AIRS/AMSU/HSB
MIT Precipitation Index

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OUTLINE

- Precipitation Index
- NAST-M Testbed: 54/118/183/425 GHz Imager
- Microwave/AIRS 9-point NN Cloud Clearing of Radiances
- Science Preserving Data Compression of AIRS-Type Data (~×25)

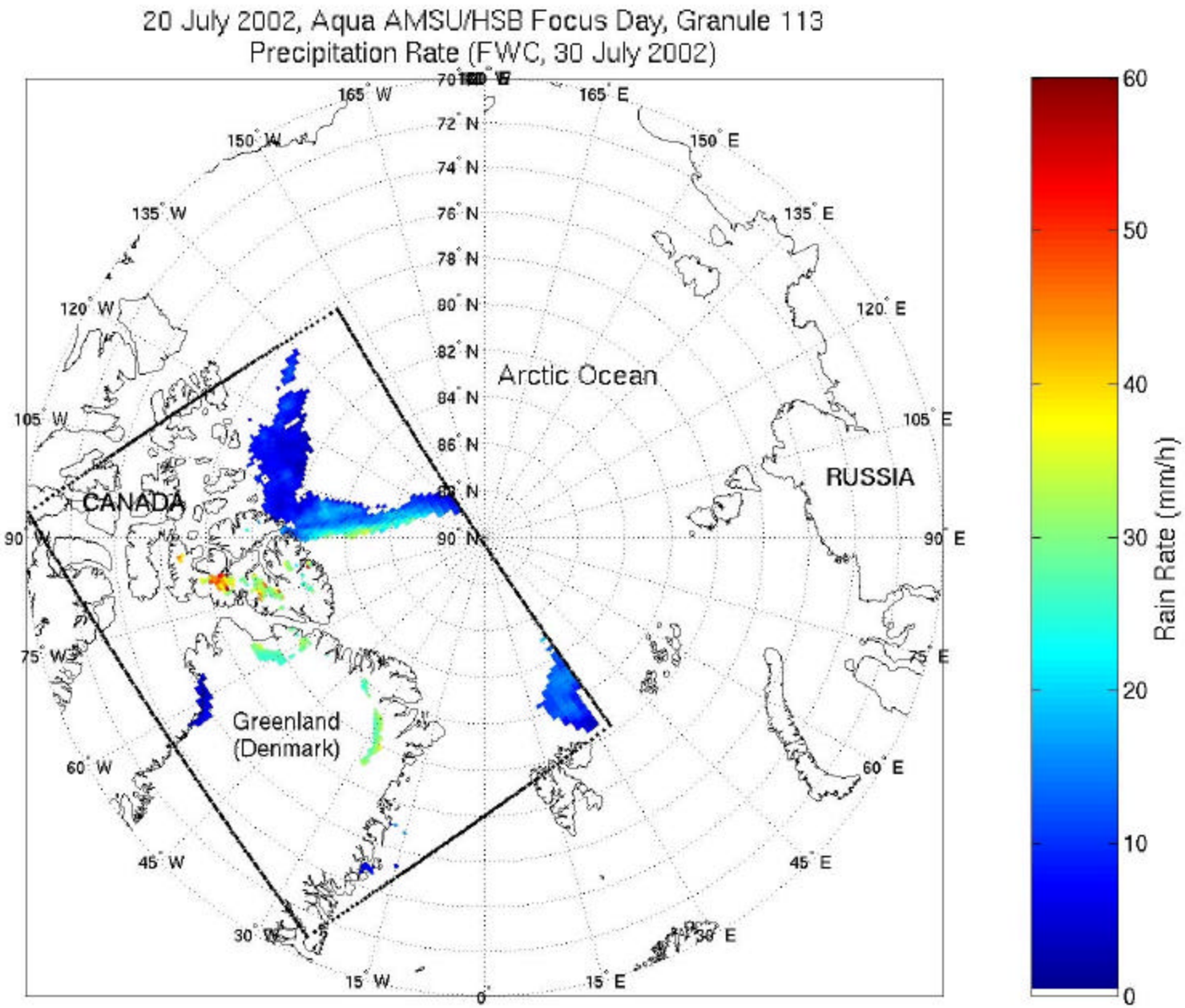
Status of Related Efforts

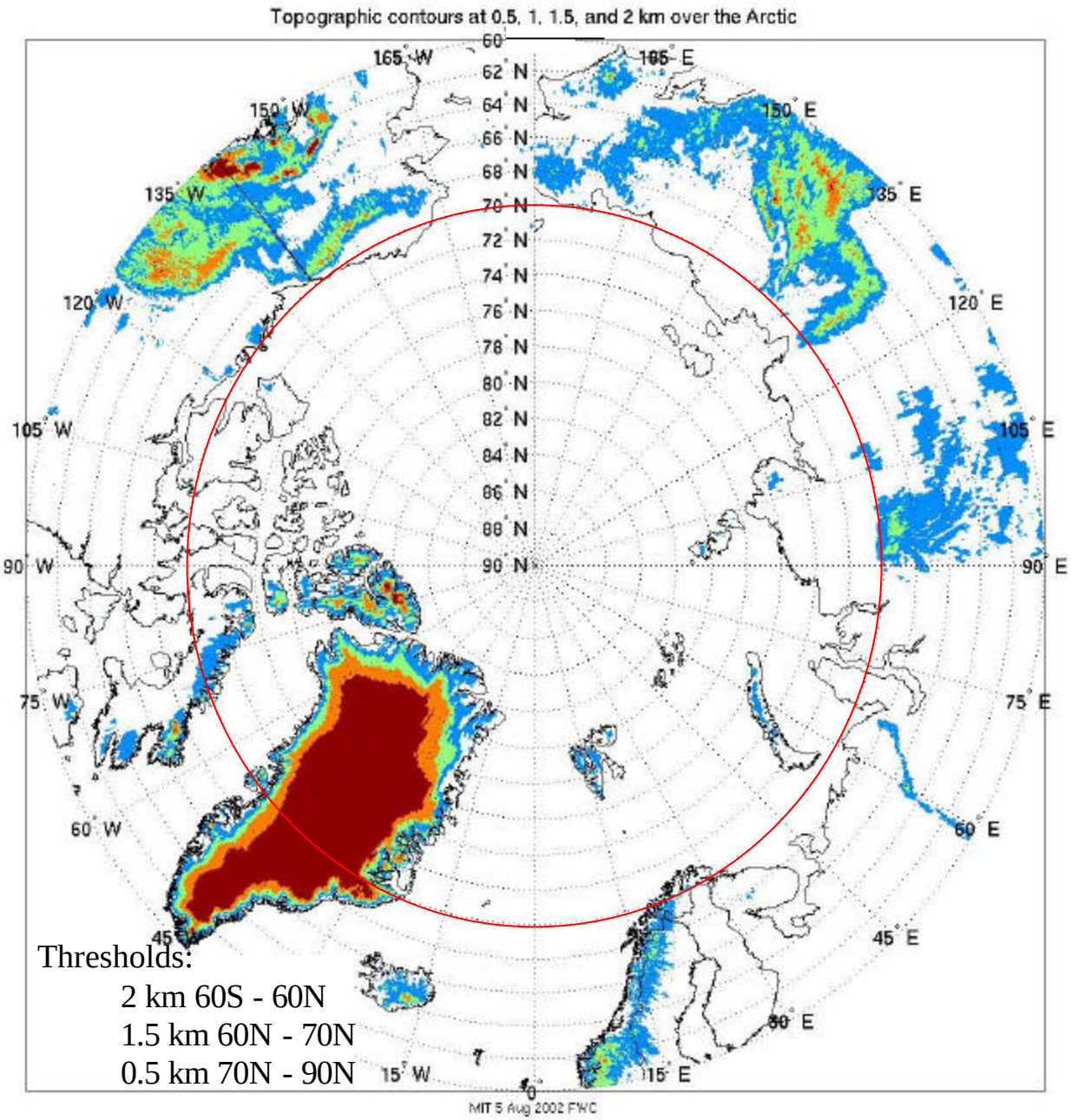
- **NAST-M Testbed: 54/118/183/425 GHz Imager in Crystal Face**
  - Data analysis started; includes Aqua underflights; separately funded (preliminary data available on web)
- **Microwave/AIRS 9-point NN Cloud Clearing of Radiances**
  - Promising results in simulations, thesis available via web
  - TGARS manuscript in preparation; IGARSS 2002 paper
  - Application to Aqua data starting
- **Science-Preserving Data Compression of AIRS-Type Data (~´25)**
  - Science preservation despite uncertain environmental statistics
  - Thesis completed; needs to be adapted to current problems (future effort)

Precipitation Index

- **Strategy and Plan**
  - "Precipitation Index" (PI), is a sensitive uncalibrated estimate
  - Users can select threshold matched to their individual needs (e.g. just flag strong convective events)
  - Precipitation estimates—a future research project requiring calibration/validation
- **Algorithm Status**
  - Phase I complete—uses surface-blind functions almost exclusively
    - well documented in IGARSS 2002 and TGARS preprint
  - Phase II: angle effects; oceanic window channels better sense rain <~1-2 km
- **Software Status**
  - Delivery of Phase-I algorithm in C code complete[1]. Awaiting JPL Promotion TBD
- **Product Issues and Discoveries**

[1]Promoted to subsystem_test

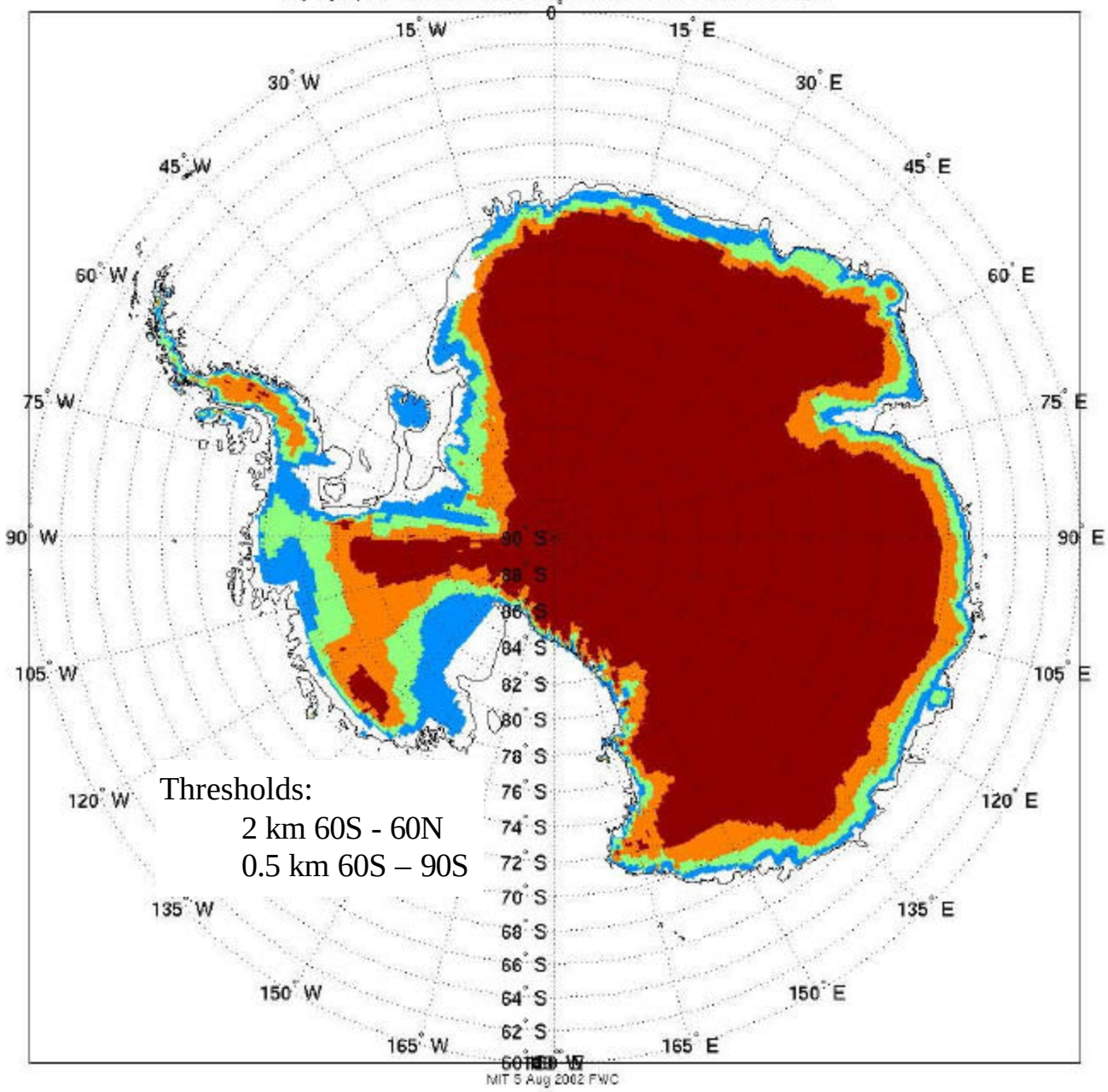

20 July 2002, Aqua AMSU/HSB Focus Day, Granule 113
Precipitation Rate (FWC, 30 July 2002)
Arctic Ocean
CANADA
RUSSIA
Greenland
(Denmark)
165° W
150° W
135° W
120° W
105° W
90° W
75° W
60° W
45° W
30°
15° W
0°
15° E
30° E
45° E
60° E
75° E
90° E
105° E
120° E
135° E
150° E
165° E
72° N
74° N
76° N
78° N
80° N
82° N
84° N
86° N
88° N
90° N
Rain Rate (mm/h)
0
10
20
30
40
50
60



Thresholds:

2 km 60S - 60N
1.5 km 60N - 70N
0.5 km 70N - 90N

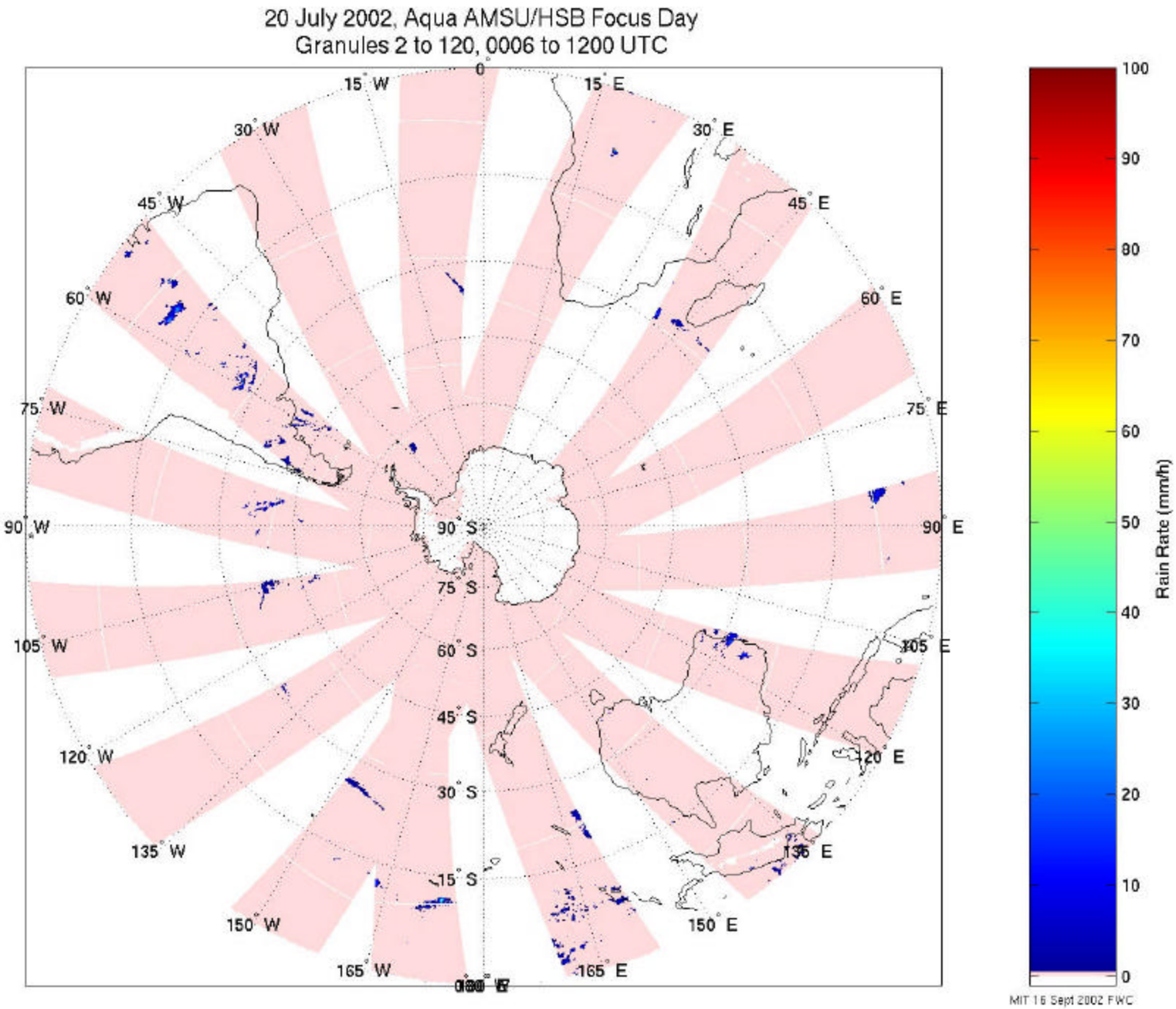
Topographic contours at 0.5, 1, 1.5, and 2 km over Antarctica

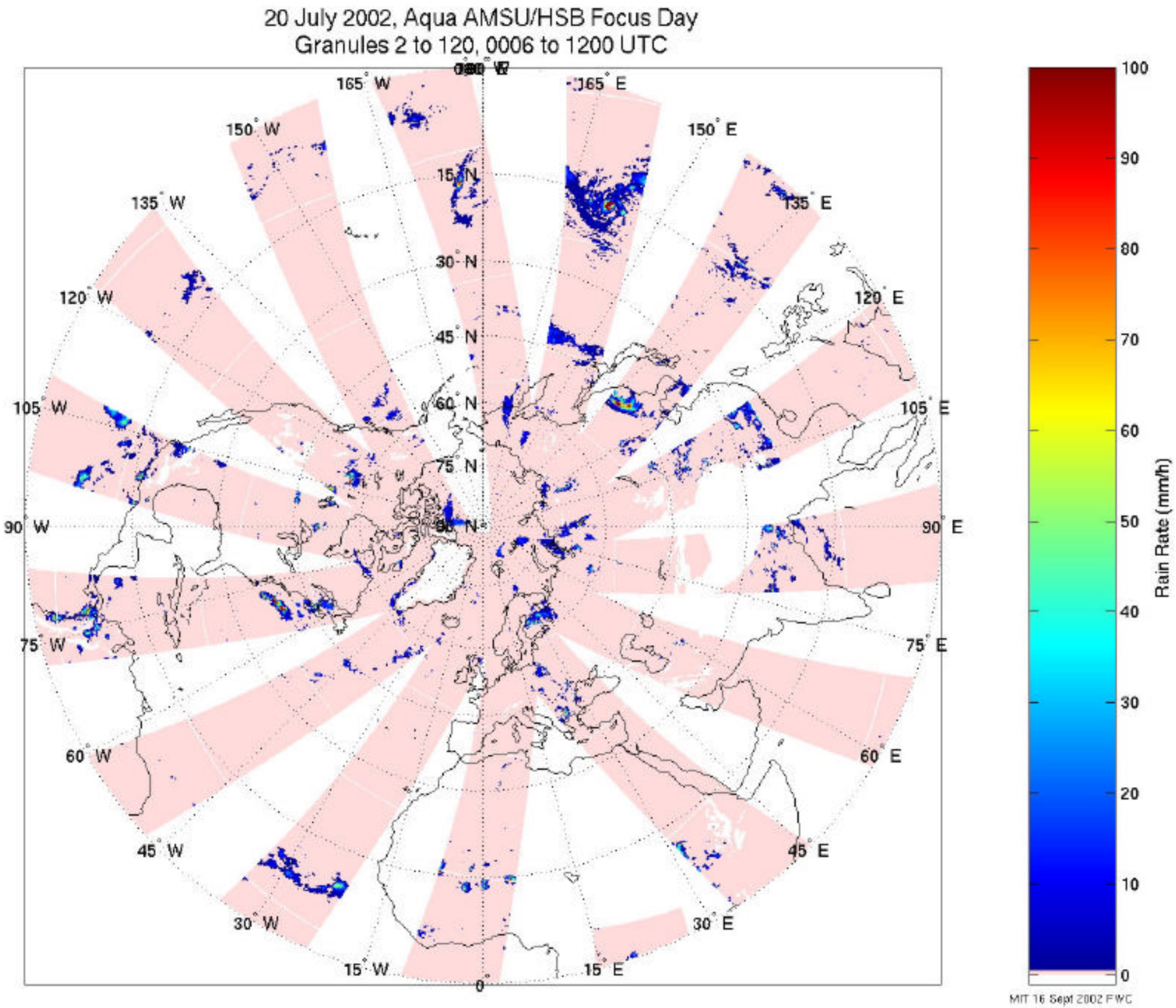


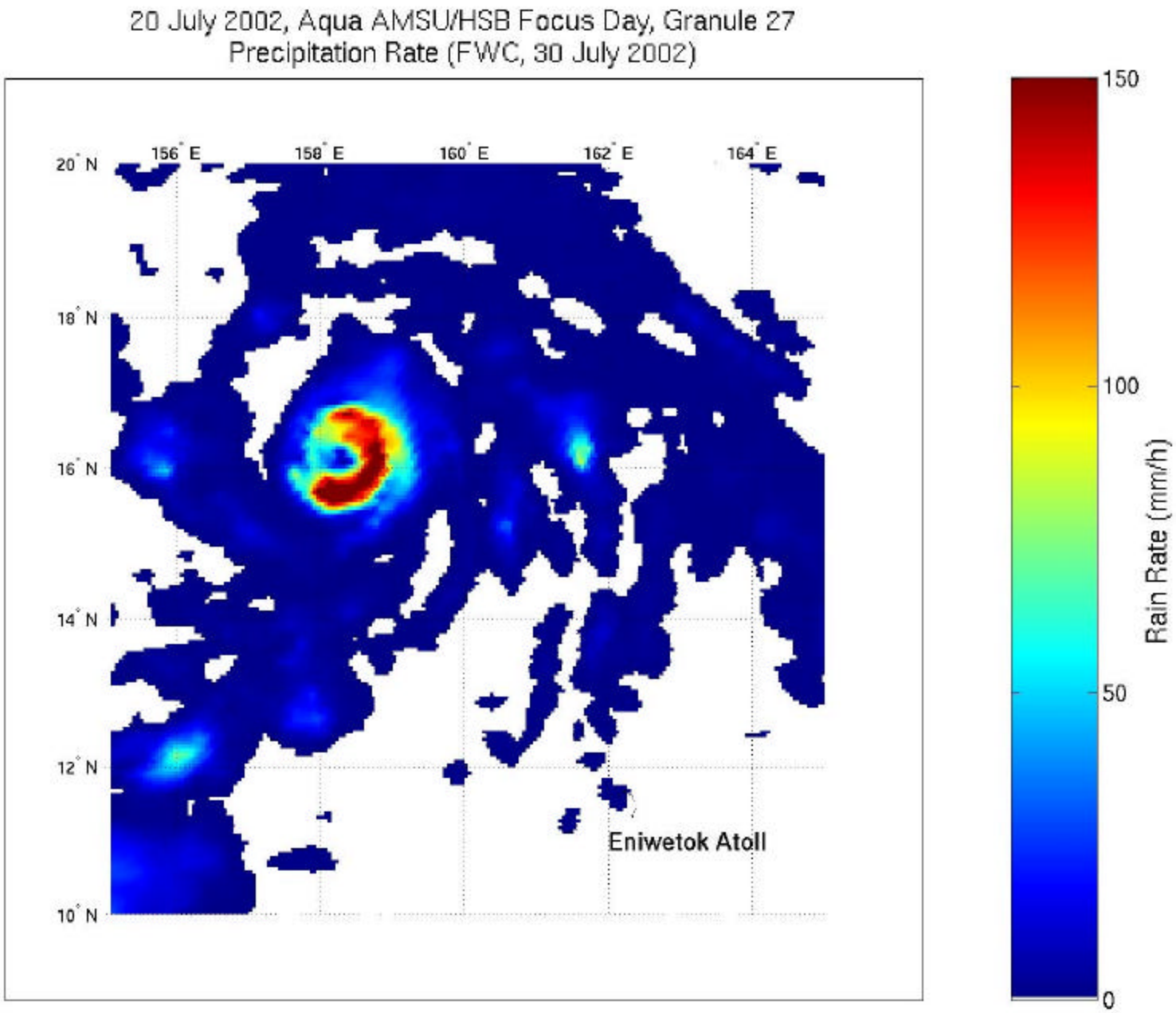
Thresholds:

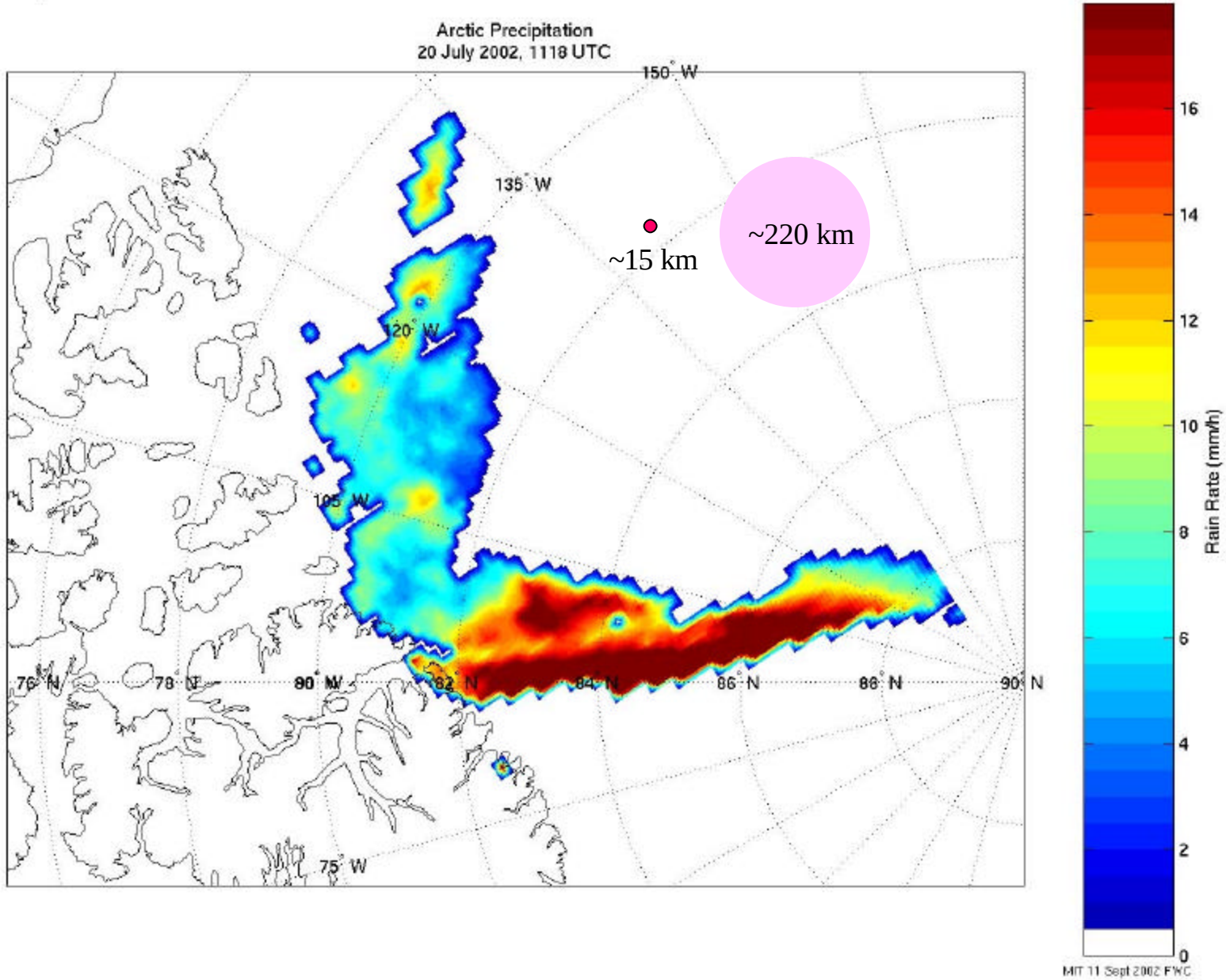
2 km 60S - 60N

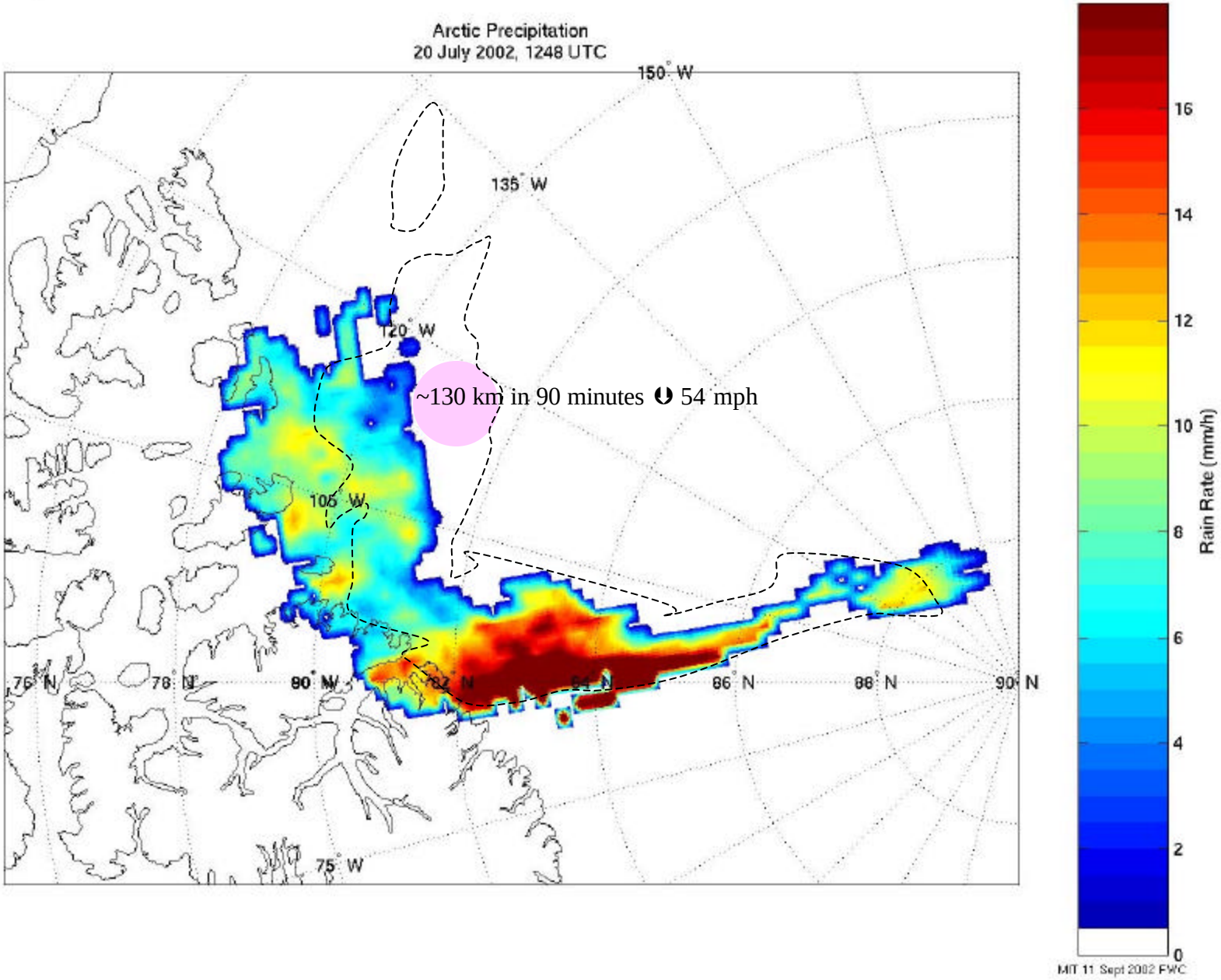
0.5 km 60S – 90S

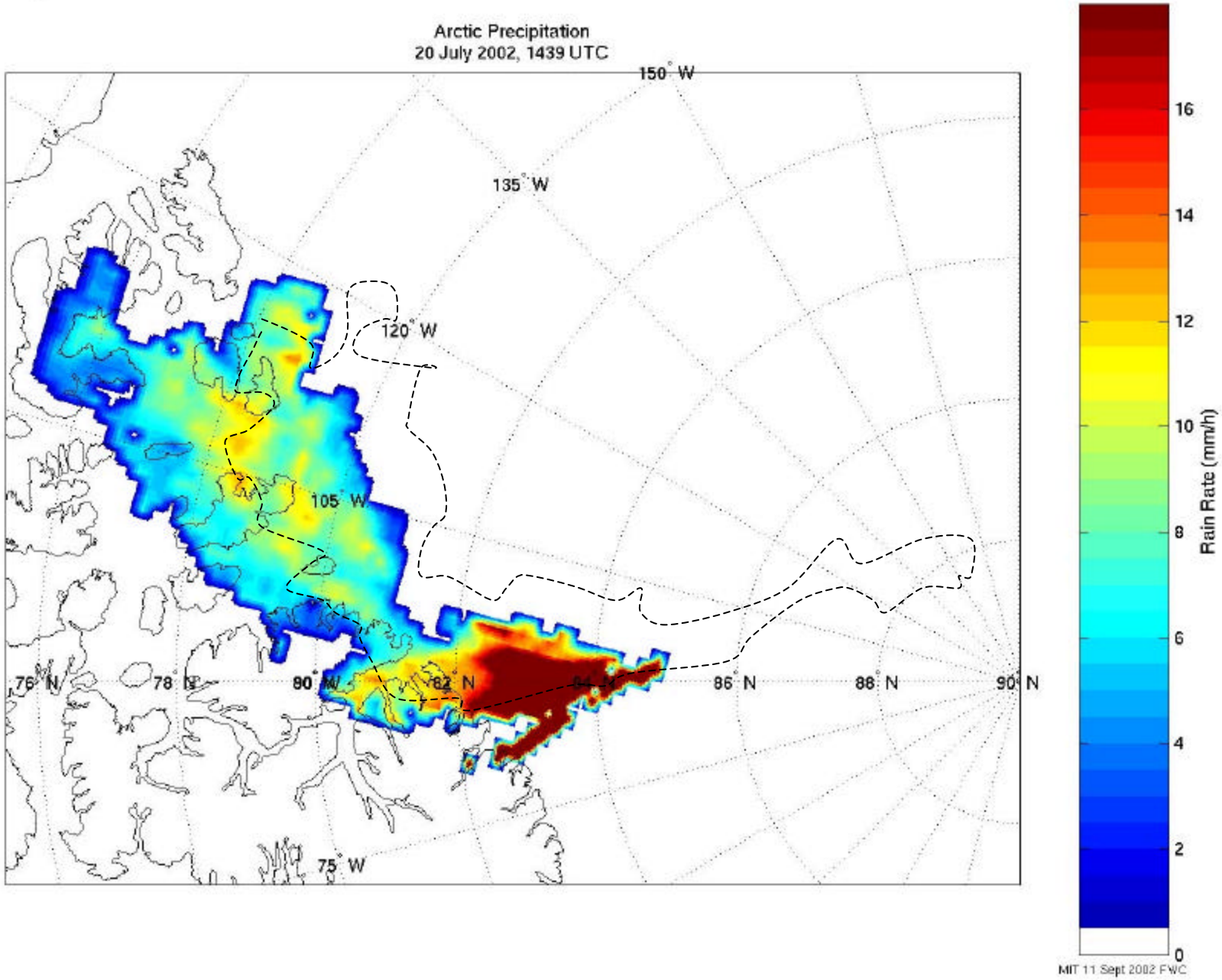

20 July 2002, Aqua AMSU/HSB Focus Day
Granules 2 to 120, 0006 to 1200 UTC
0°
15° W
15° E
30° W
30° E
45° W
45° E
60° W
60° E
75° W
75° E
90° W
90° E
105° W
105° E
120° W
120° E
135° W
135° E
150° W
150° E
165° W
165° E
180° E
90° S
75° S
60° S
45° S
30° S
15° S
Rain Rate (mm/h)
100
90
80
70
60
50
40
30
20
10
0
MIT 16 Sept 2002 FWC

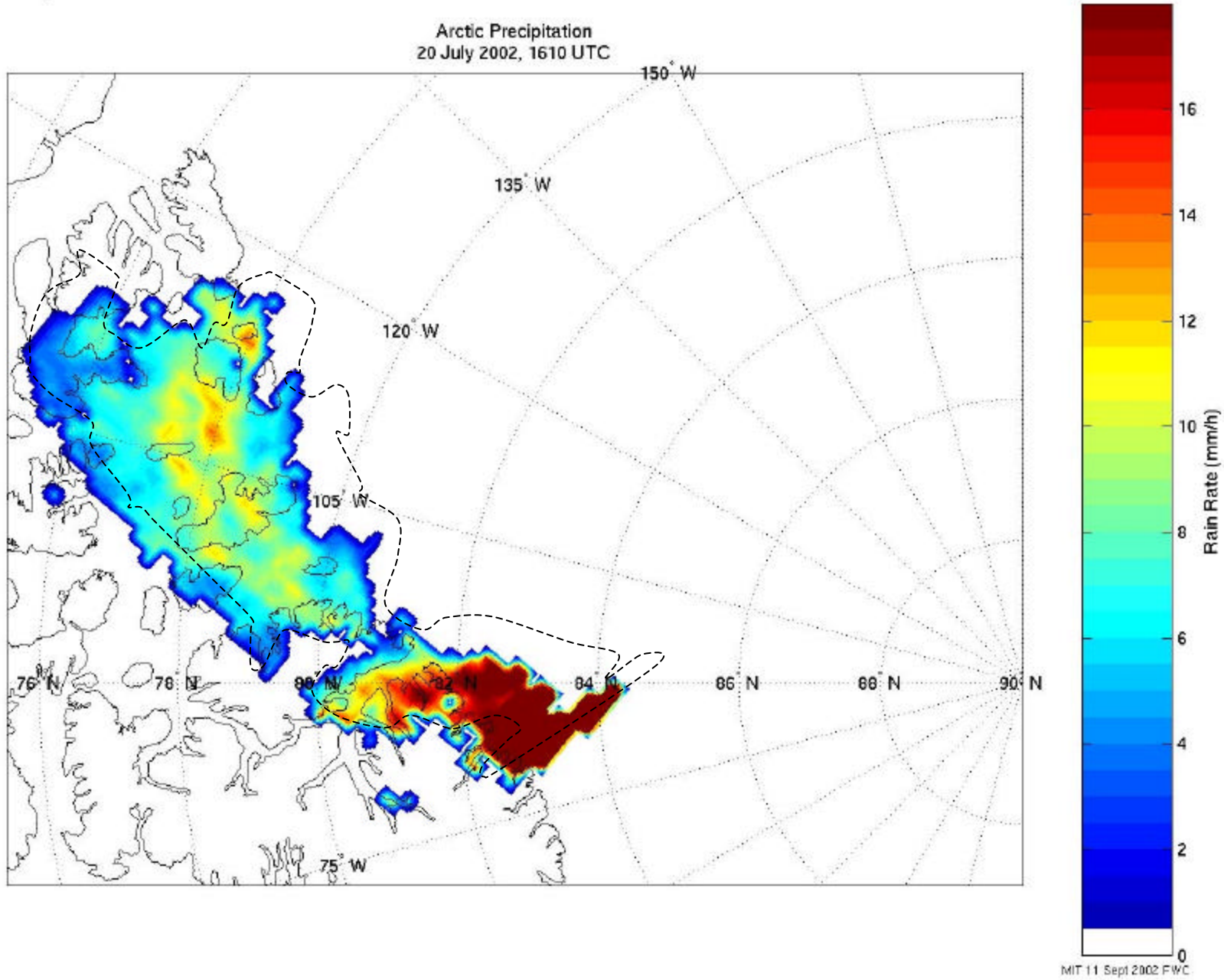

20 July 2002, Aqua AMSU/HSB Focus Day
Granules 2 to 120, 0006 to 1200 UTC
165° W
165° E
150° W
150° E
135° W
135° E
120° W
120° E
105° W
105° E
90° W
90° E
75° W
75° E
60° W
60° E
45° W
45° E
30° W
30° E
15° W
15° E
0°
15° N
30° N
45° N
60° N
75° N
90° N
Rain Rate (mm/h)
100
90
80
70
60
50
40
30
20
10
0
MIT 16 Sept 2002 FWC

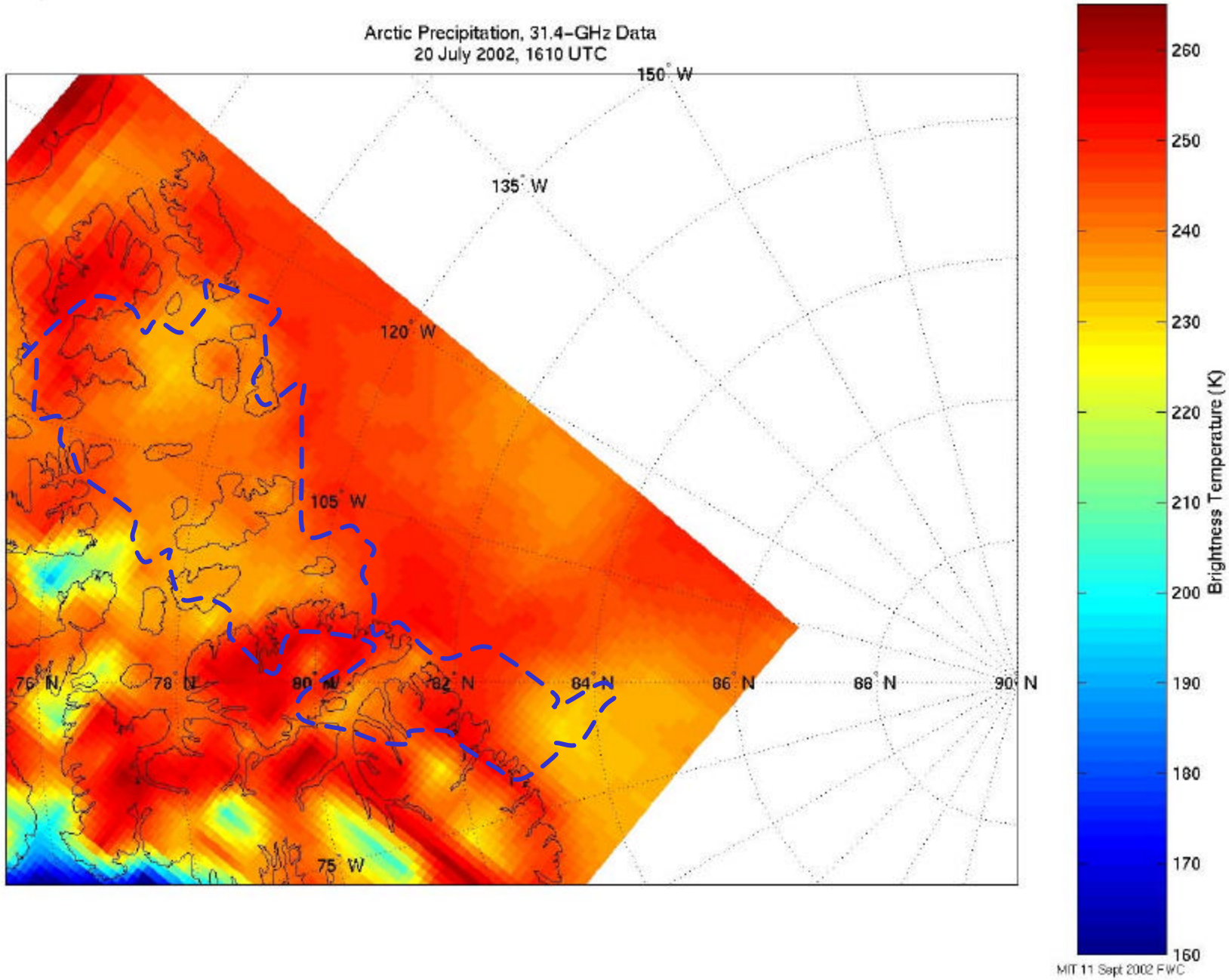

20 July 2002, Aqua AMSU/HSB Focus Day, Granule 27
Precipitation Rate (FWC, 30 July 2002)
156° E
158° E
160° E
162° E
164° E
20° N
18° N
16° N
14° N
12° N
10° N
Eniwetok Atoll
150
100
50
0
Rain Rate (mm/h)


Arctic Precipitation
20 July 2002, 1118 UTC
150° W
135° W
120° W
105° W
90° W
75° W
76° N
78° N
82° N
84° N
86° N
88° N
90° N
~15 km
~220 km
Rain Rate (mm/h)
0
2
4
6
8
10
12
14
16
MIT 11 Sept 2002 FWC


Arctic Precipitation
20 July 2002, 1248 UTC
150° W
135° W
120° W
105° W
90° W
75° W
76° N
78° N
82° N
84° N
86° N
88° N
90° N
~130 km in 90 minutes ➲ 54 mph
Rain Rate (mm/h)
0
2
4
6
8
10
12
14
16
MIT 11 Sept 2002 FWC


Arctic Precipitation
20 July 2002, 1439 UTC
150° W
135° W
120° W
105° W
90° W
75° W
76° N
78° N
80° N
82° N
84° N
86° N
88° N
90° N
Rain Rate (mm/h)
0
2
4
6
8
10
12
14
16
MIT 11 Sept 2002 FWC


Arctic Precipitation
20 July 2002, 1610 UTC
150° W
135° W
120° W
105° W
75° W
76° N
78° N
80° N
82° N
84° N
86° N
88° N
90° N
Rain Rate (mm/h)
0
2
4
6
8
10
12
14
16
MIT 11 Sept 2002 FWC


Arctic Precipitation, 31.4-GHz Data
20 July 2002, 1610 UTC
150° W
135° W
120° W
105° W
90° W
75° W
76° N
78° N
80° N
82° N
84° N
86° N
88° N
90° N
Brightness Temperature (K)
260
250
240
230
220
210
200
190
180
170
160
MIT 11 Sept 2002 FWC

Summary
Product Issues and Discoveries

- **Precipitation index false alarms are now rare**
  - Due to more conservative surface elevation mask used (some loss over high ice)
- **Discovered useful sensitivity to snowfall**
  - Snowfall rates map well; novel product
- **Discovered large fast-moving Arctic ice-pack snowstorms**
  - Demonstrates unique capability for mapping rain and snow over ice pack and snow fields

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