AIRS Temperature/Moisture Retrievals in the Environment of the Saharan Air Layer and 2005 Tropical Storm Irene

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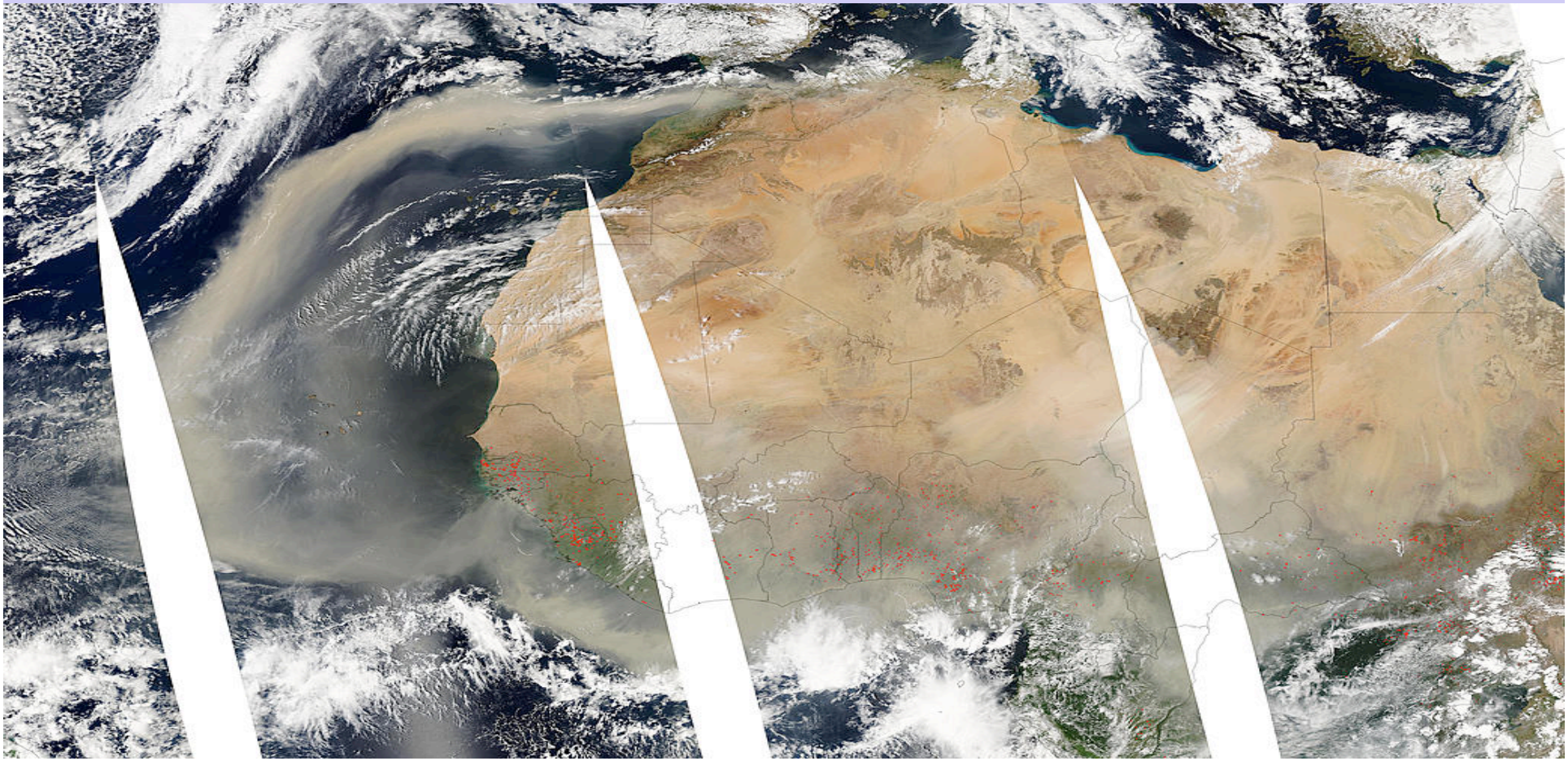
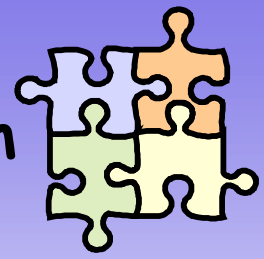


Discussion Outline



- **Motivation:** Hurricane intensity change problem

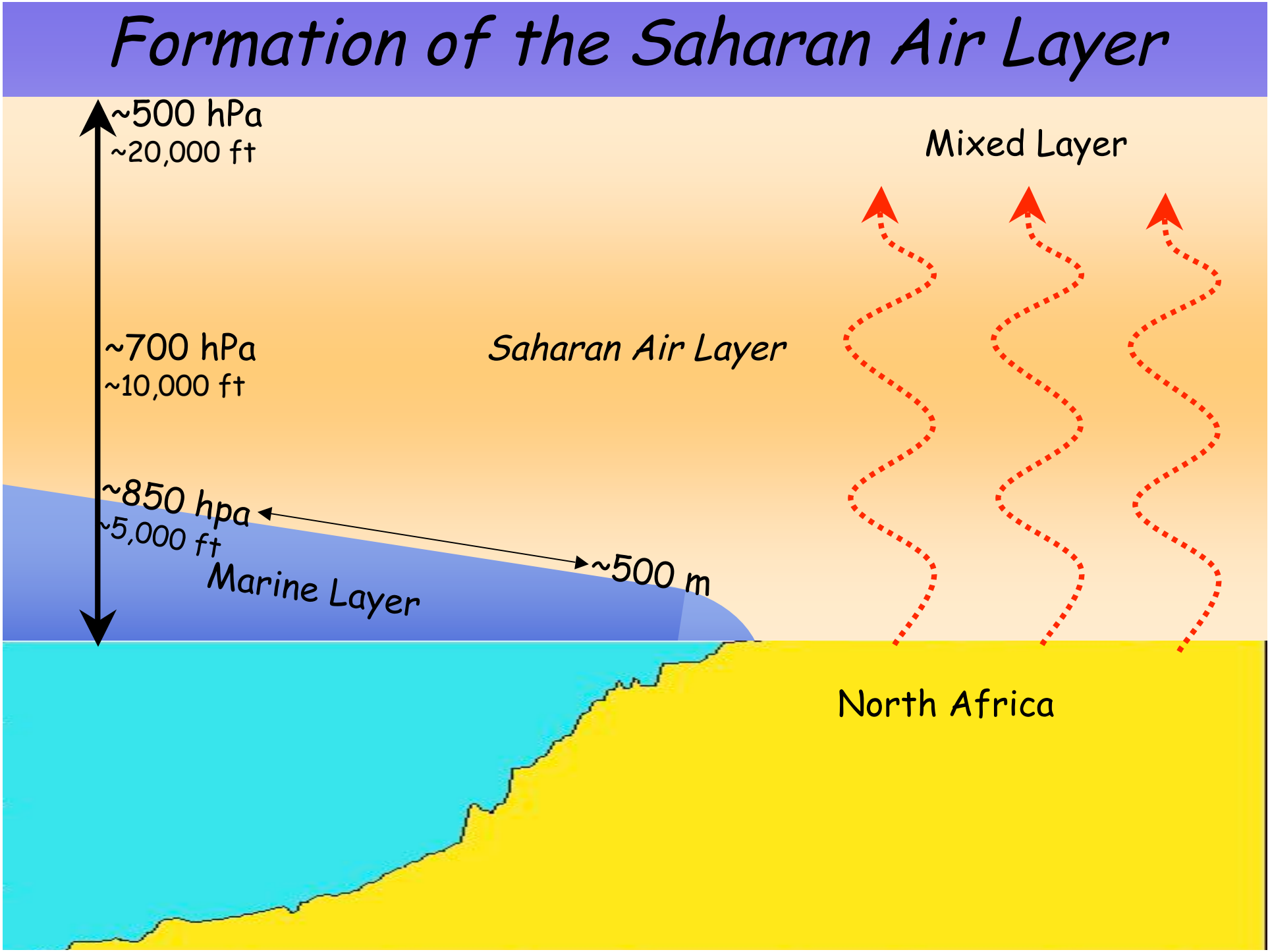
- **Saharan Air Layer**
  - -background
  - -characteristics impacting Atlantic TCs
  - - description of the new GOES SAL imagery & examples

- **Break for Lunch (12:15 to 1:30pm)**

- **Saharan Air Layer Experiment: 2005 TS Irene**
  - -G-IV GPS dropsonde observations
  - -GPS dropsonde-AIRS retrieval comparisons

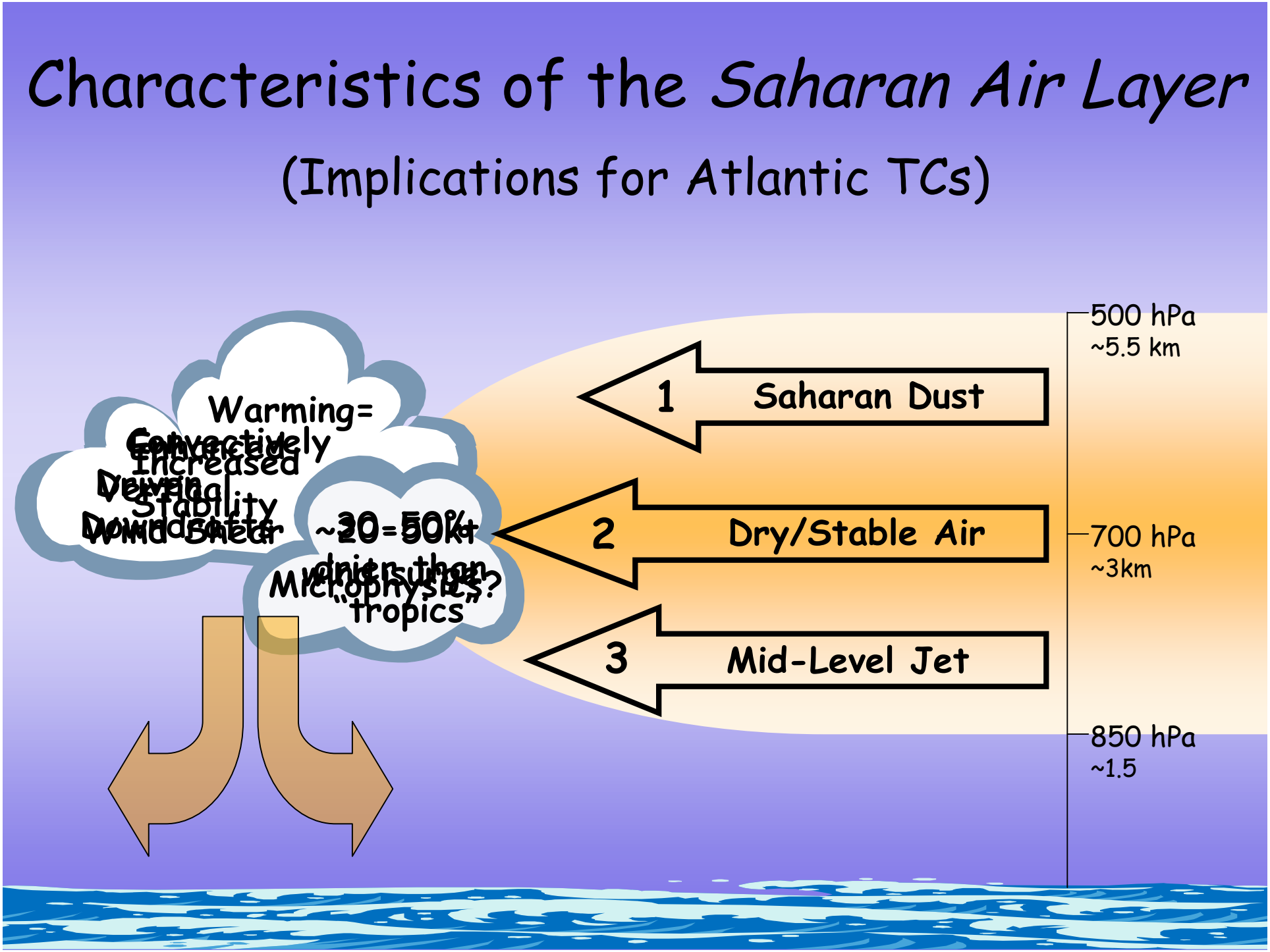
- **Conclusions/Future Work**

Formation of the Saharan Air Layer

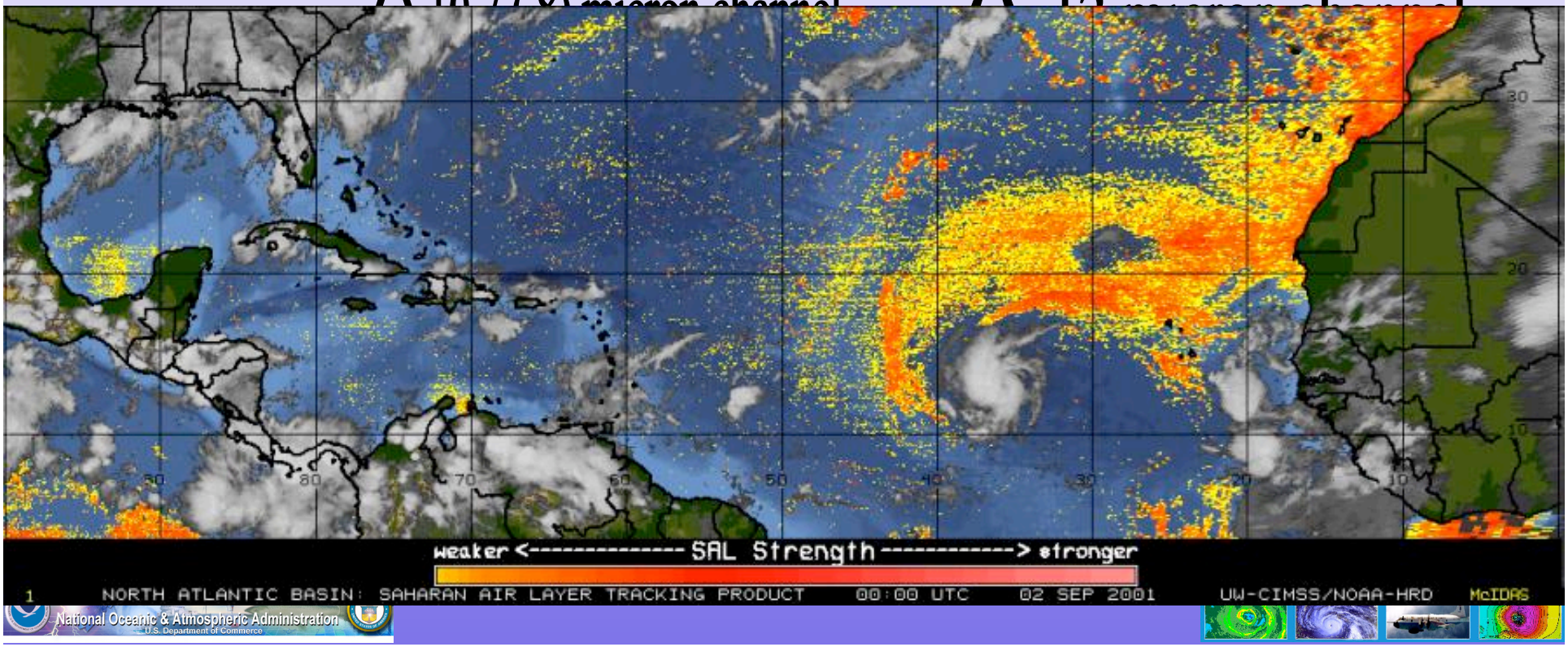


Characteristics of the *Saharan Air Layer*

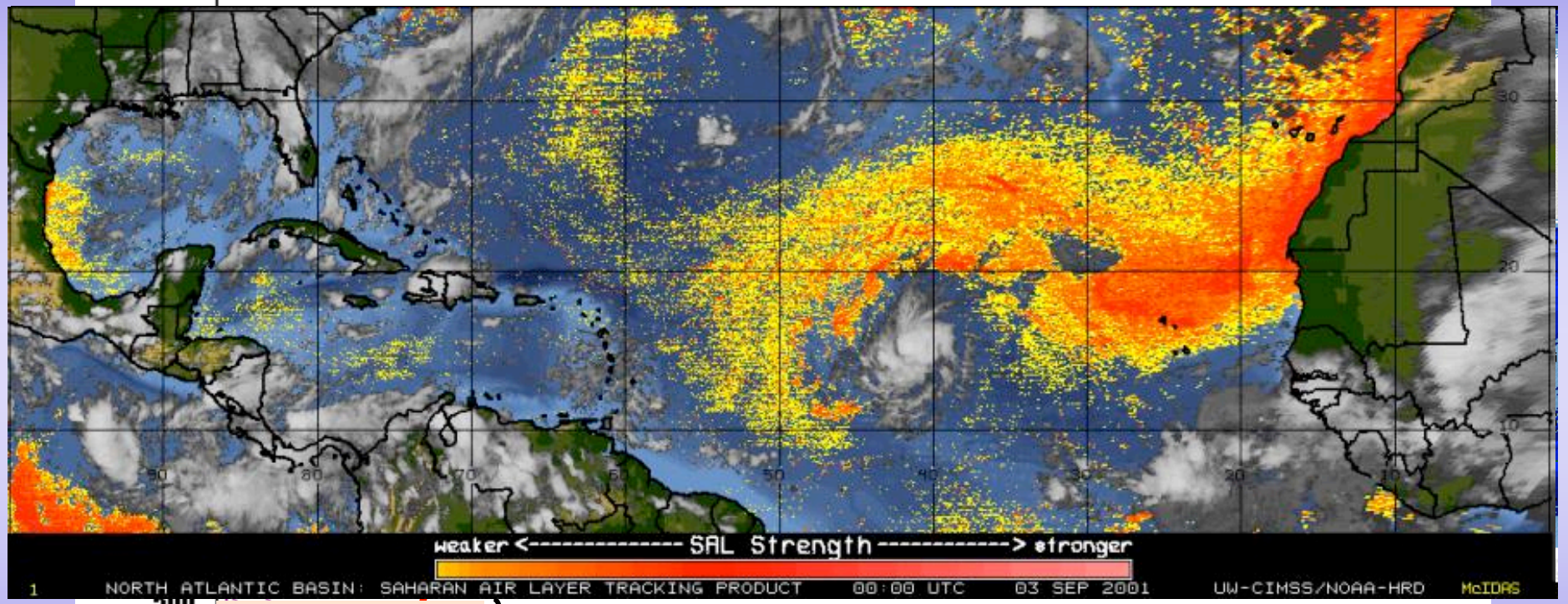
(Implications for Atlantic TCs)



GOES 8/9/10 Imager; Meteosat-8

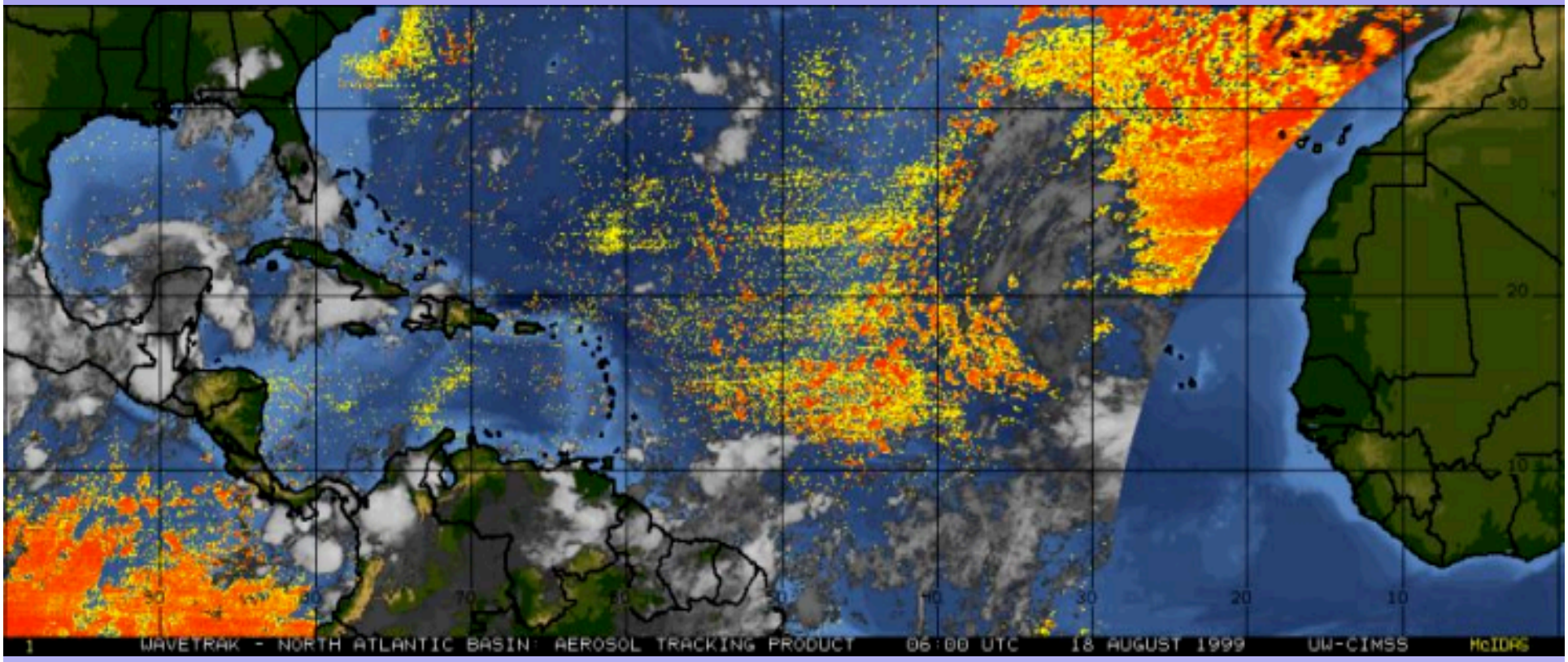


Satellite Water Vapor Imagery…capturing the SAL?



Hurricanes Dennis/Cindy/Emily 1999

GOES SAL Tracking Imagery



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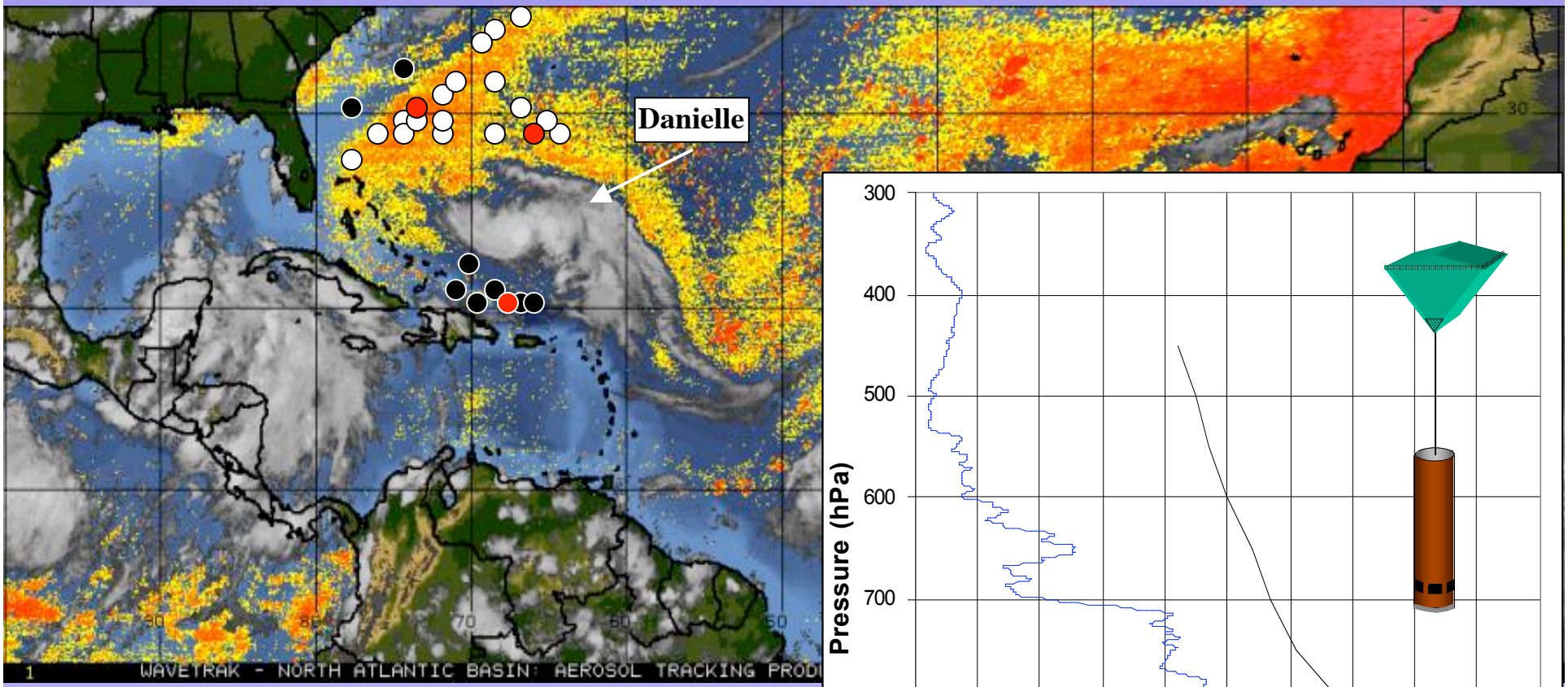
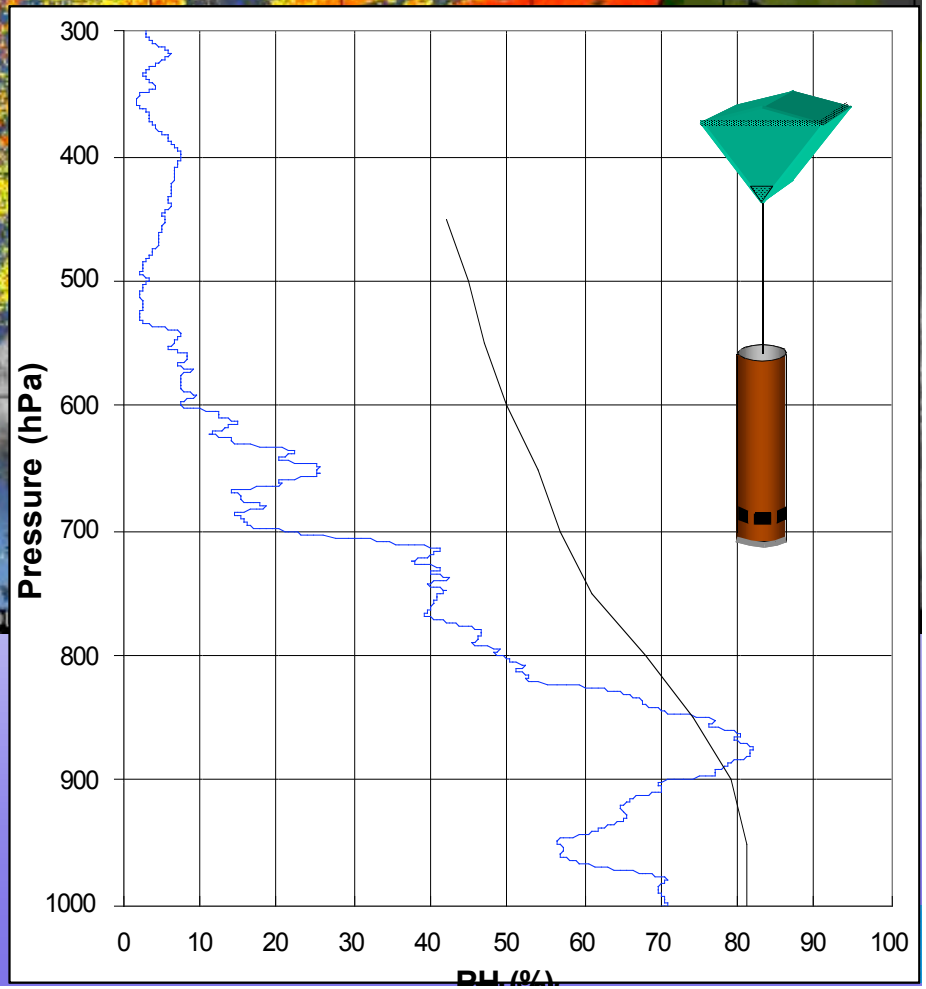
Atlantic Oceanographic and Meteorological Laboratory

Hurricane Danielle 29 August 1998 00 UTC

GPS dropsondes launched from the NOAA G-IV





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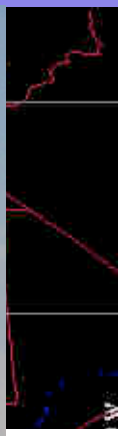
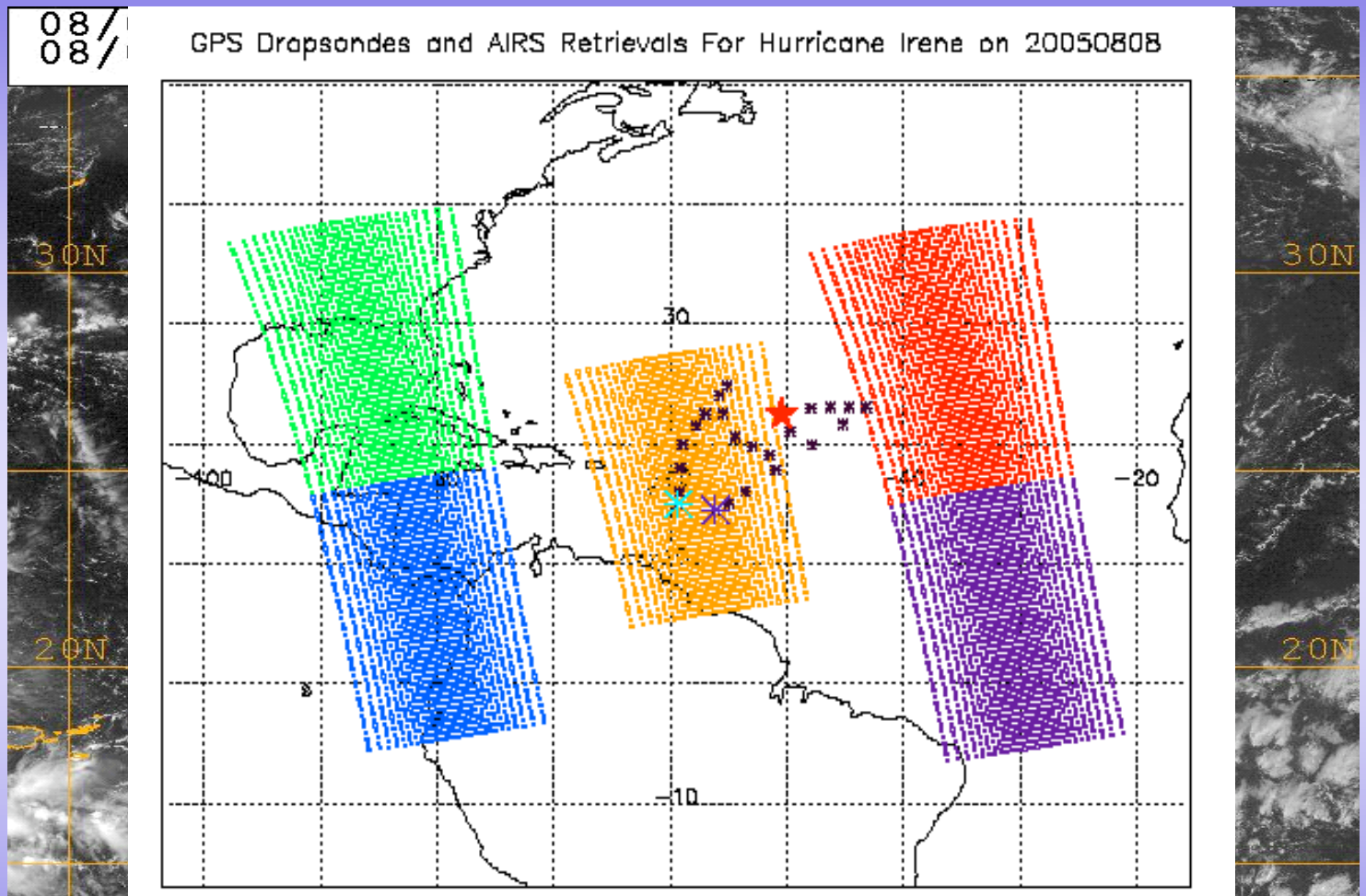
Saharan Air Layer Experiment (SALEX)

G-IV Mission 050807n



Saharan Air Layer Experiment

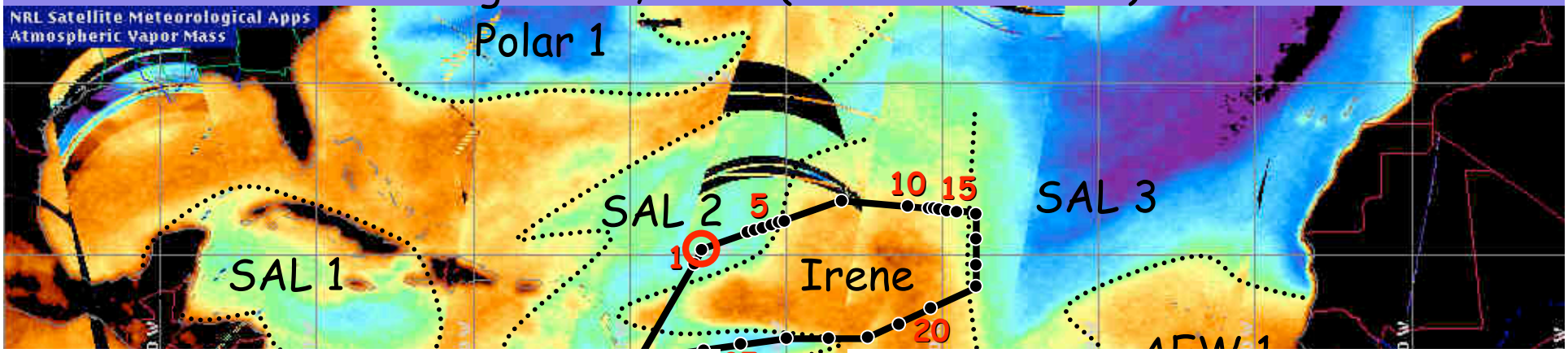
G-IV Mission 08 September 2005

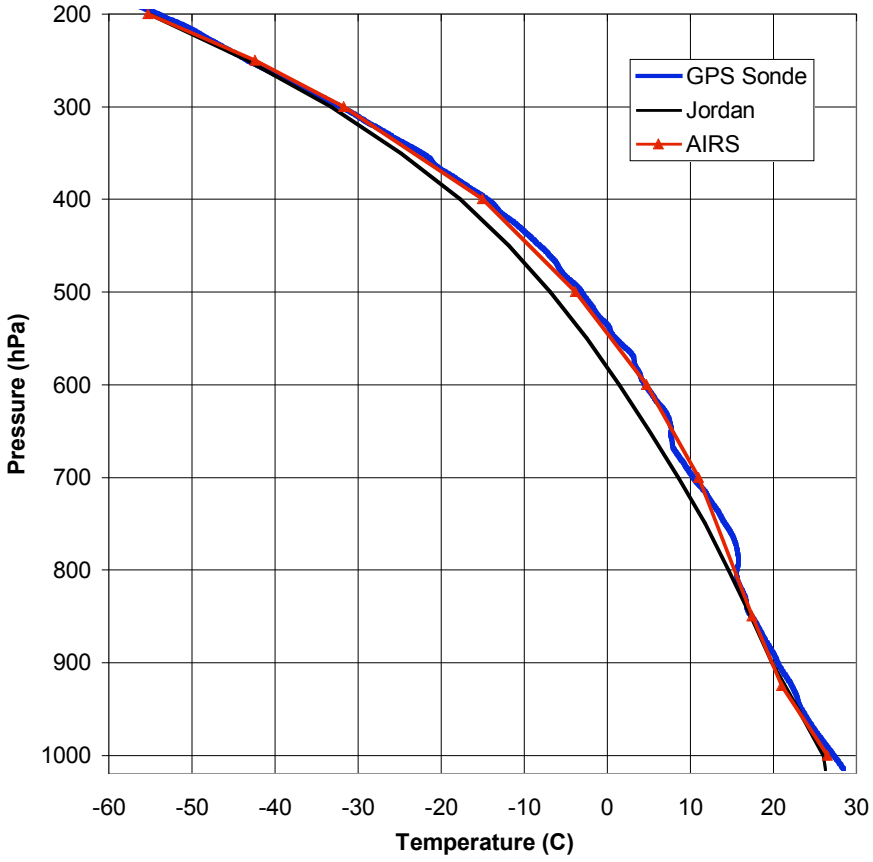


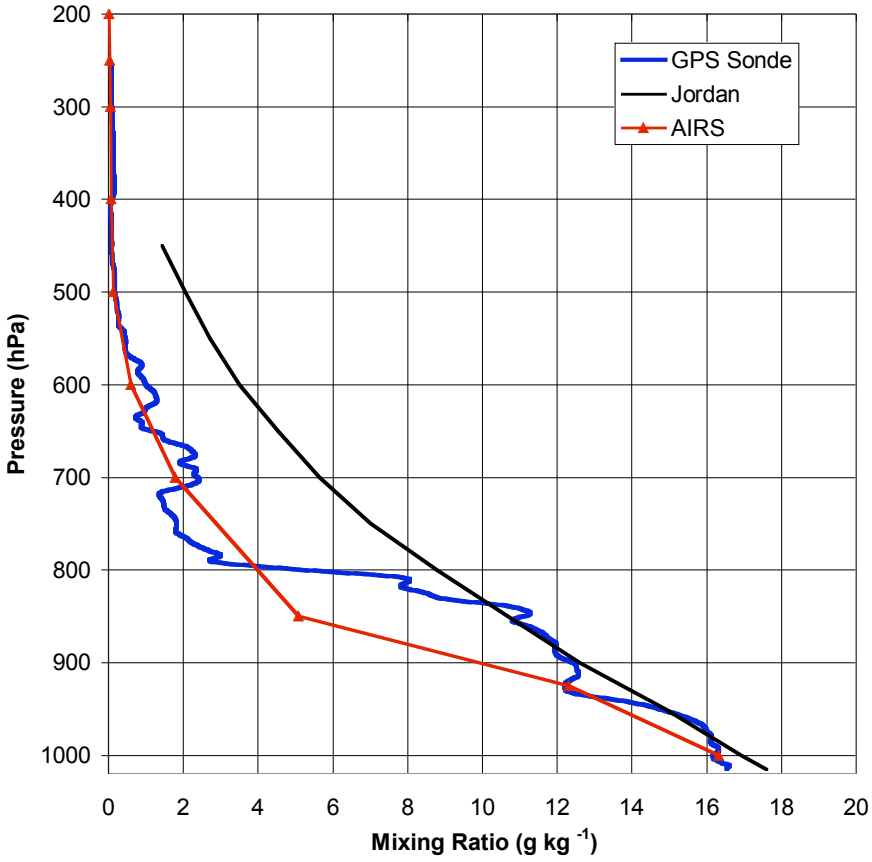
- AIRS L2 Standard Retrieval Product (28 pressure levels)
- Temporal: +/- 3 hr
- Spatial: ≤50 km
- AIRS Retr Qual Flags: 0/512/1536/3584

Saharan Air Layer Experiment (SALEX)

August 07, 2005 (NOAA G-IV Jet)

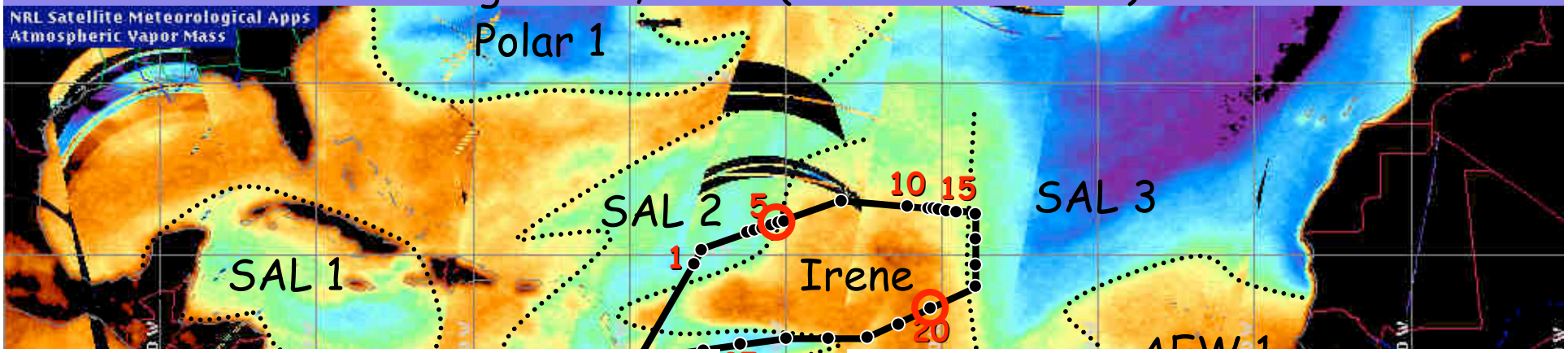


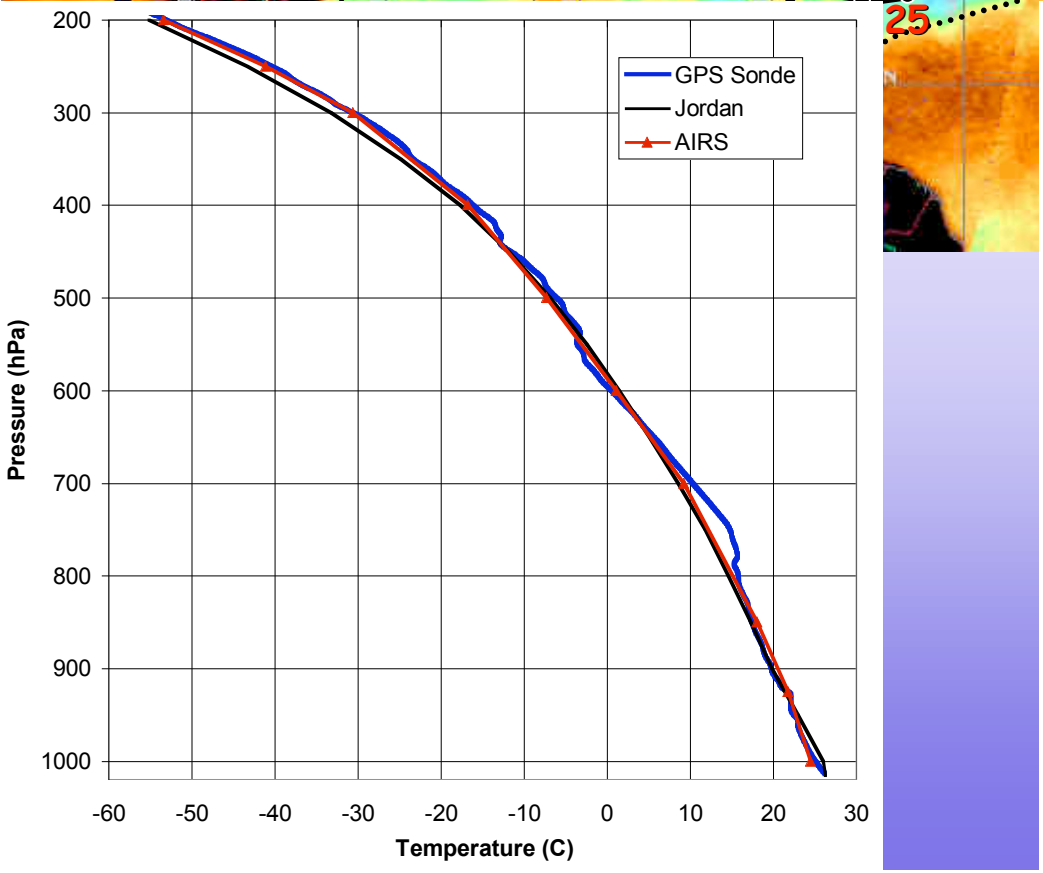


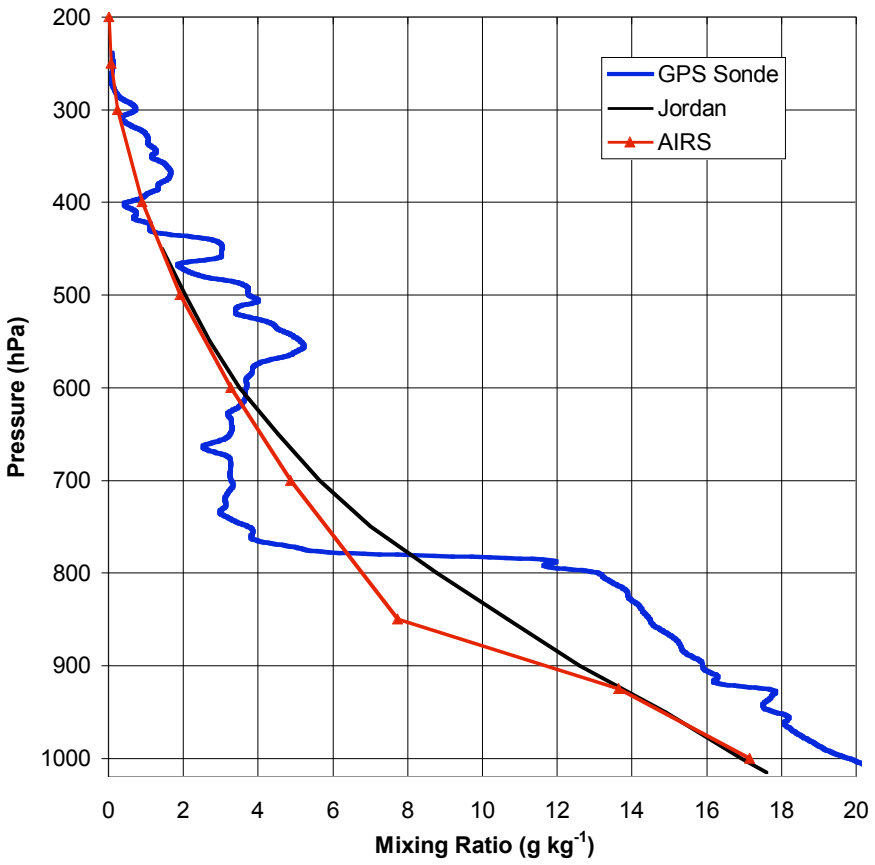


Saharan Air Layer Experiment (SALEX)

August 07, 2005 (NOAA G-IV Jet)

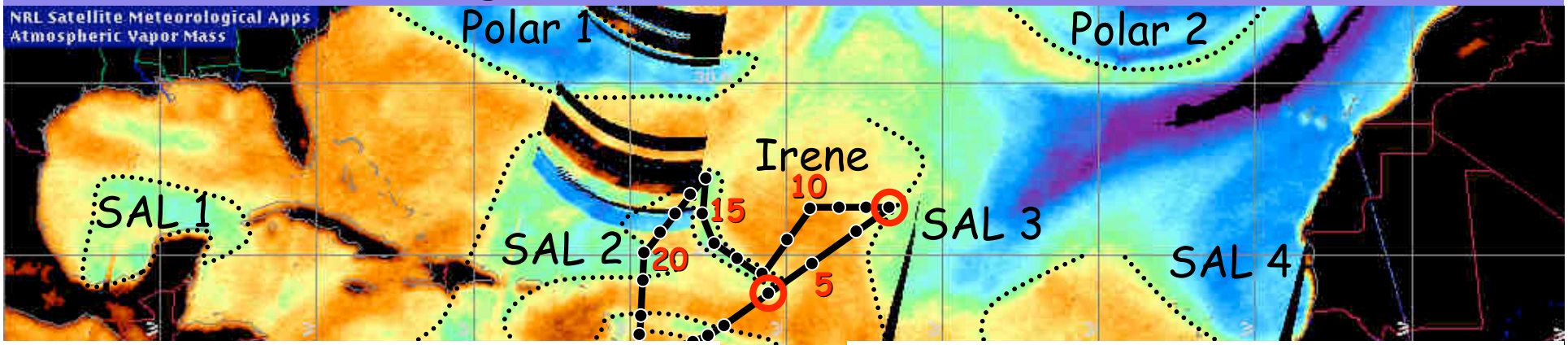


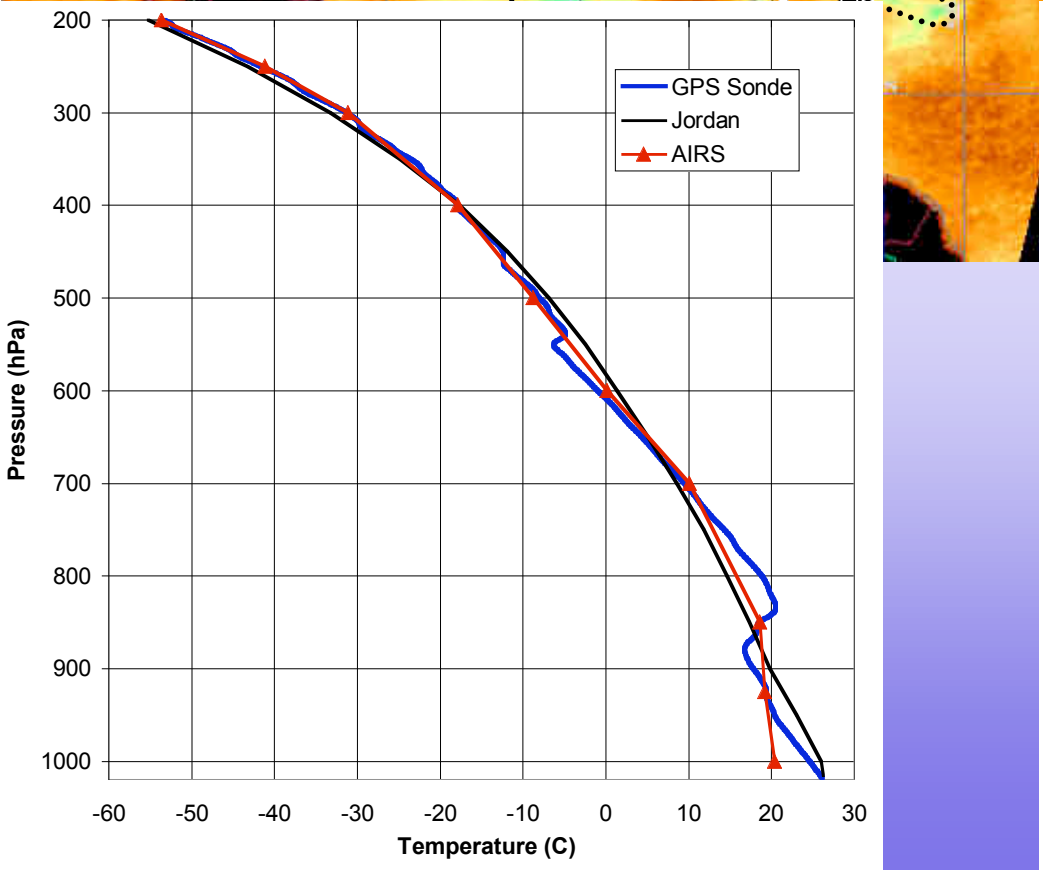


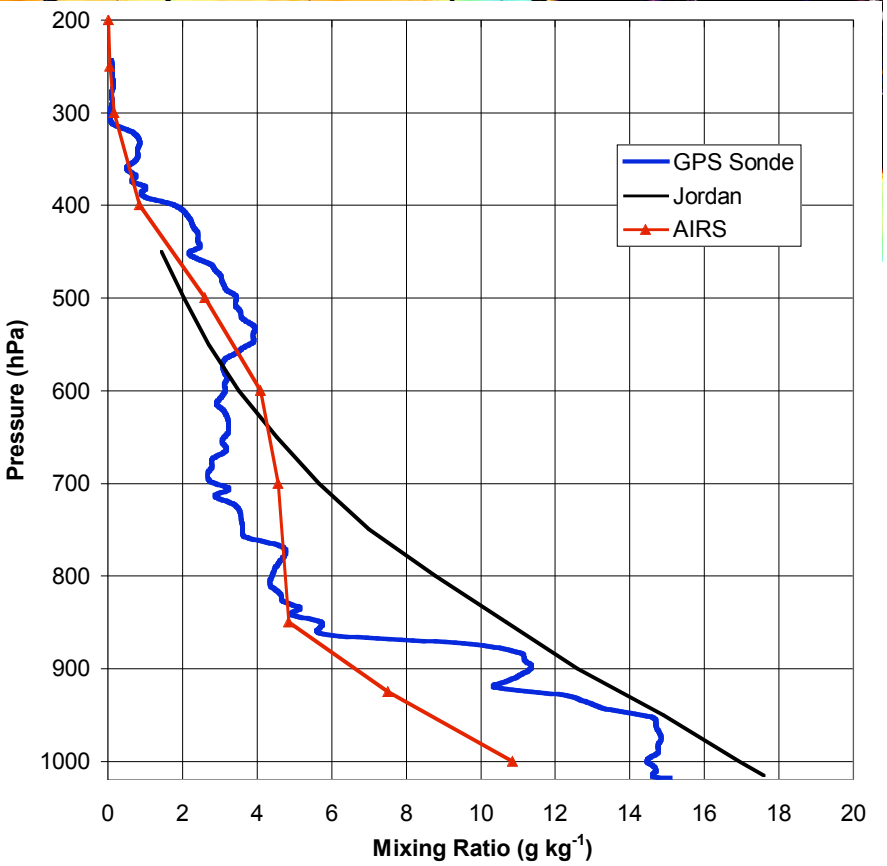


Saharan Air Layer Experiment (SALEX)

August 08, 2005 (NOAA G-IV Jet)







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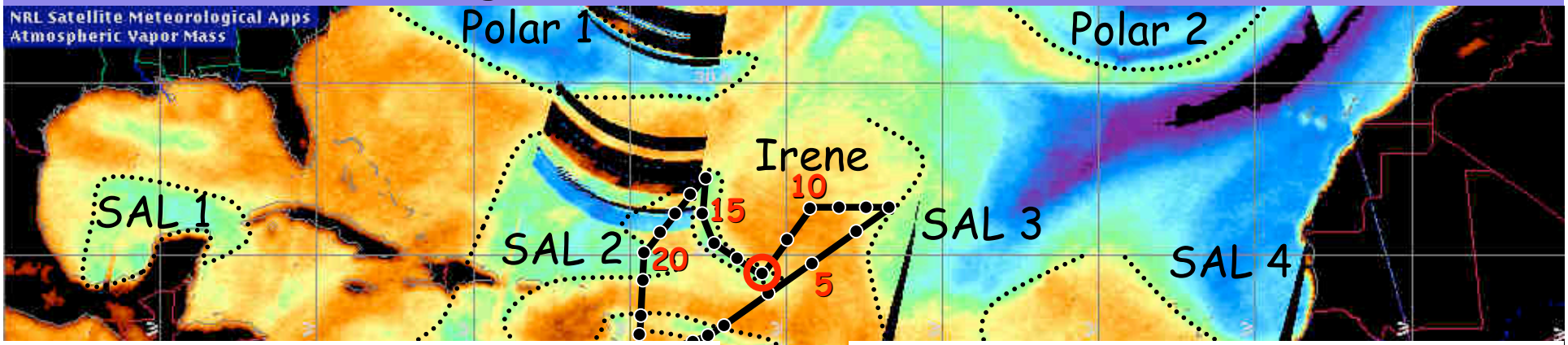
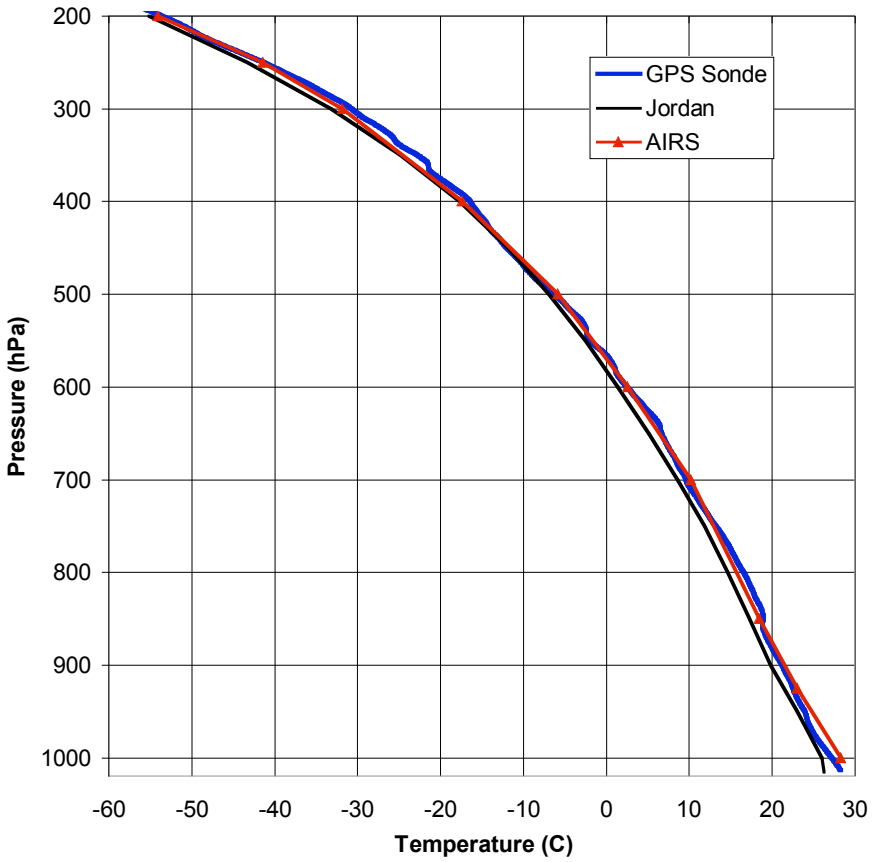
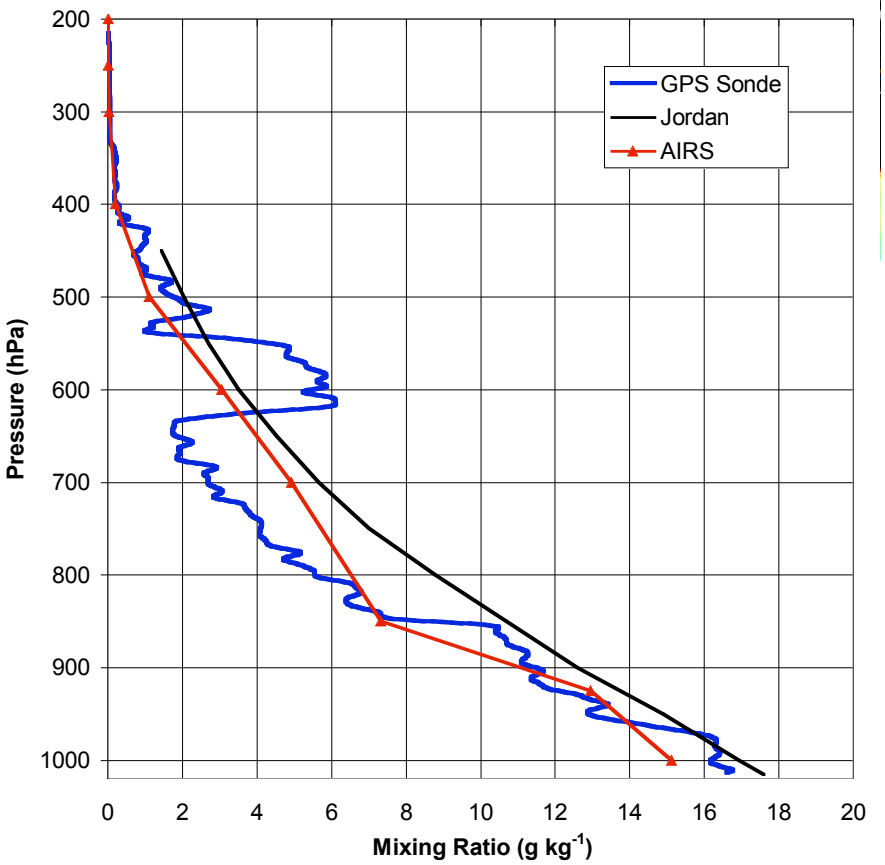
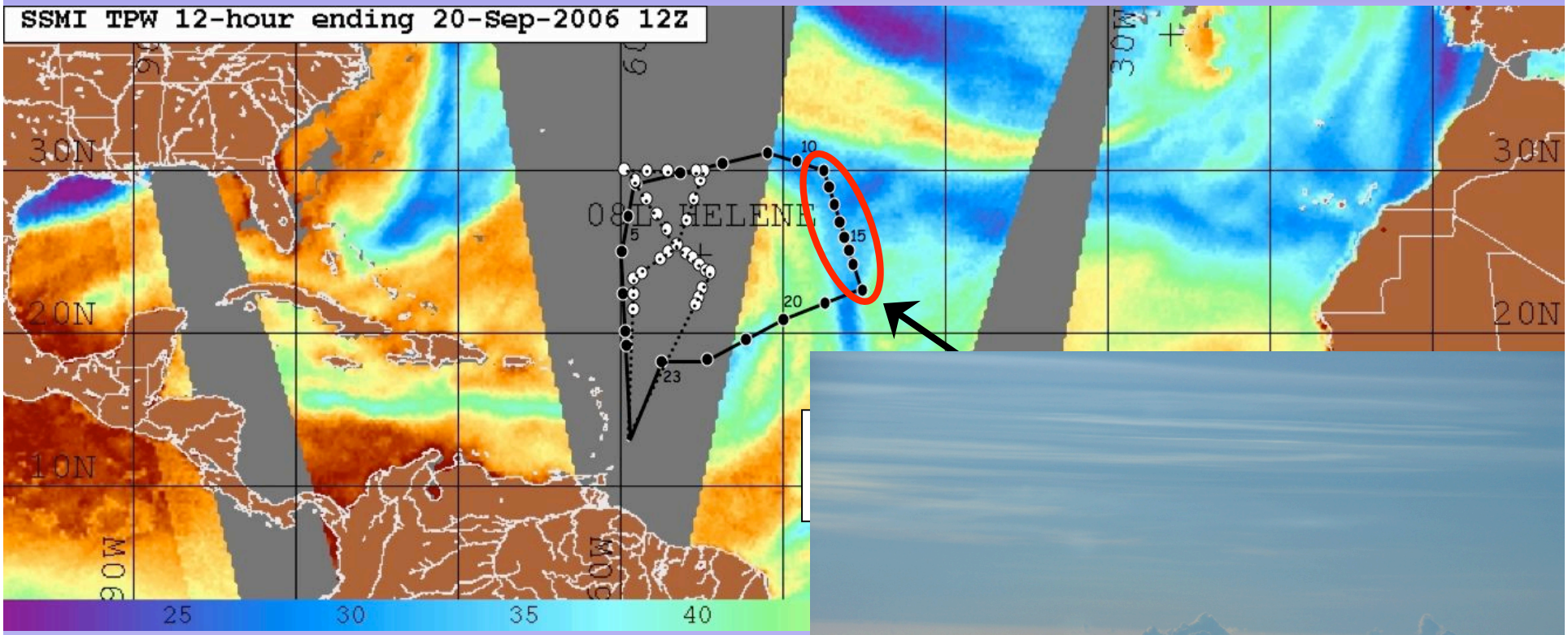






P-3/G-IV SALEX Missions

Hurricane Helene: 15/16/18/20 September 2006



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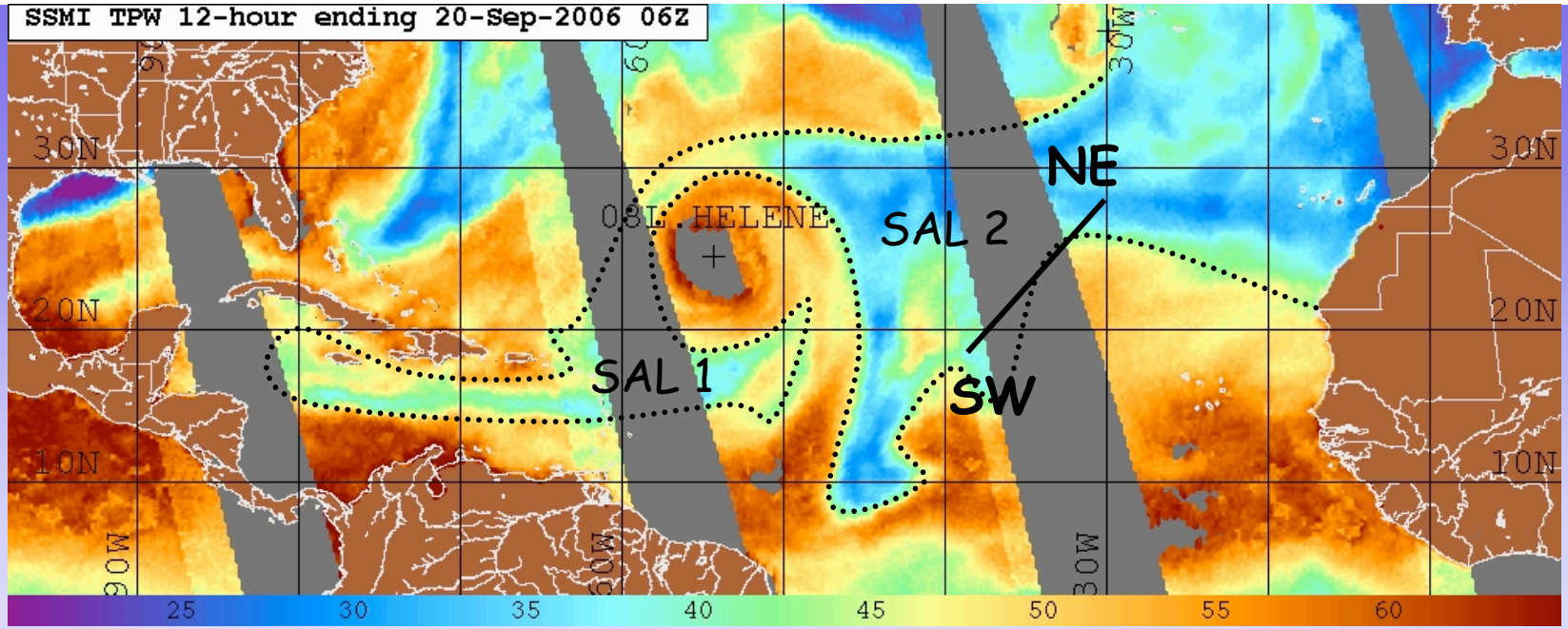
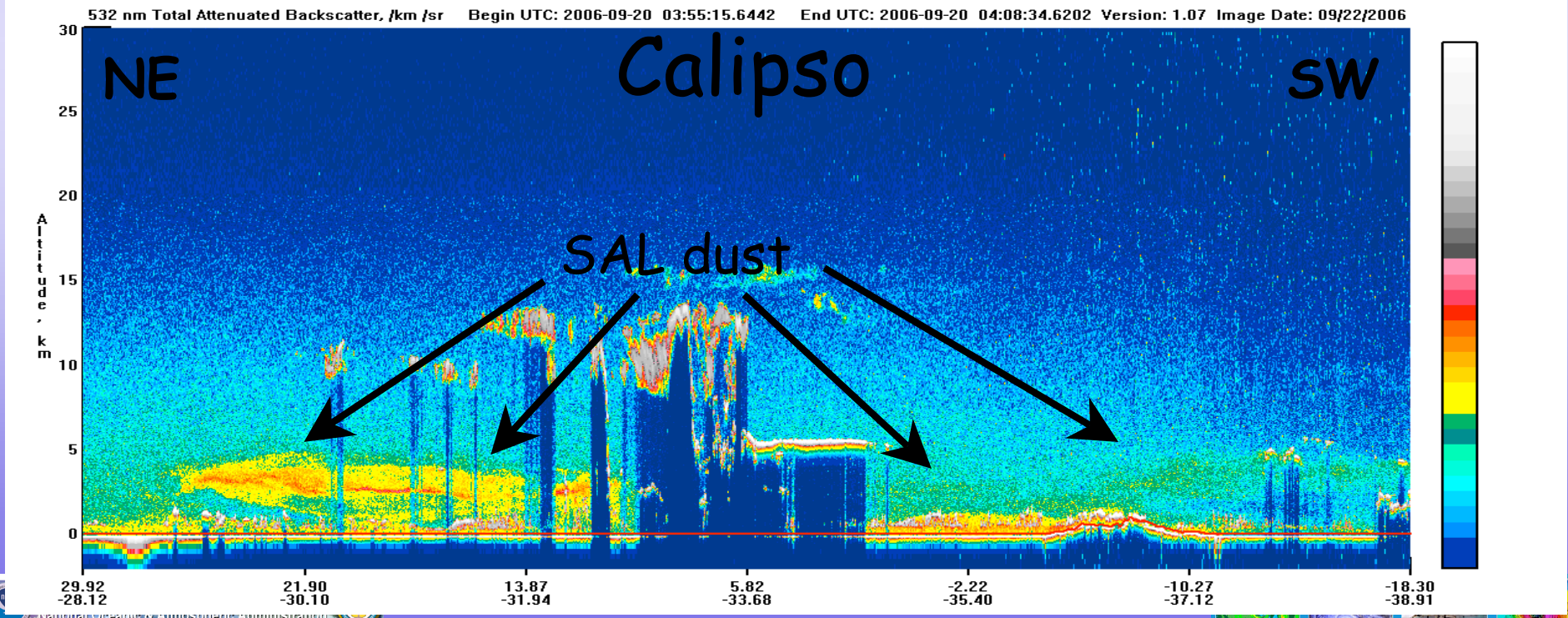

SSMI TPW 12-hour ending 20-Sep-2006 06Z
30N
20N
10N
90W
60W
30W
HELENE
SAL 1
SAL 2
NE
SW
25
30
35
40
45
50
55
60


532 nm Total Attenuated Backscatter, /km /sr
Begin UTC: 2006-09-20 03:55:15.6442
End UTC: 2006-09-20 04:08:34.6202
Version: 1.07
Image Date: 09/22/2006
NE
Calipso
SW
SAL dust
Altitude, km
30
25
20
15
10
5
0
29.92
-28.12
21.90
-30.10
13.87
-31.94
5.82
-33.68
-2.22
-35.40
-10.27
-37.12
-18.30
-38.91

Conclusions

- **The SAL suppresses Hurricanes:**
  1) Dry air: convectively driven downdrafts
  2) Mid-level easterly jet: enhanced vertical wind shear
  3) Suspended mineral dust: enhanced temp inversion; microphysics?

- **NOAA's SALEX Missions: Observe & Understand the SAL's Influence on TCs in the N. Atlantic and Caribbean**

- **Qualitative comparisons Between GPS Sondes and AIRS Lev II Standard Retrieval Product (V4) suggest that:**
  1) AIRS appears to effectively capture the SAL's warm air
  2) AIRS may be overestimating the 700 mb moisture in the SAL
  3) AIRS may be underestimating the low-level moisture at and below the base of the SAL (~850 mb)

Future Work

- Conduct Quantitative Comparisons between GPS Dropsondes from 2005 & 2006 SALEX missions (TS Irene, TS Debby & Hurricane Helene) and collocated AIRS retrievals (V5)

- Investigate TC interactions with other types of dry layers (e.g. Mid-Latitude Dry Air Intrusions)

- Develop a new Jordan Mean Tropical Sounding (SAL vs non-SAL)

LINKS:

- Real-Time SAL Imagery (GOES & Meteosat):
http://cimss.ssec.wisc.edu/tropic/real-time/wavetrak/sal.html

- NOAA SALEX page (research; aircraft mission catalogue):
http://www.aoml.noaa.gov/hrd/project2006/sal.html