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Potential Use for the MWRP in Observation and Model Comparisons of the Thermodynamic Environment

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Objectives

(1) Compare the thermodynamic profiles retrieved from the Micro-Wave Radiometer Profiler (MWRP) during the AMF 2006 deployment in Niamey, Niger to those from the Merged Sounding VAP output profiles.

(2) Explore the unique utility in profiles derived from MWRP retrievals for the purpose of model assessments,

The Microwave Radiometer Profiler (MWRP)

Why is the MWRP the ideal atmospheric profiler for model assessments?

The Pros and Cons of Radiosondes	Profiler Capabilities and Limitations
4-6 launches per day	Continuous profiles
Range entire atmosphere	Max range 10 km
In-situ measurements	Retrievals
Relatively high (~10-m) vertical resolution	Relatively low (100-m to 250-m) vertical resolution
~40-min tropospheric ascent time (~2 hr to full height)	Instantaneous
Horizontal drift	True vertical profile

9 June 2006
MWRP vs. Merged Sounding VAP

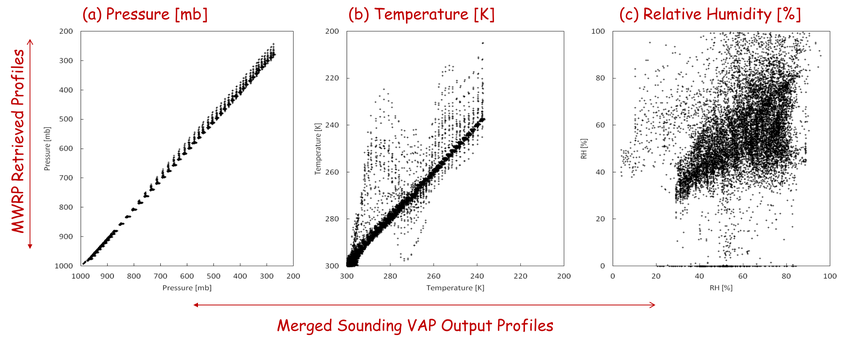

Figure 1. Scatter plots of MWRP-retrieved thermodynamic profiles against Merged Sounding VAP output profiles, sampled at 5-minute intervals on June 9, 2006.

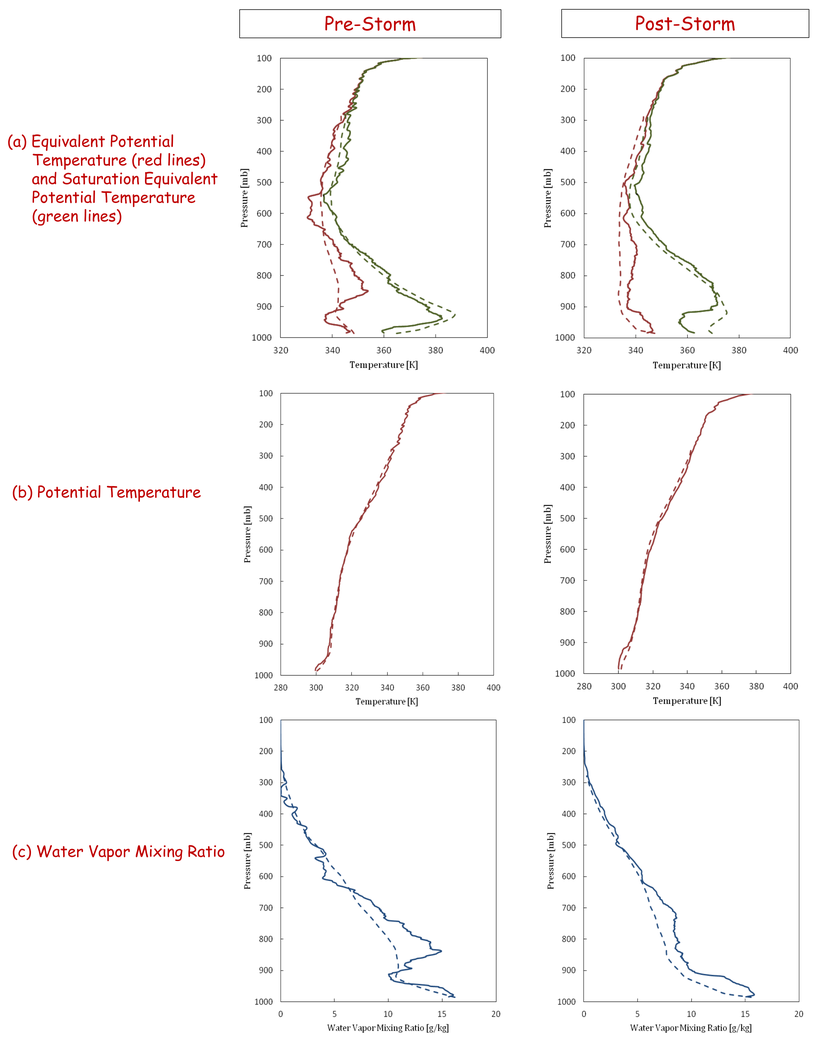

Figure 2. Pre-storm (0500 UTC) and Post-Storm (1300 UTC) thermodynamic environments on June 9, 2006 from the Merged Sounding VAP (solid lines) and the MWRP (dashed lines).

Challenges and Possibilities for MWRP CAPE Computations

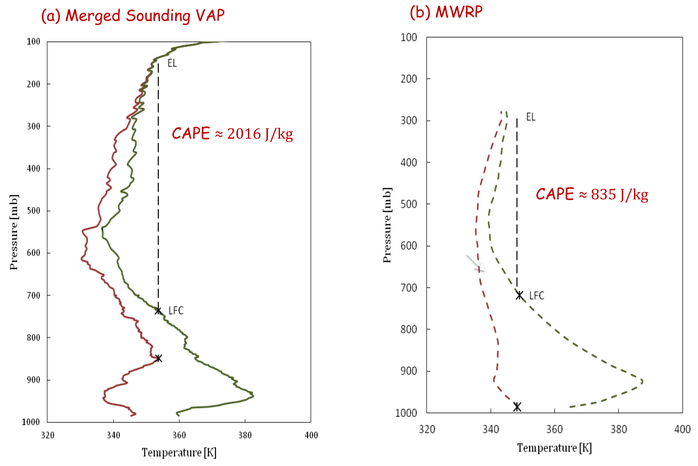

Figure 3. Profiles of equivalent potential temperature (red lines) and saturation equivalent potential temperature (green lines) for the pre-storm environment on June 9, 2006 used to compute CAPE, defined as the positive area bounded by the saturation equivalent potential temperature profile and the line of maximum equivalent potential temperature (black dashed line).

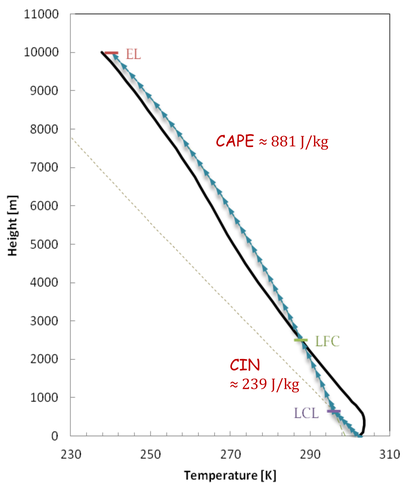

Figure 4.

Atmospheric virtual temperature profile (black line) from the MWRP for the pre-storm environment on June 9, 2006 used to compute CAPE and CIN, defined as the positive and negative areas bounded by the environmental temperature profile and the curve of an ascending air parcel originating at the surface (blue line).

Initial Results and Future Work

(1) MWRP temperature profiles appear to be well correlated with Merged Sounding VAP output.

(2) Methods to compute CAPE and CIN that are appropriately suited for evaluating model-produced profiles are easily automated for application with MWRP profiles.

(3) The future work will focus on understanding the root cause of the differences between the humidity profile reported by MWRP and Merged Sounding VAP, and the attempted resolution of such issue.