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OBSERVATION OF MEDITERRANEAN PRECIPITATING SYSTEMS USING AMSU

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1. MOTIVATION

We aim at exploring the information provided by the Advanced Microwave Sounding Unit (AMSU) as an alternative to the use of reanalysis data to form a climatology of precipitating systems in the Mediterranean region, without relying on retrievals algorithms. AMSU has been collecting data onboard NOAA satellites since 1998.

2. OBJECTIVES

Using **satellite data** only to:

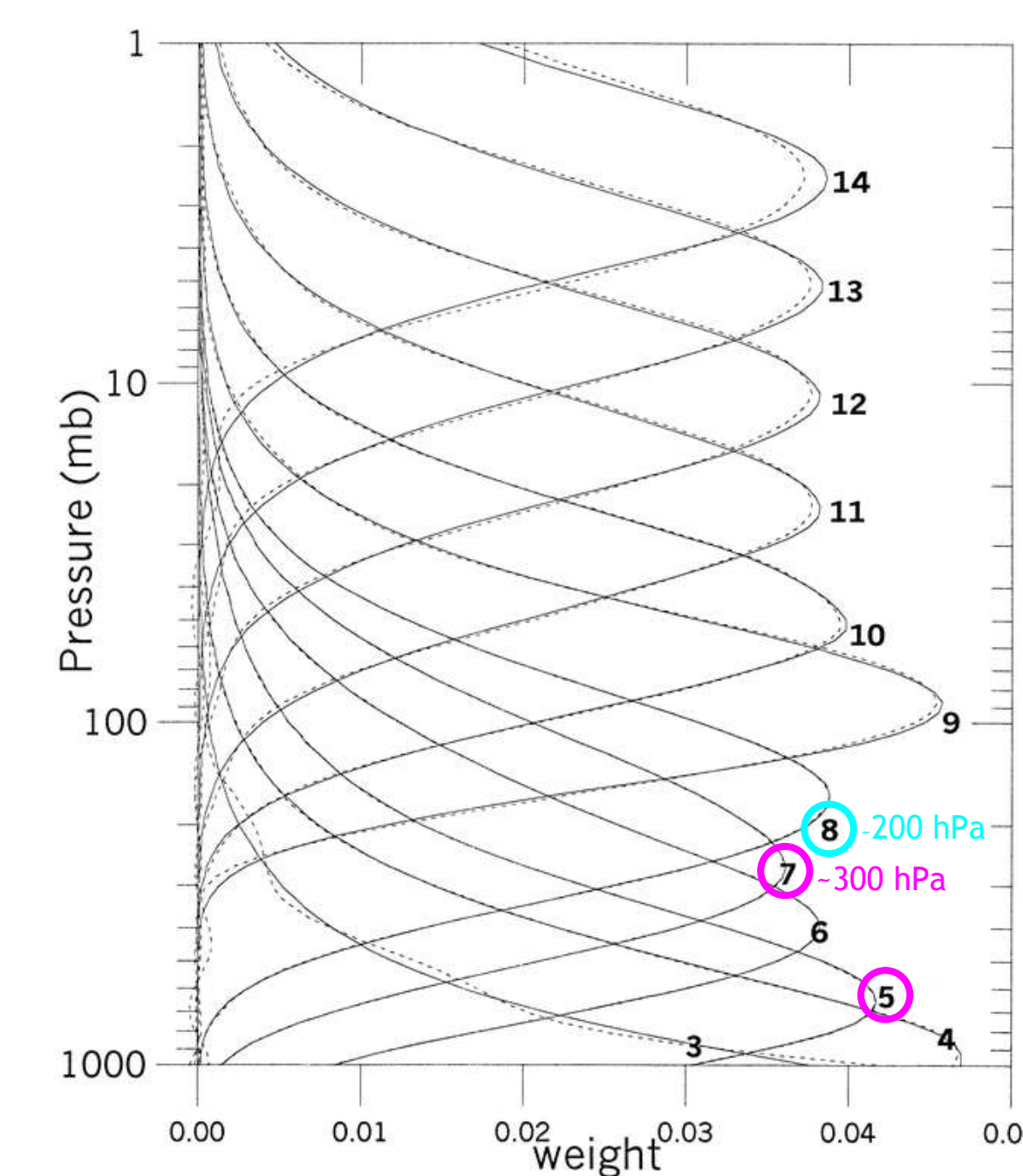
- identify upper level precursors of storms;
- detect and characterize storms;
- identify configurations favorable to the formation/occurrence of severe weather conditions.

3. CASE STUDIES

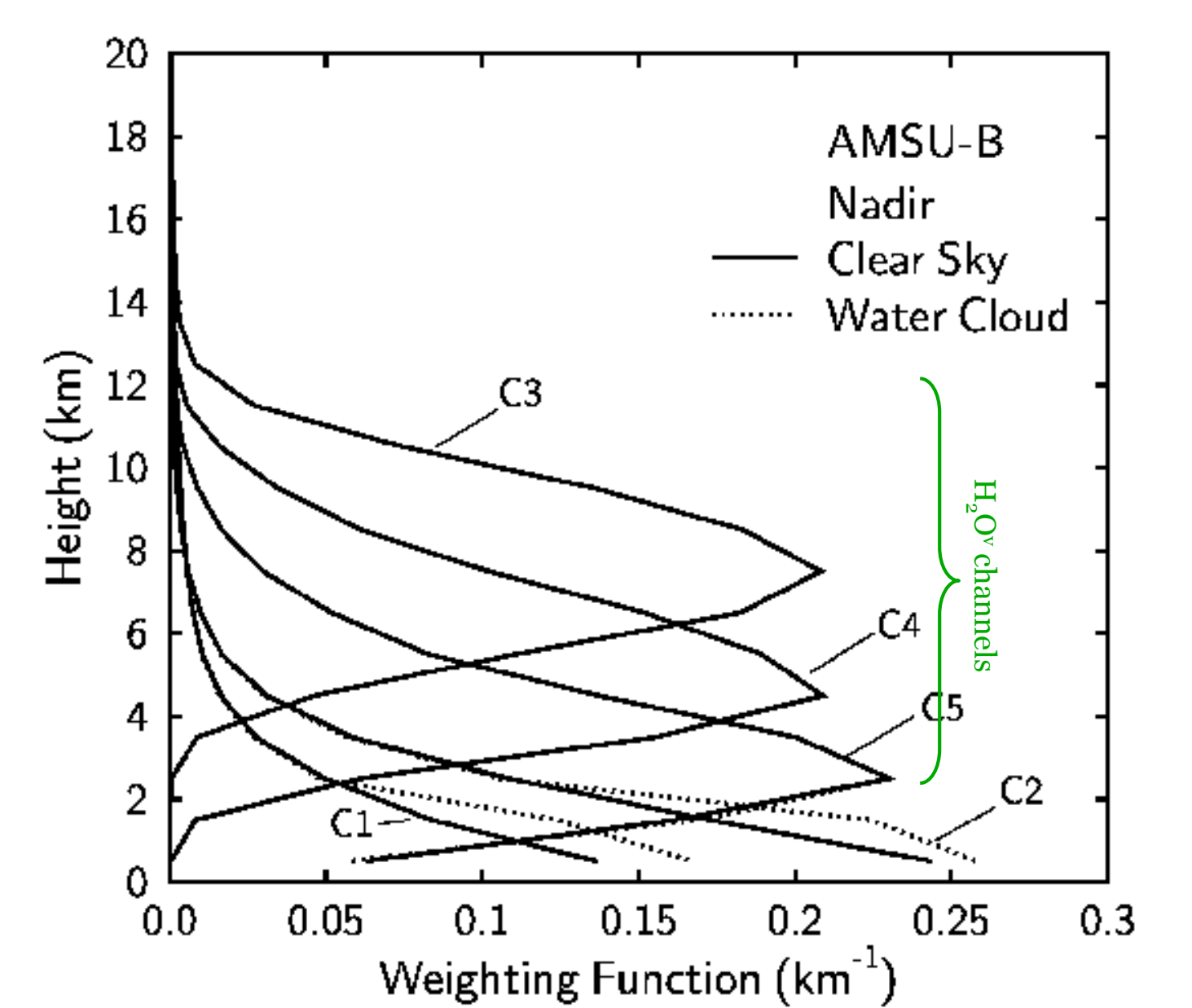
- Gard Region 9 Sep 2002 [sections 5, 6]: heavy rainfall and flash floods; accumulated precipitation of 690mm/24h at some locations.
- Algiers 9-10 Nov 2001 [section 7]: Floods, strong winds and gusts; 262mm/24h registered in Algiers

4. DATA

AMSU-A channels 5, 7, and 8 for upper level features (horiz. resol.: 48km @ nadir)

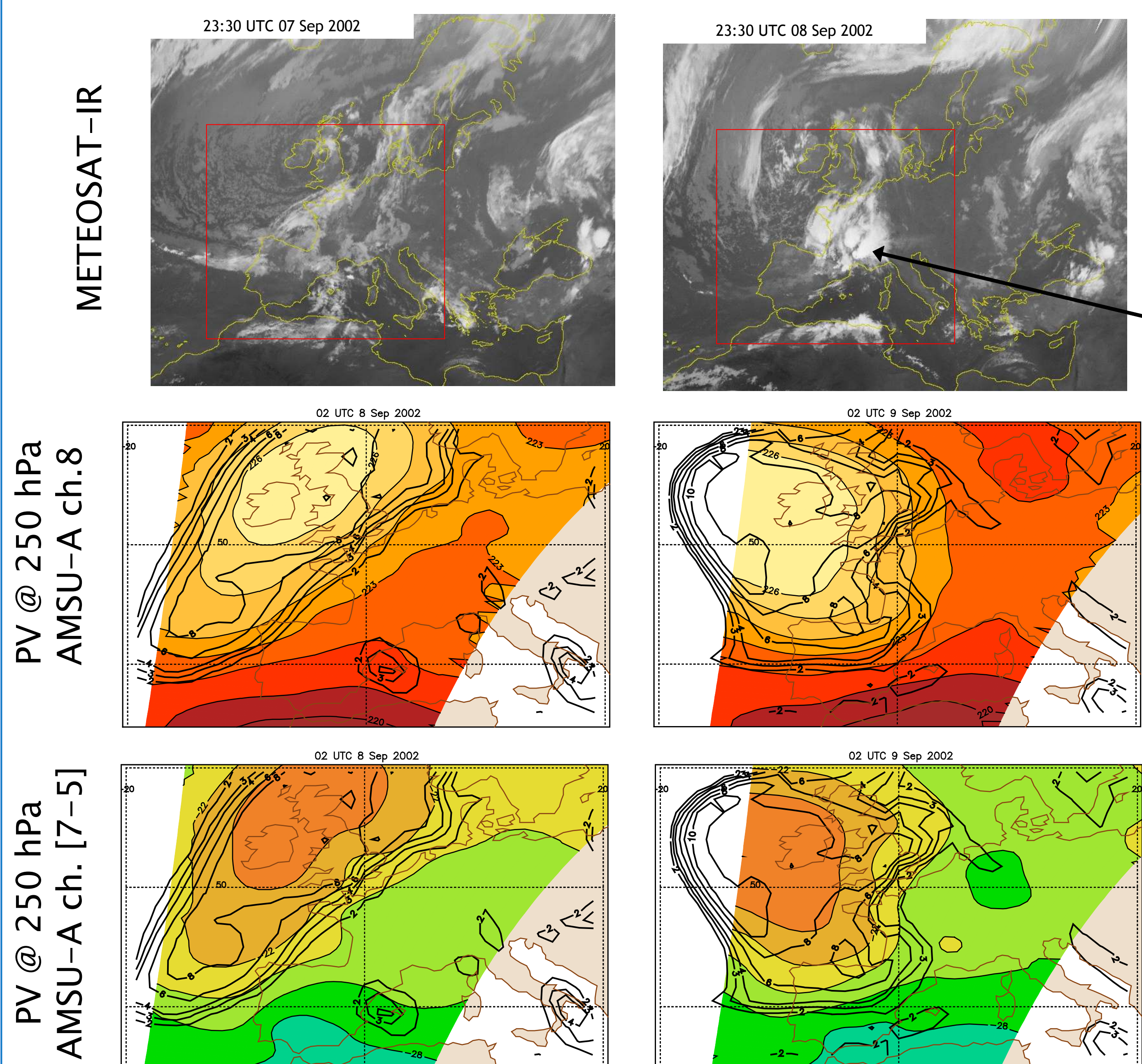


AMSU-B channels 3, 4 and 5 for precipitation (horiz. resol.: 16km @ nadir)



Comparison and Validation: ERA-40, TRMM 3B42 3-hourly accumulated precipitation product, radar-derived and ground station precipitation.

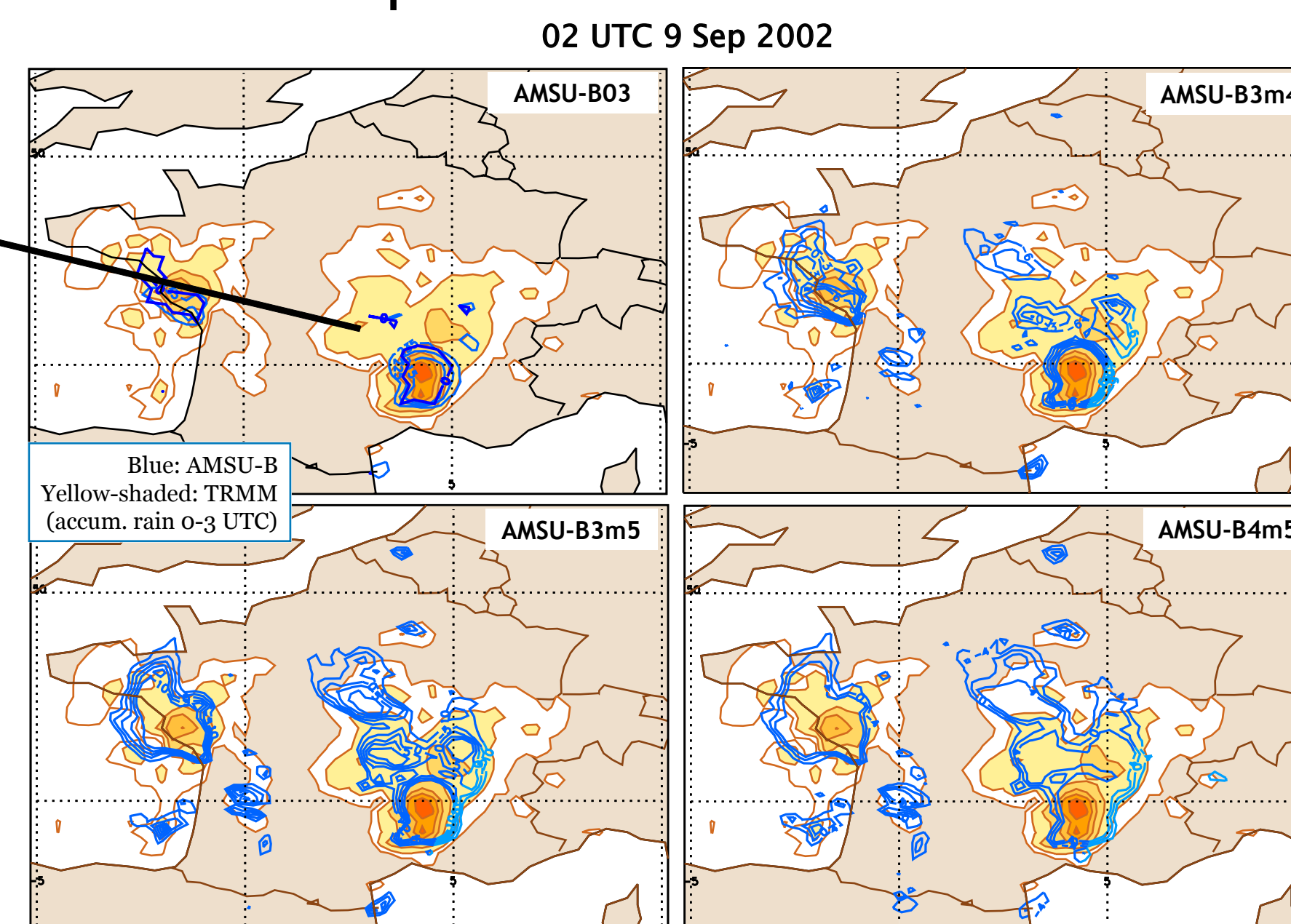
5. DETECTION OF UPPER LEVEL PRECURSORS OF STORMS



AMSU-A8 detects upper level troughs;
AMSU-A7m5 detects deep troughs

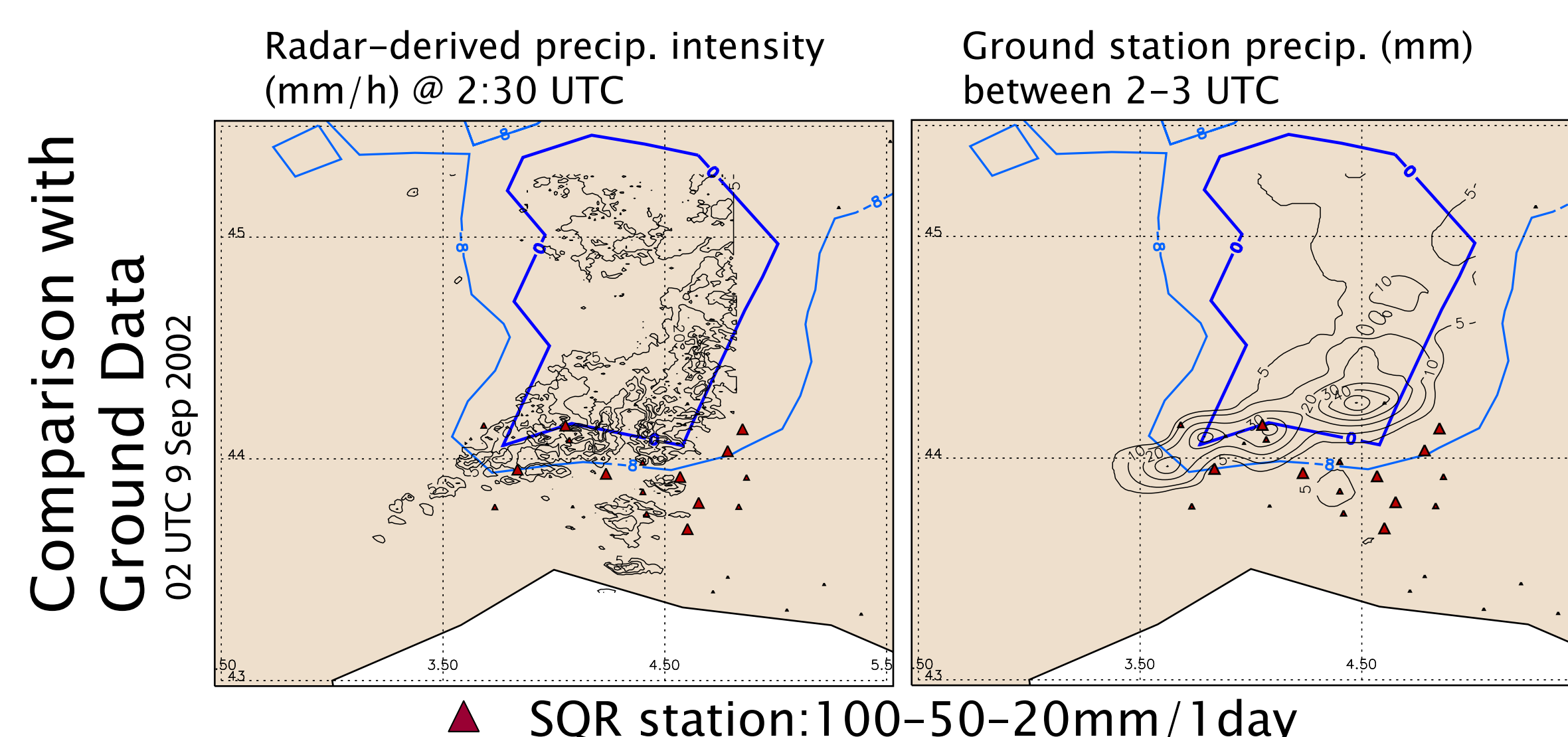
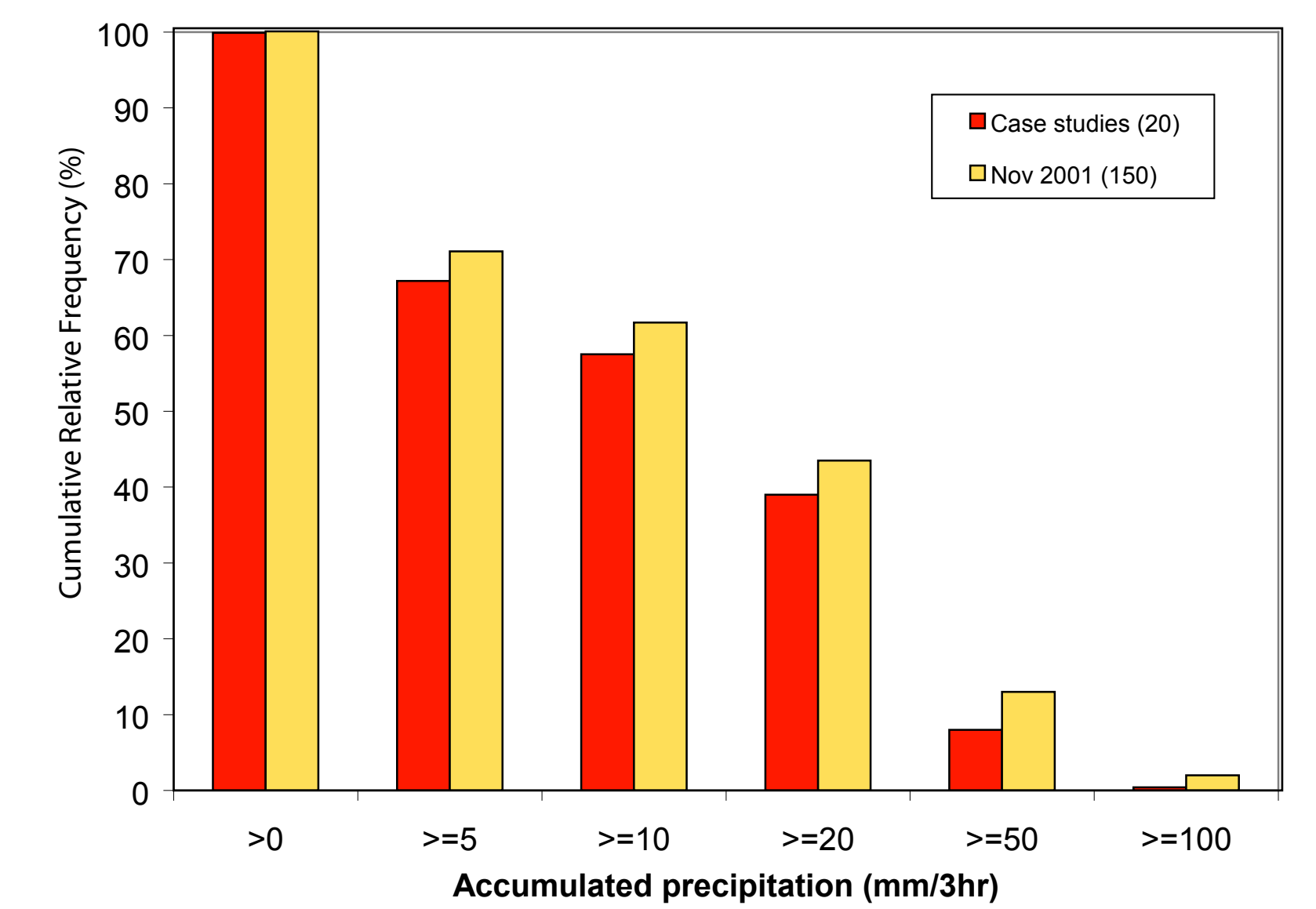
6. DETECTION OF PRECIPITATION

Comparison with TRMM data



« Deep Convection Threshold »
Analysis using TRMM

DCT = AMSU_B4m5 ≥ 0 and AMSU_B3m5 ≥ 0 and AMSU_B3m4 ≥ 0

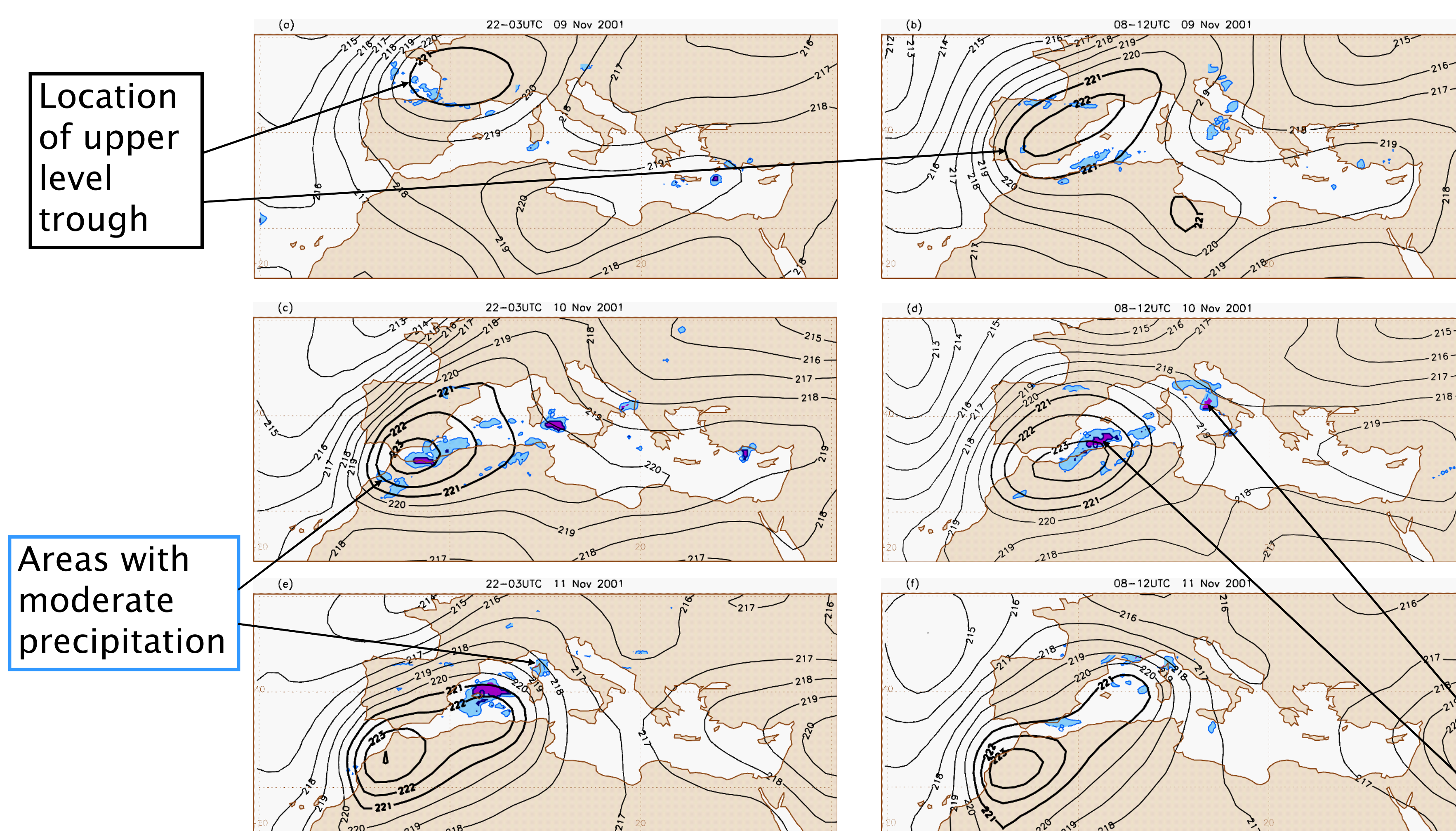


Dark blue: DCT
Light blue:
AMSU-B3m5 = -8K

Good agreement with
TRMM and ground
measurements

Use as thresholds for
detection of precipitation

7. APPLICATION : SEVERE STORM IN ALGIERS 9-10 Nov 2001



SUMMARY:

- AMSU-A ch. 8 works best to identify upper level troughs, while ch. 7 minus 5 provides information about its vertical penetration.
- Combination of ch. 3 to 5 of AMSU-B is able to detect moderate to heavy rainfall. In particular AMSU-B ch. 3 minus 5 = -8 K was found to be a robust threshold to detect moderate precipitation.
- DCT is found to detect precipitating areas that yield 20 mm accumulated in 3 hr, in nearly 50% of the cases.
- **Ongoing work:** use the above channels to establish a climatology of precipitating systems and their typology relative to the upper level situation.

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