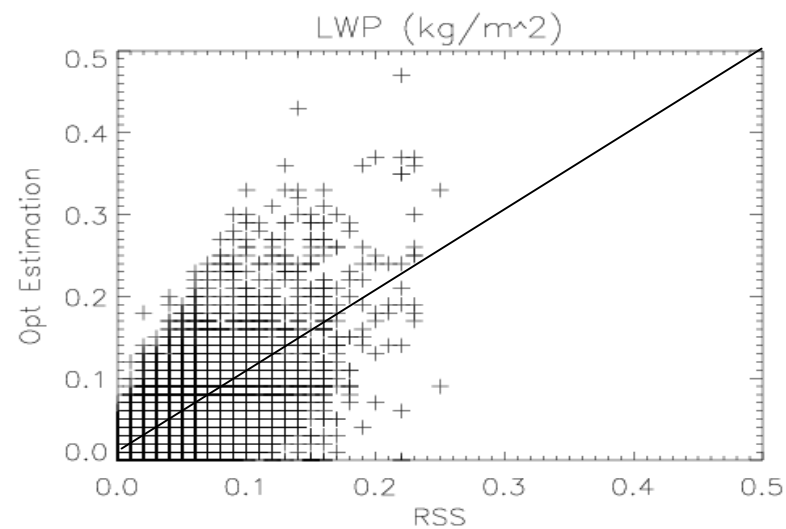

Opt Estimation - LWP(Kg/m2)
Lat
34
32
30
29
27
25
24
120
123
126
130
133
136
140
Lon
1.30
1.04
0.78
0.52
0.26
0.00

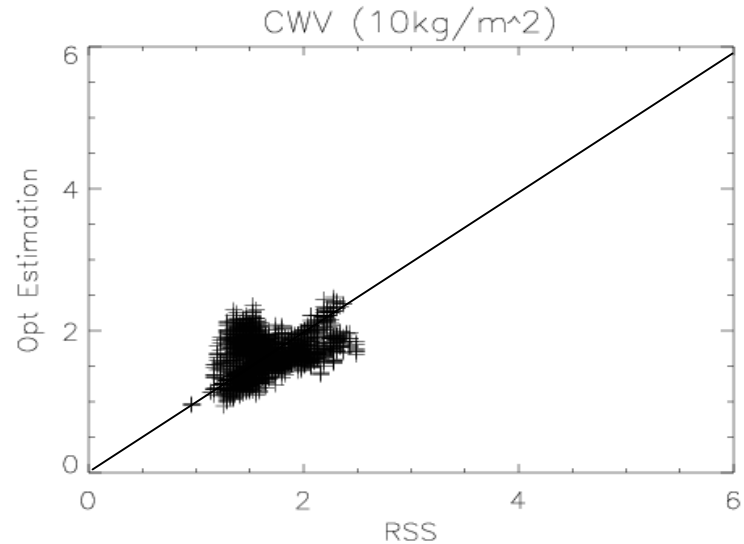

LWP = 1.0 : ΔZ = 2.5 km
PR Convective DSD
Z = 34.7 dBZ
Pc = 6.92 mm h⁻¹
Ps = 9.09 mm h⁻¹
LWC = 4.00 gm⁻³
Combined DSD
Z = 20.2 dBZ
Ps = 0.50 mm h⁻¹
Pc = 0.76 mm h⁻¹
LWC = 0.40 gm⁻³
Cloud Mode (LWC = 0.2 gm⁻³)
Drizzle Mode (LWC = 0.2 gm⁻³)
N(R) mm⁻⁴
10⁰
10⁻²
10⁻⁴
10⁻⁶
10⁻⁸
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Radius (mm)

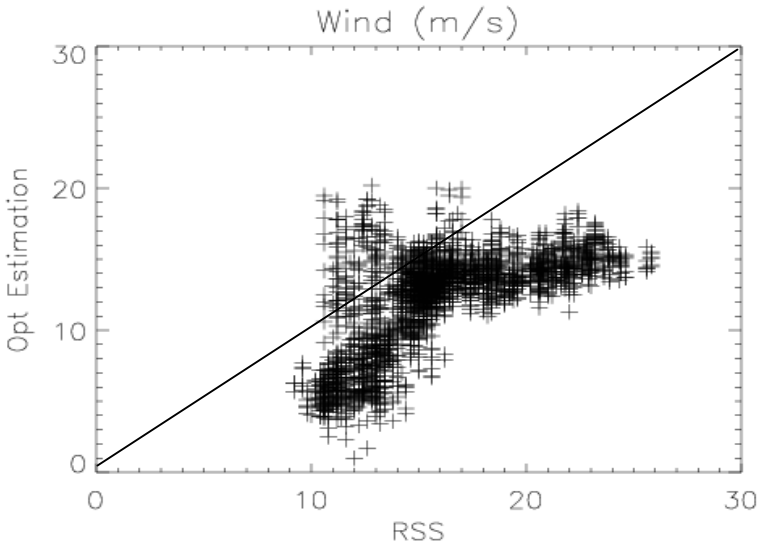

60
45
30
15
0
−15
−30
−45
−60
−135
−90
−45
0
45
90
135
180
Land
Ice
Possible Ice
Water
Coast

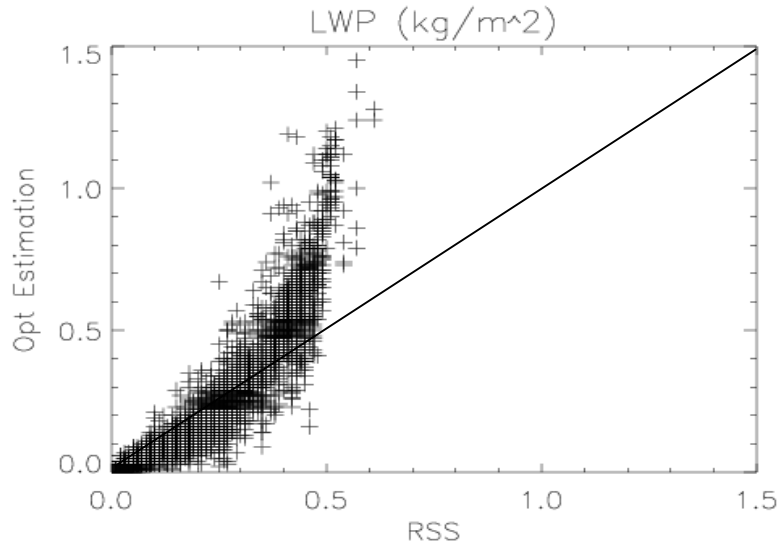

CWV (10kg/m^2)
Opt Estimation
RSS
0
2
4
6


Wind (m/s)
Opt Estimation
RSS
0
5
10
15
20

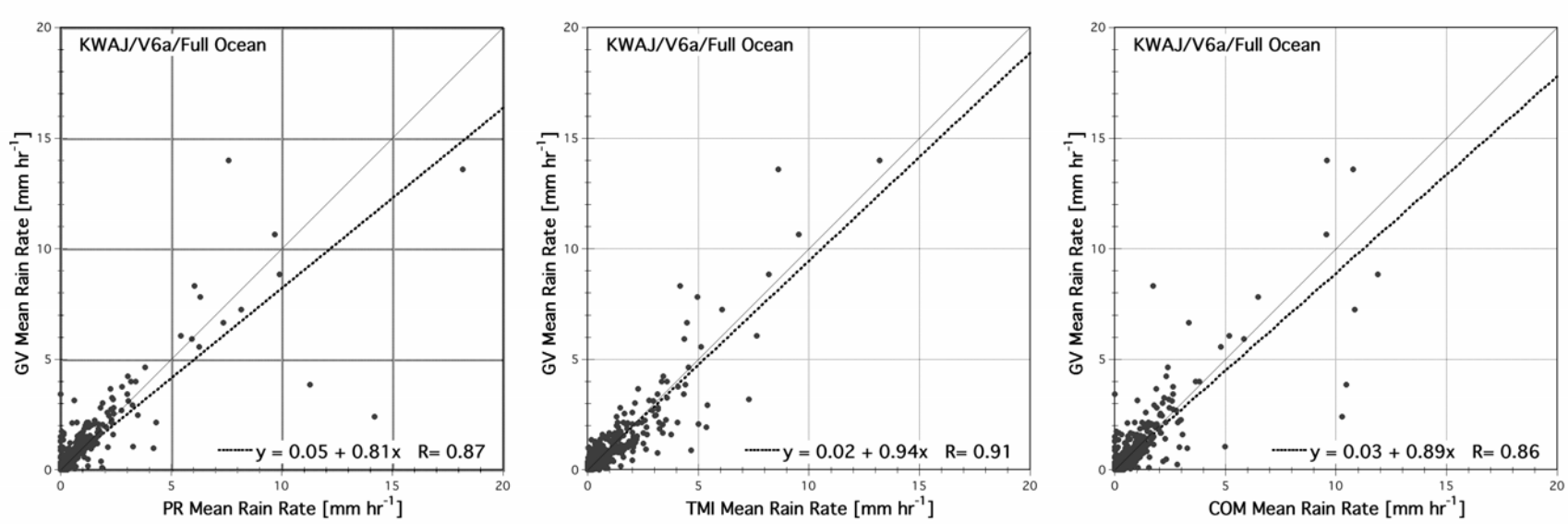

LWP (kg/m^2)
Opt Estimation
RSS
0.0
0.1
0.2
0.3
0.4
0.5


CWV (10kg/m^2)
Opt Estimation
RSS
0
2
4
6


Wind (m/s)
Opt Estimation
RSS
0
10
20
30

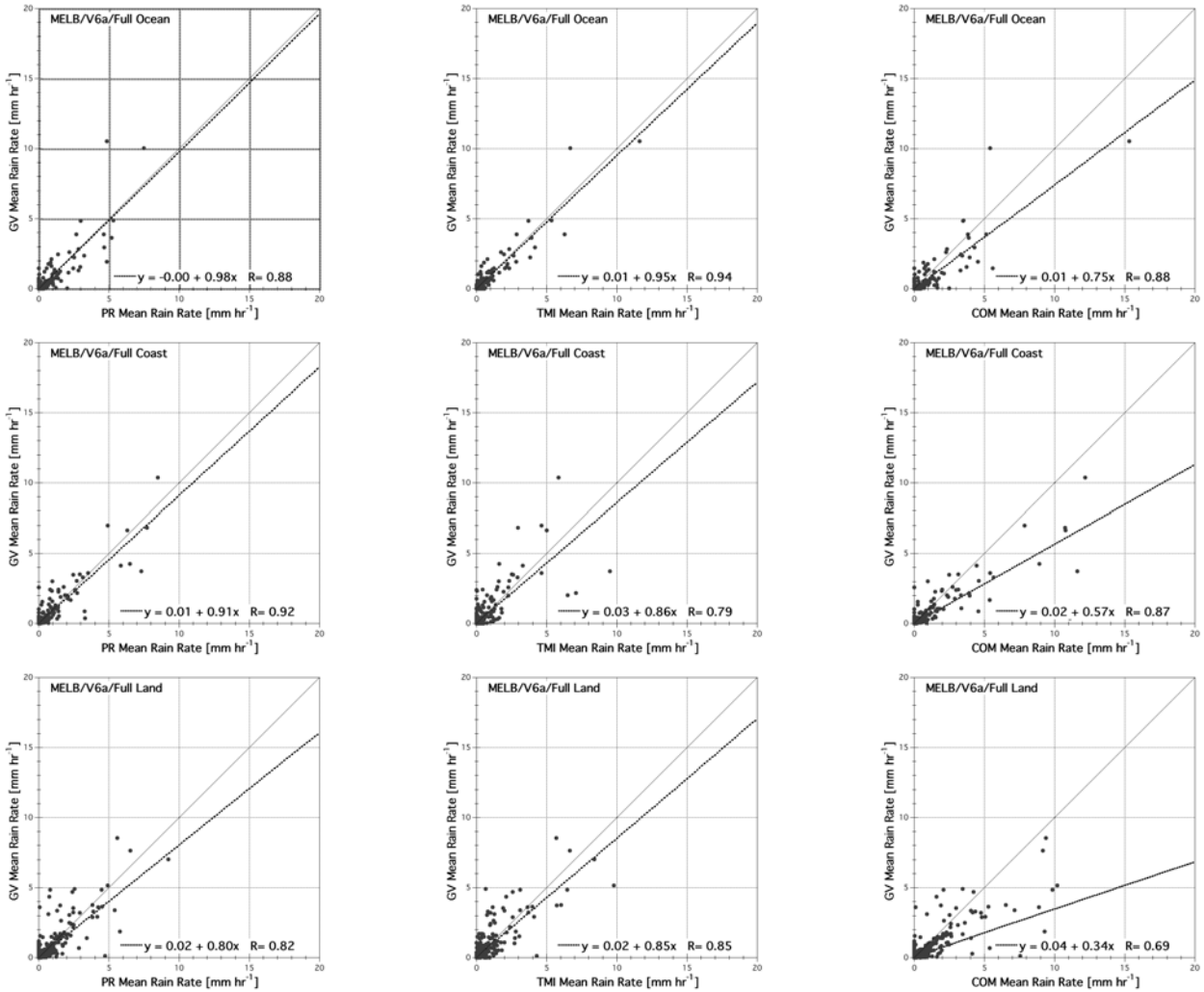

LWP (kg/m^2)
Opt Estimation
RSS
0.0
0.5
1.0
1.5

KWAJ "Full Ocean" Scatter Plots

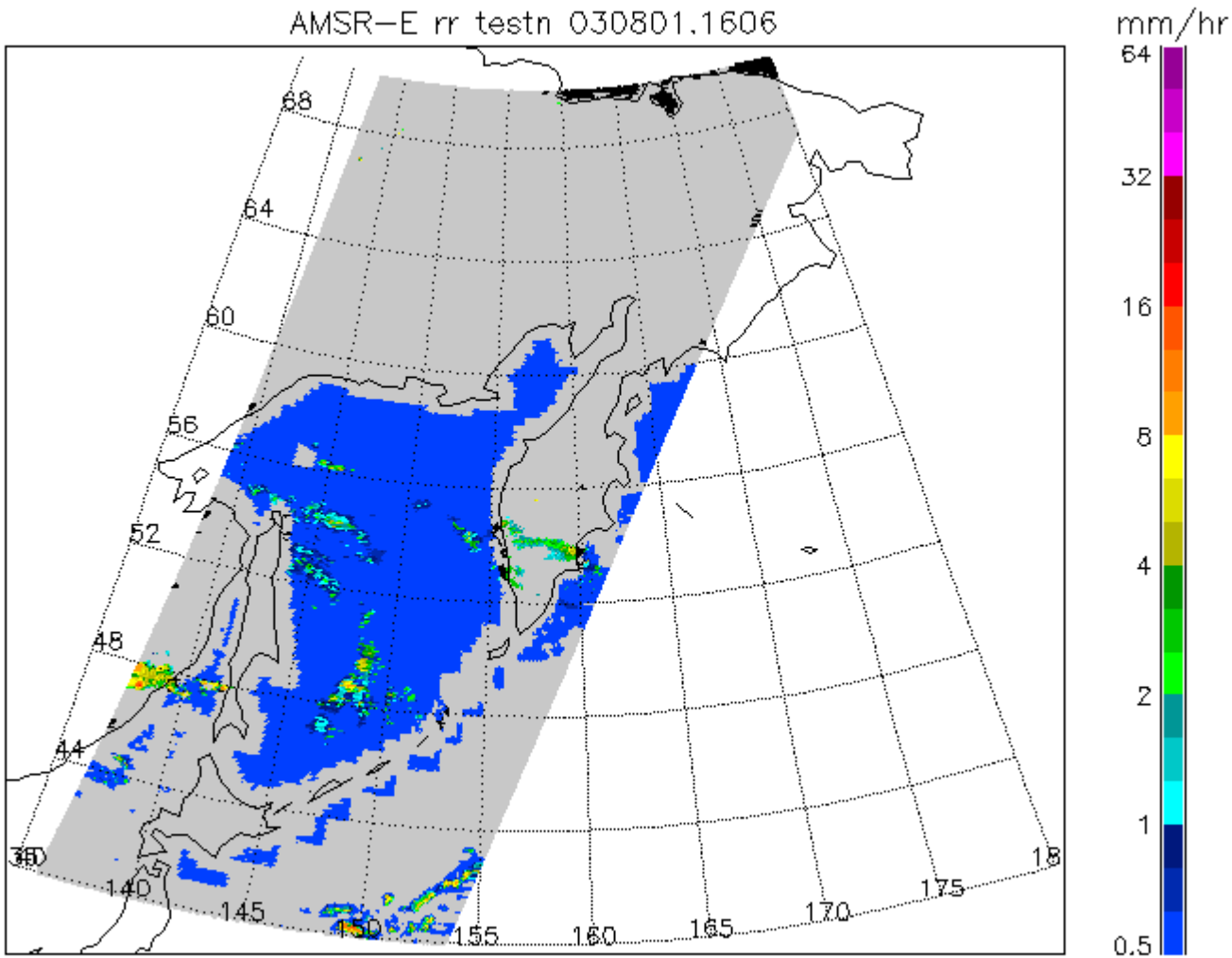


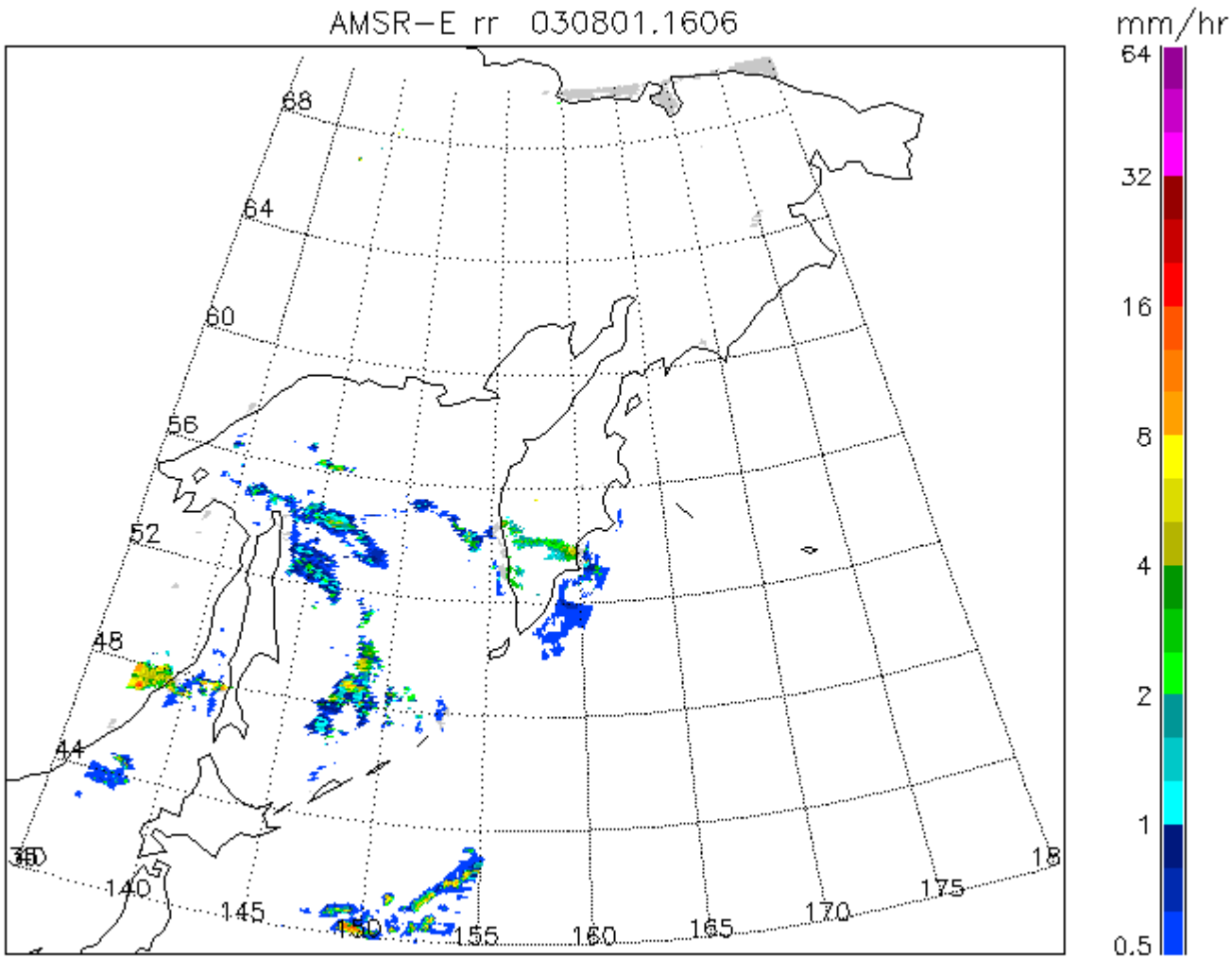
Courtesy of Dave Wolff, NASA/GSFC

MELB Scatter Plots

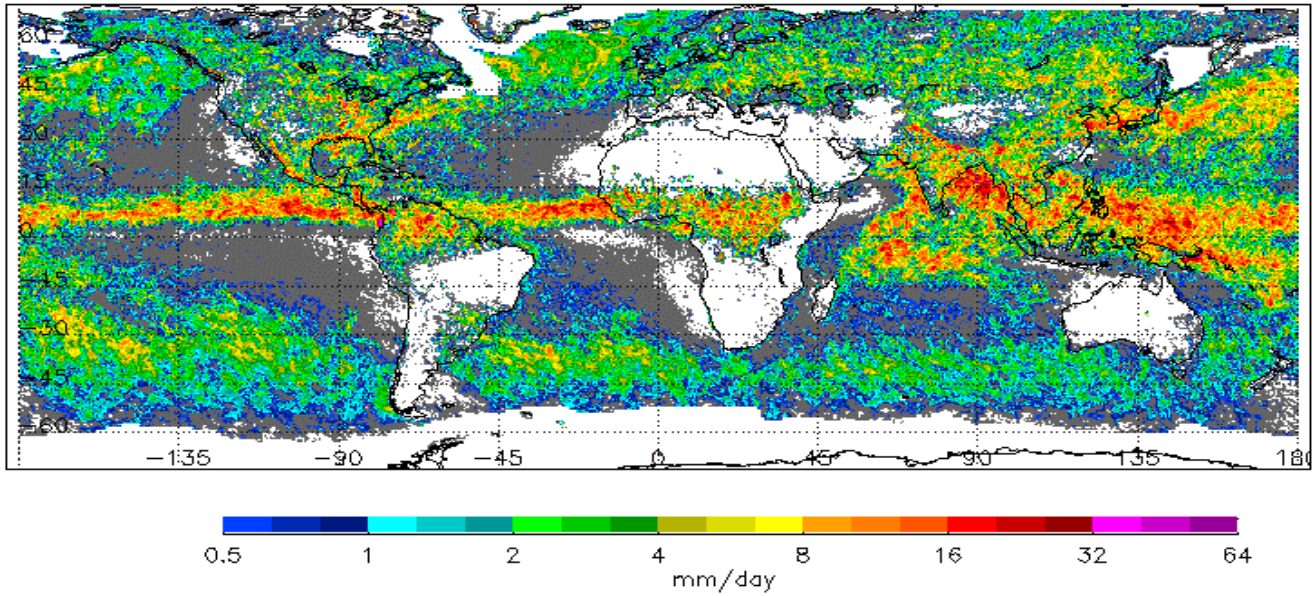


Courtesy of Dave Wolff, NASA/GSFC

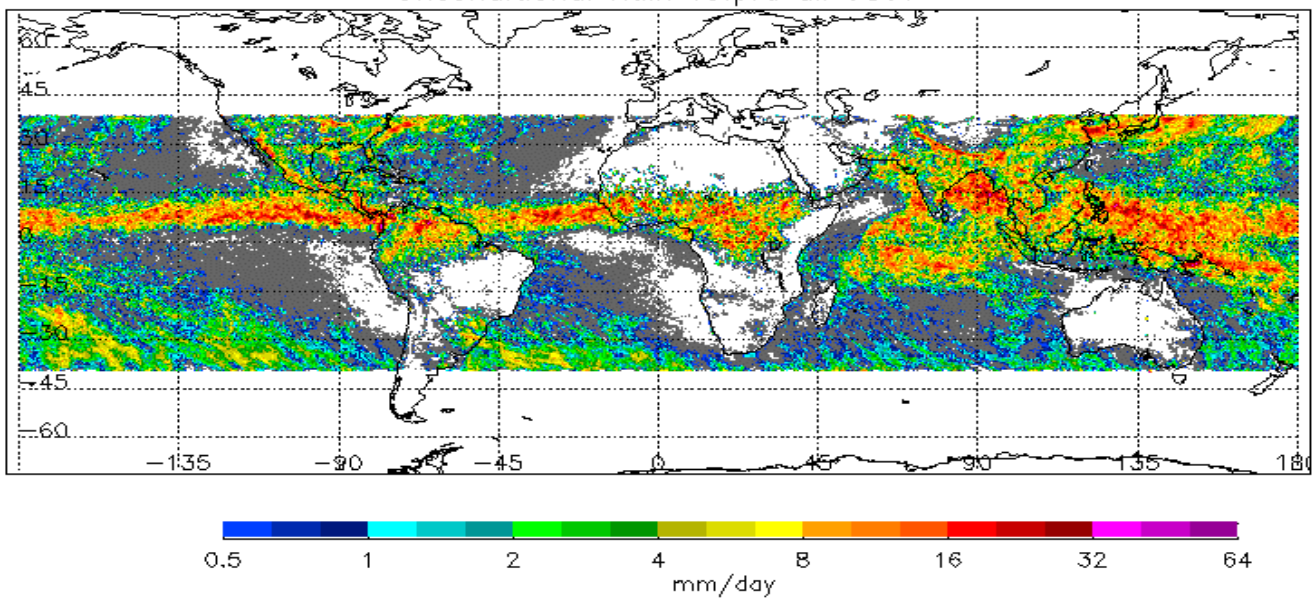

AMSR-E rr testn 030801.1606
mm/hr
64
32
16
8
4
2
1
0.5
68
64
60
56
52
48
44
40
140
145
150
155
160
165
170
175
180

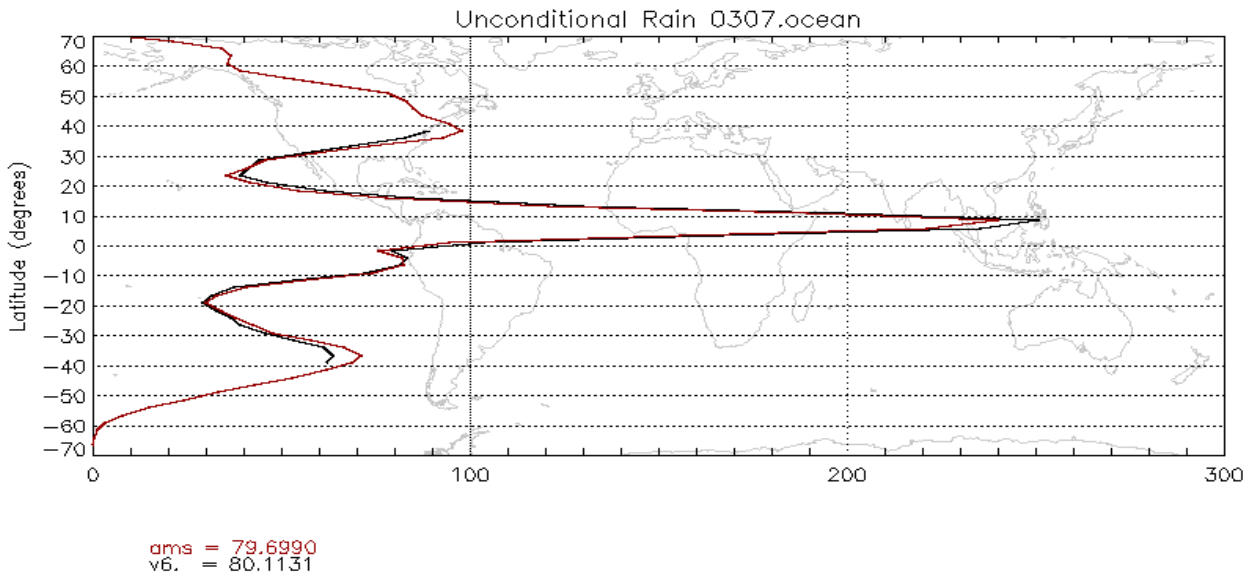

AMSR-E rr 030801.1606
mm/hr
64
32
16
8
4
2
1
0.5
68
64
60
56
52
48
44
40
140
145
150
155
160
165
170
175
180

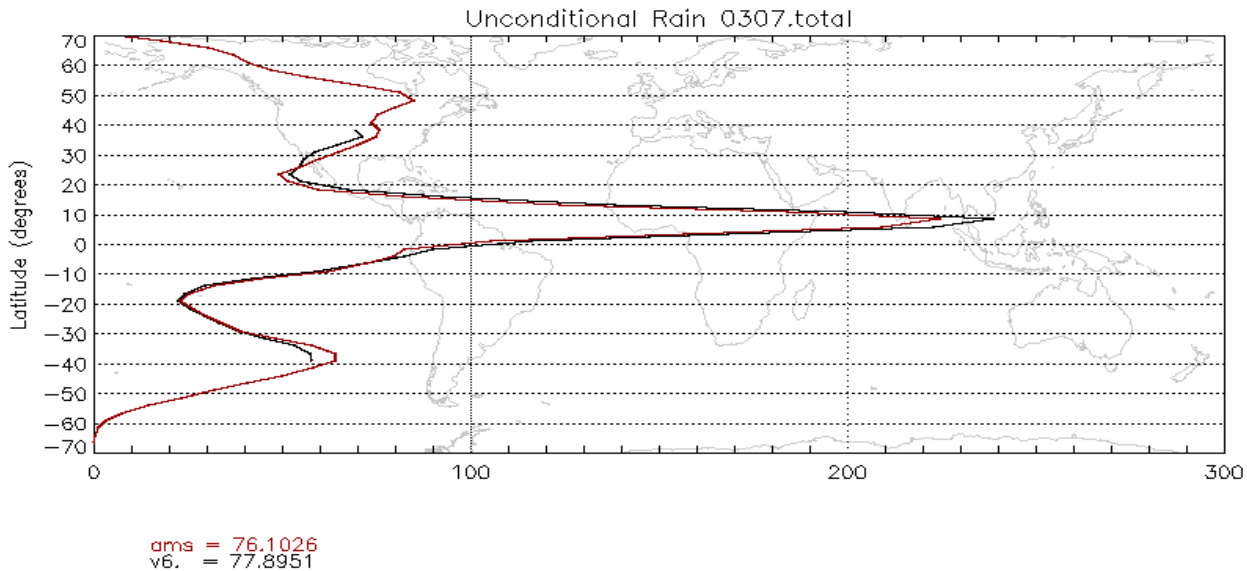
Unconditional Rain amsre all 0307



Unconditional Rain v6.pra all 0307




Unconditional Rain 0307.ocean
Latitude (degrees)
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
0
100
200
300
ams = 79.6990
v6. = 80.1131


Unconditional Rain 0307.total
Latitude (degrees)
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
0
100
200
300
ams = 76.1026
v6. = 77.8951