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Thermodynamic and Wind Profiling for Fog Prediction

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Microwave profilers operate at these California sites

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Forecast Applications

- Wind and Solar Energy
- Utility Electric Load
- Fire Weather
- Destructive Winds
- Weather Modification
- Marine Layer and Fog

- Three microwave profilers in the Tehachapi Wind Resource Area
- Improved short-term wind energy forecast
- - U.C. Davis
  - AWS True Power
  - Sonoma Technology
  - So. Cal. Edison
  - Dept. of Energy
- Funded by the California Energy Commission

San Diego Gas & Electric operates two mobile wind and thermodynamic profilers for Santa Ana wind, fire weather, solar and utility load forecasting (Newscast)

San Jose State University operates a mobile thermodynamic and wind profiler for fire weather research

Idaho Power operates four radiometers for weather modification.
RHS Consulting operates a radiometer to support
cloud seeding for three California water districts.

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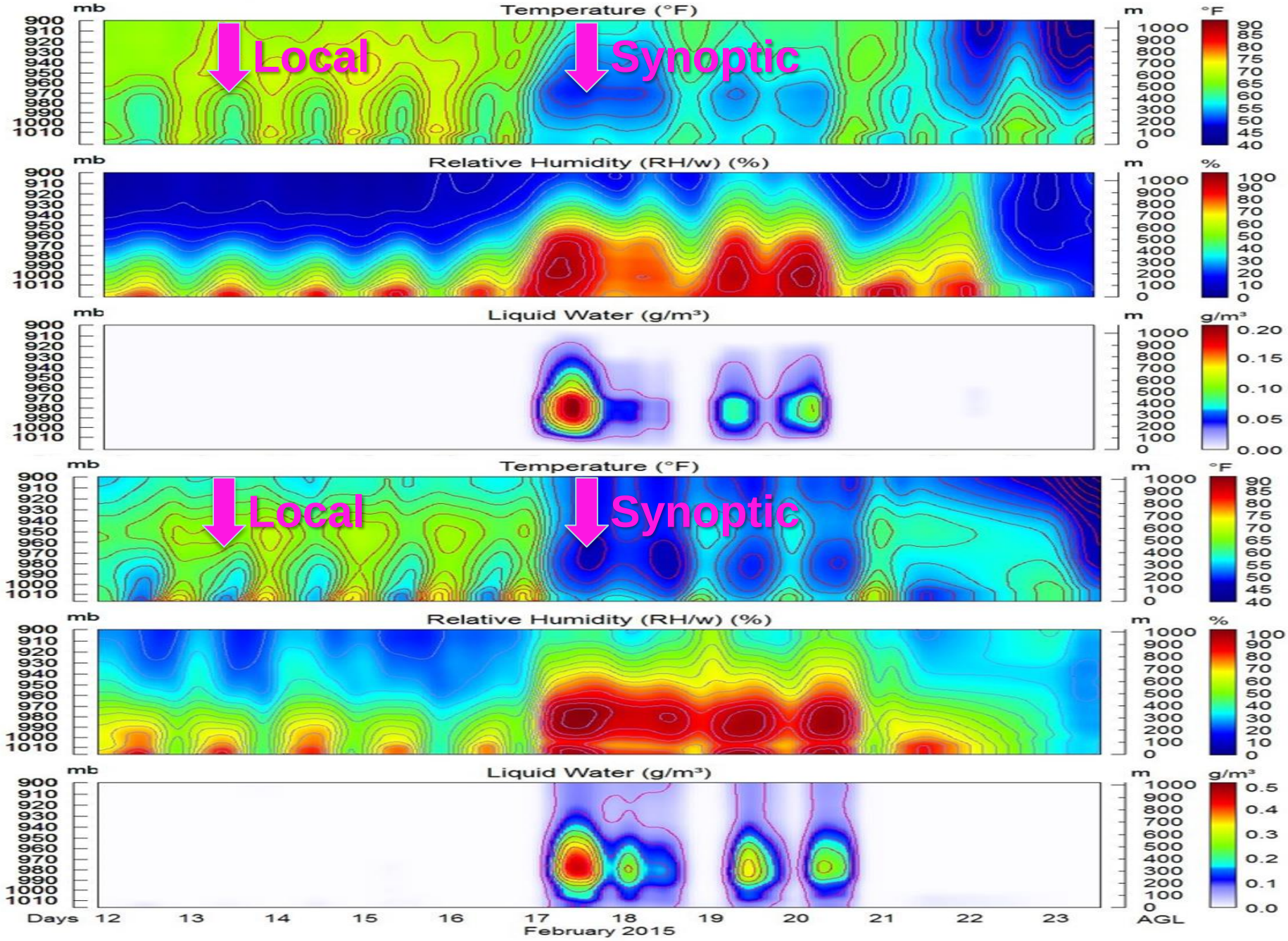
Key Fog Parameters

- Local
  - **Humidity, Temperature**
  - **Liquid Water, Cloud Cover**
  - Wind Speed and Direction

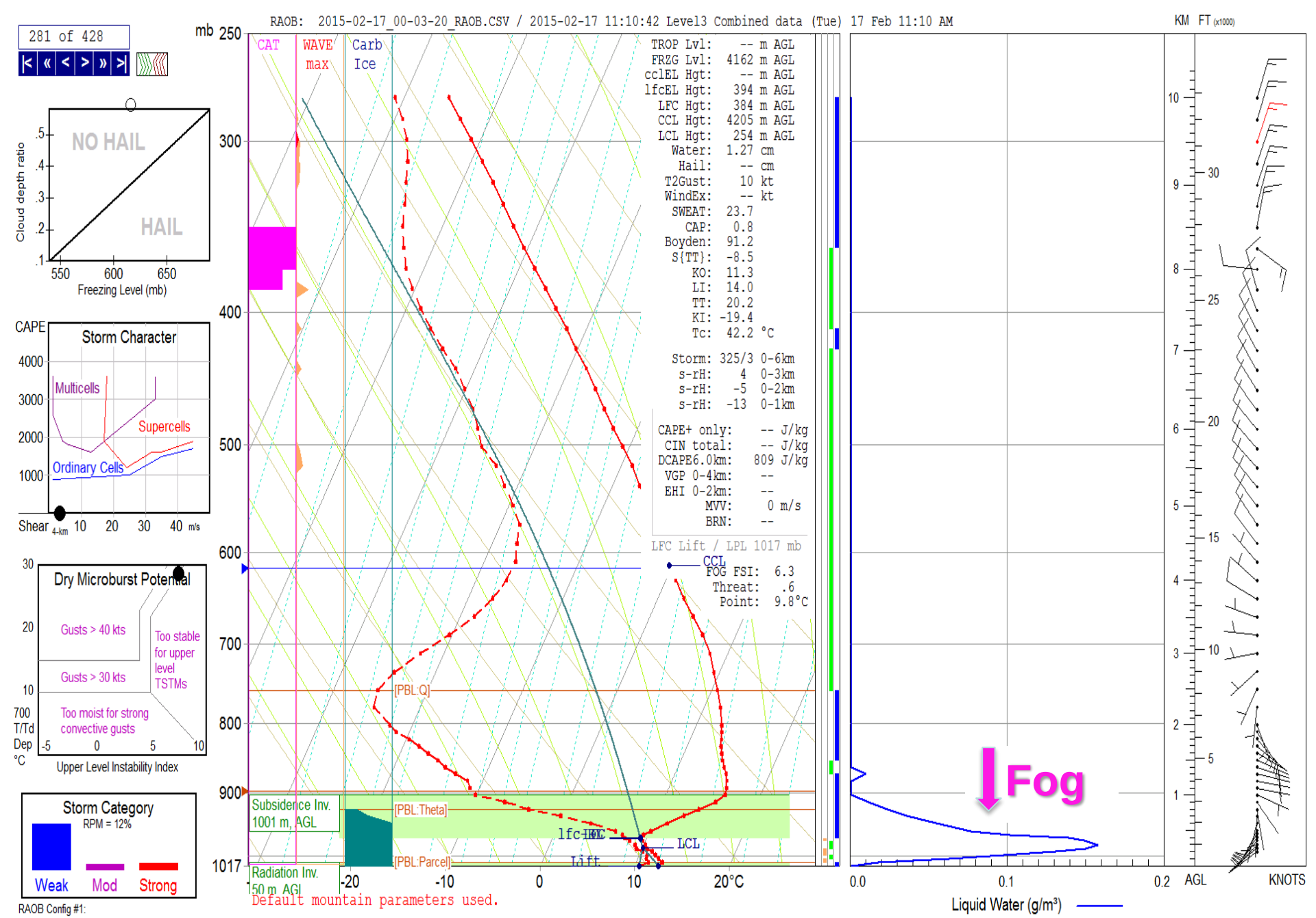
Microwave Profiler

- Synoptic (Model Output Statistics)

Boundary Layer Network radiometer at the Exploratorium in San Francisco. Another radiometer is located at San Jose.

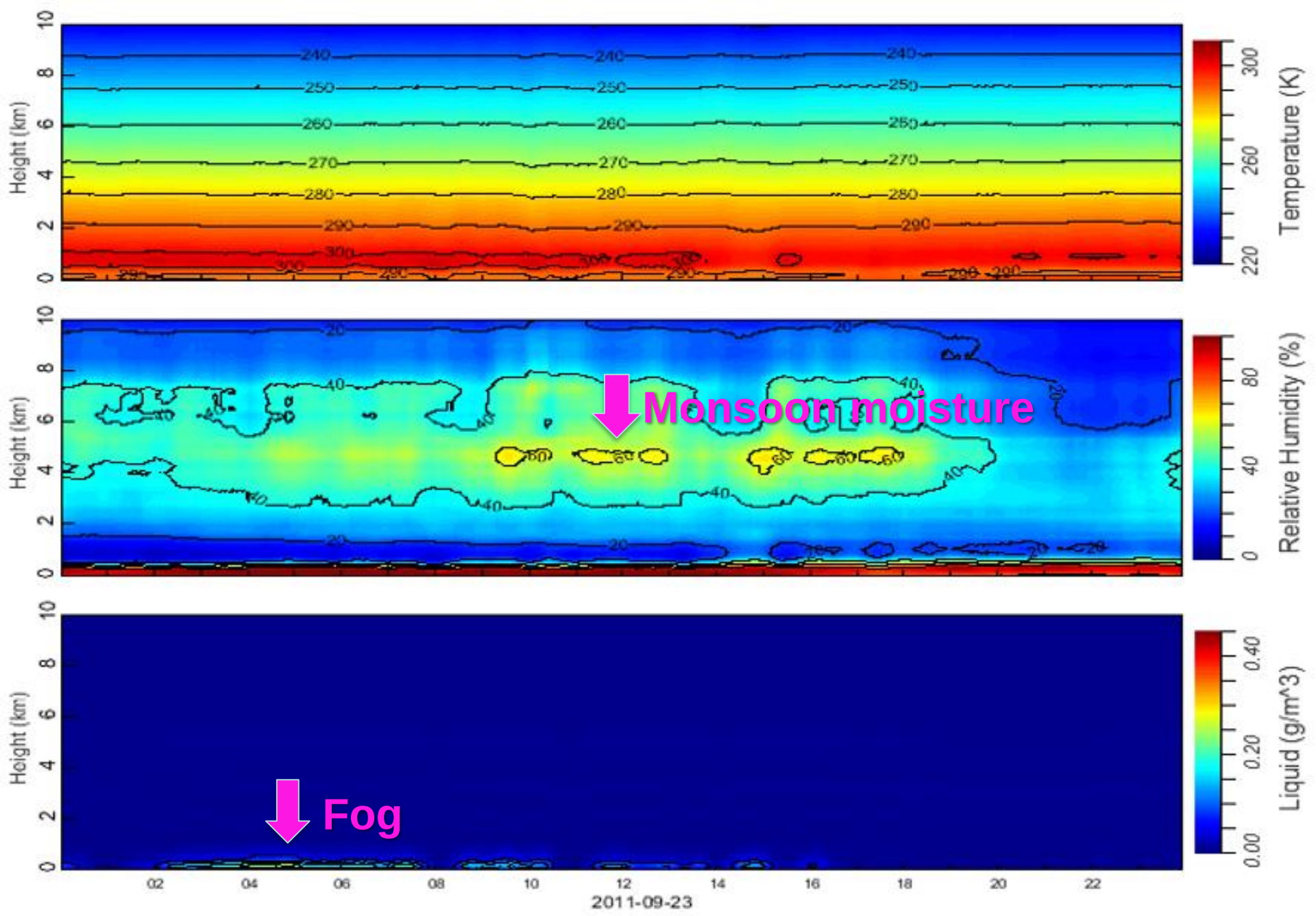


Local diurnal and synoptic signatures at San Francisco and San Jose (12-day)

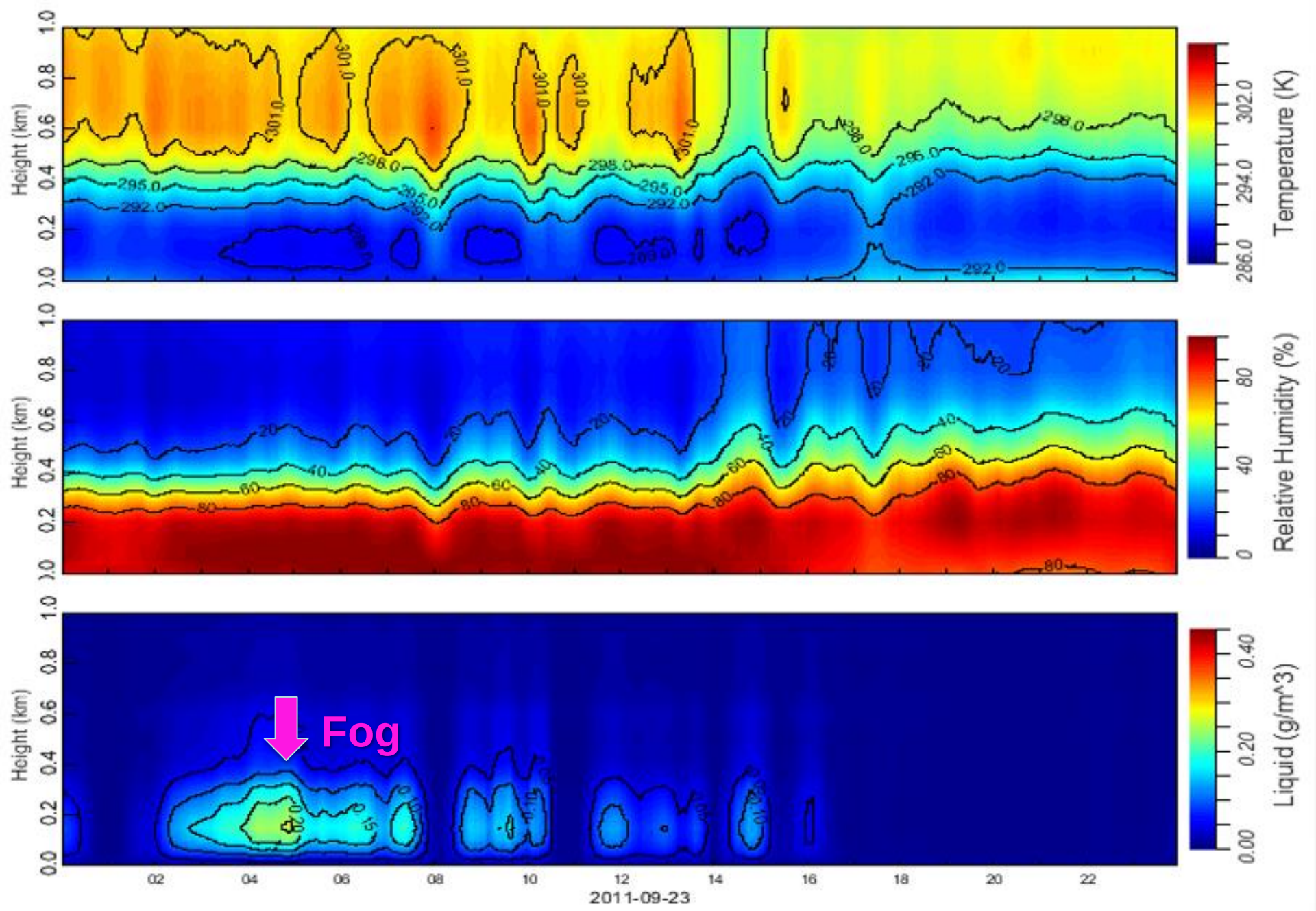


Sigma Sounding (1DVAR -- radiometer + analysis) at San Francisco, 11:10Z 17Feb15

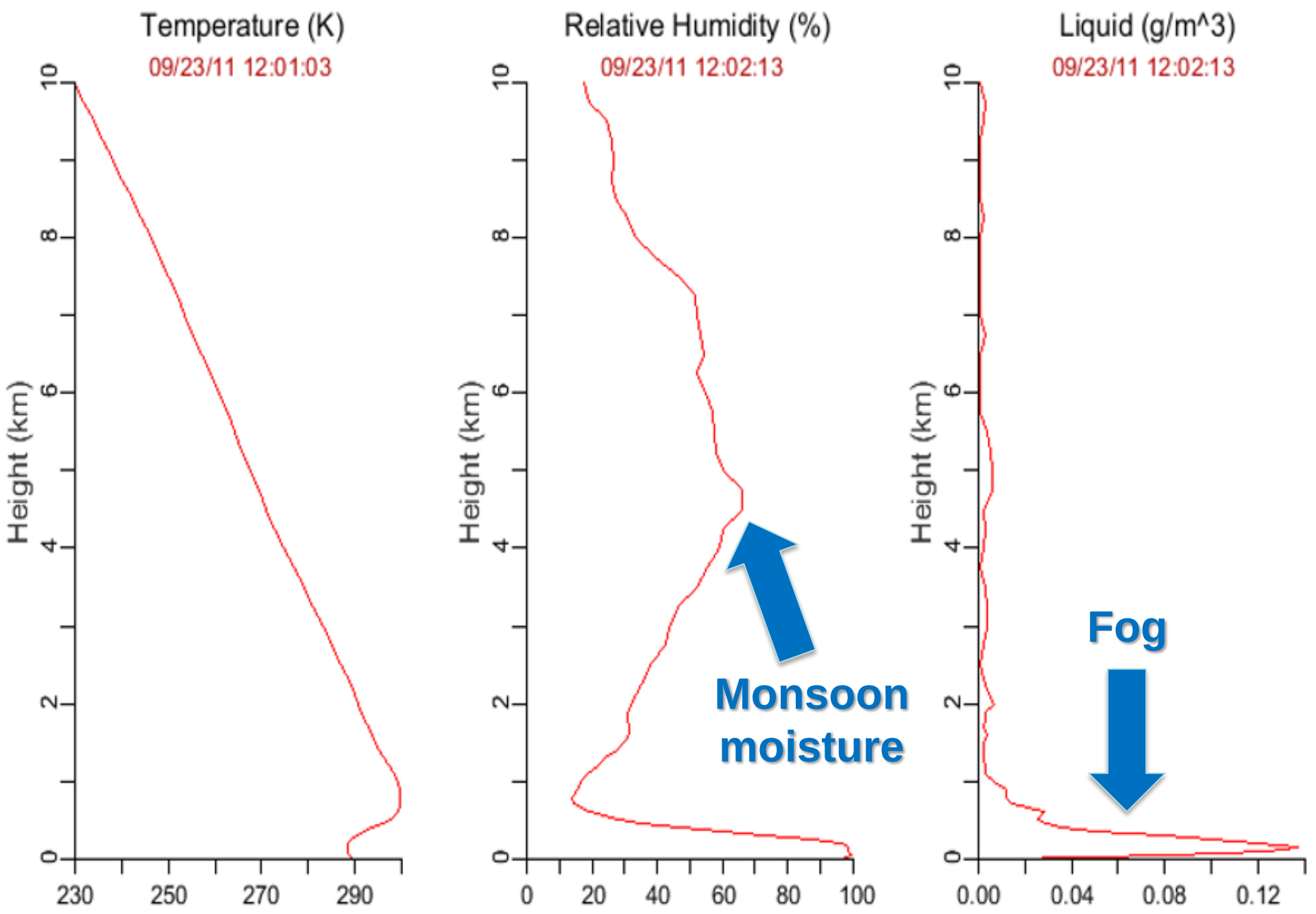
So. Cal. Edison radiometer at Los Angeles and nearest radiosonde launch sites



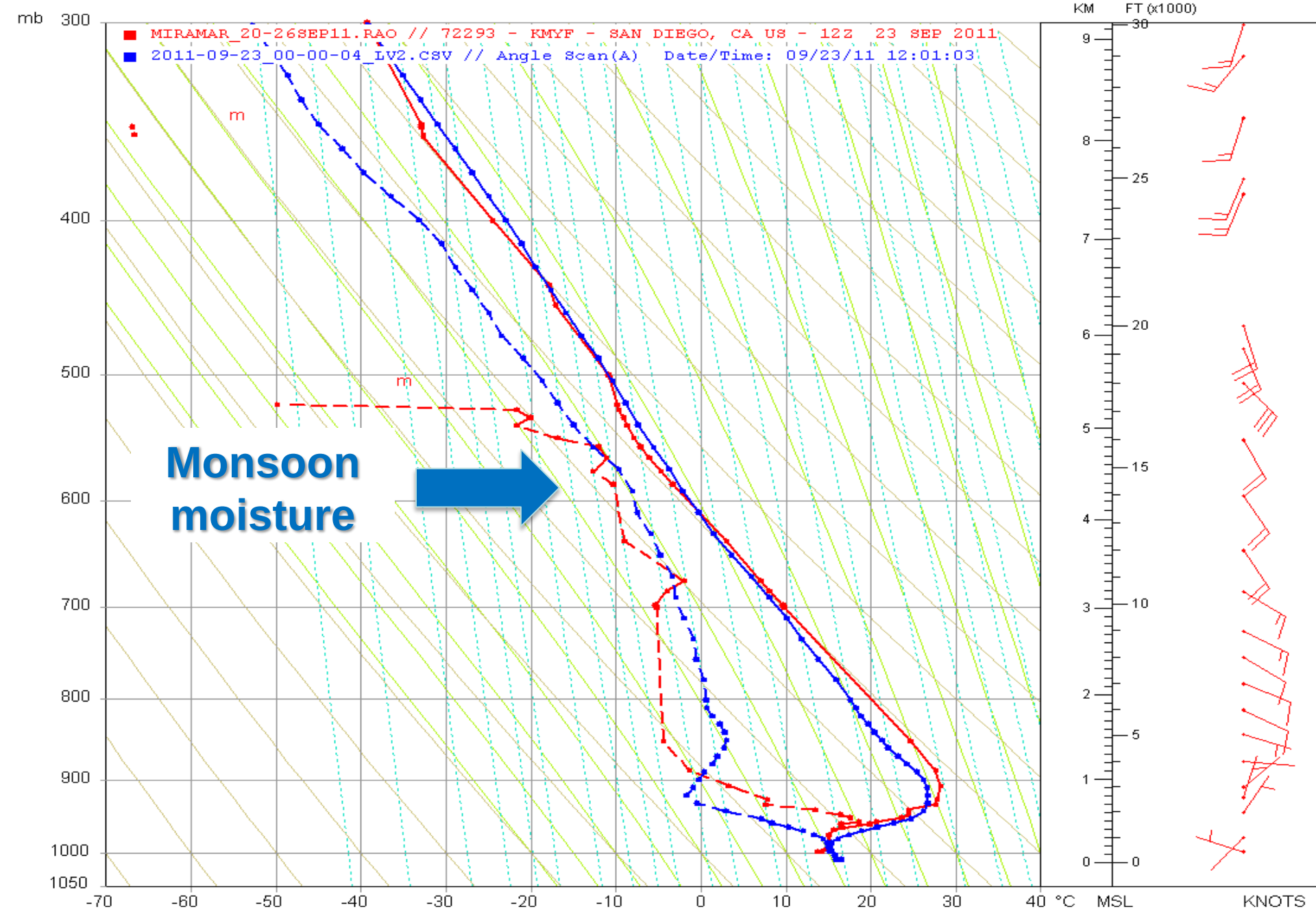
Monsoon moisture and fog in radiometer profiles to 10 km height



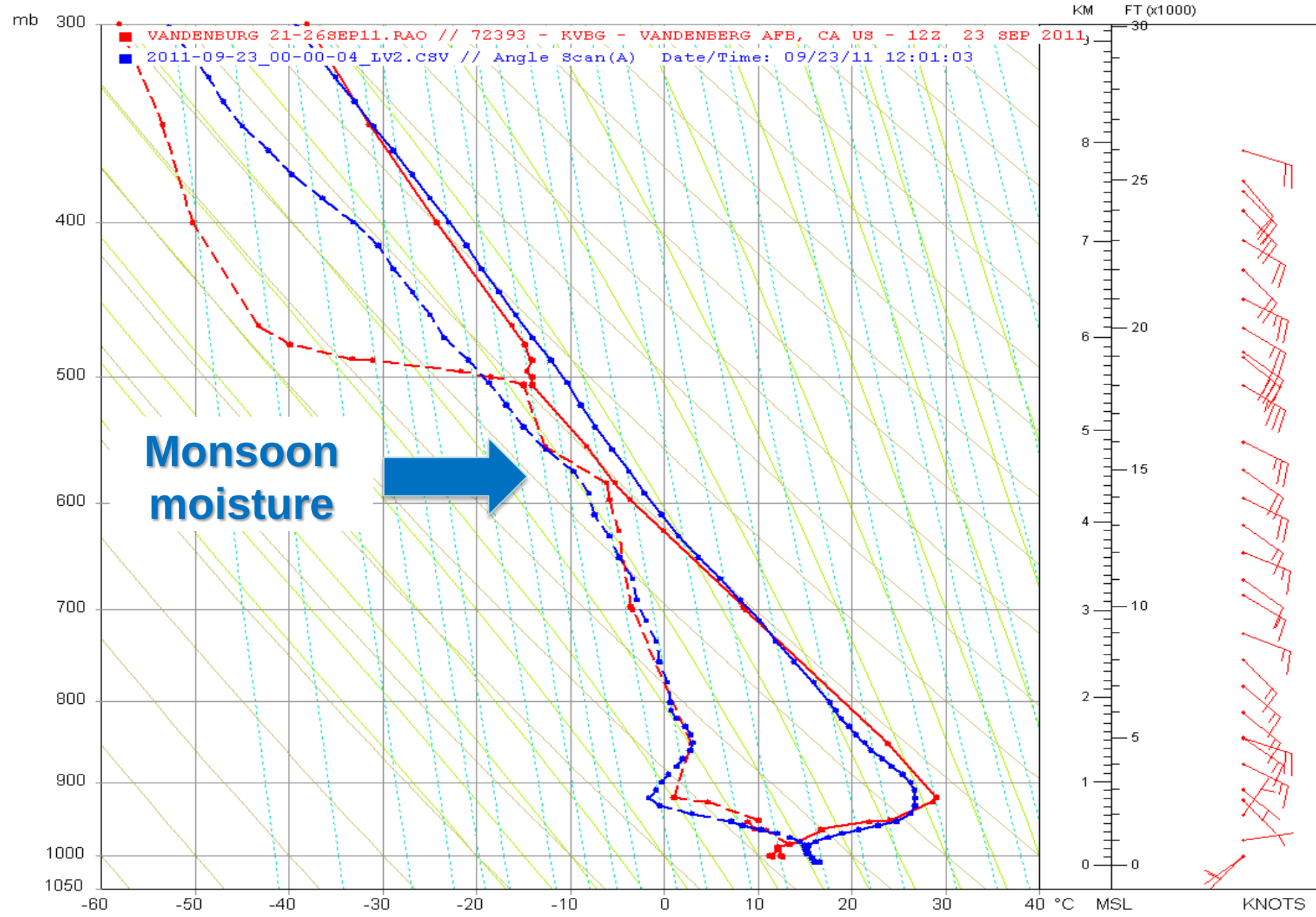
Radiometer profiles to1 km height



Radiometer profiles at Los Angeles, 12Z 23Sep11



San Diego radiosonde (red) and Los Angeles radiometer (blue), 12Z 23Sep11



Vandenberg radiosonde (red) and Los Angeles radiometer (blue),12Z 23Sep11

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How to Improve Fog Forecast

- Continuous Thermodynamic, Liquid and Wind Profiles (TLWP)
- Model Output Statistics (MOS)
- TLWP + MOS includes local and regional contributions

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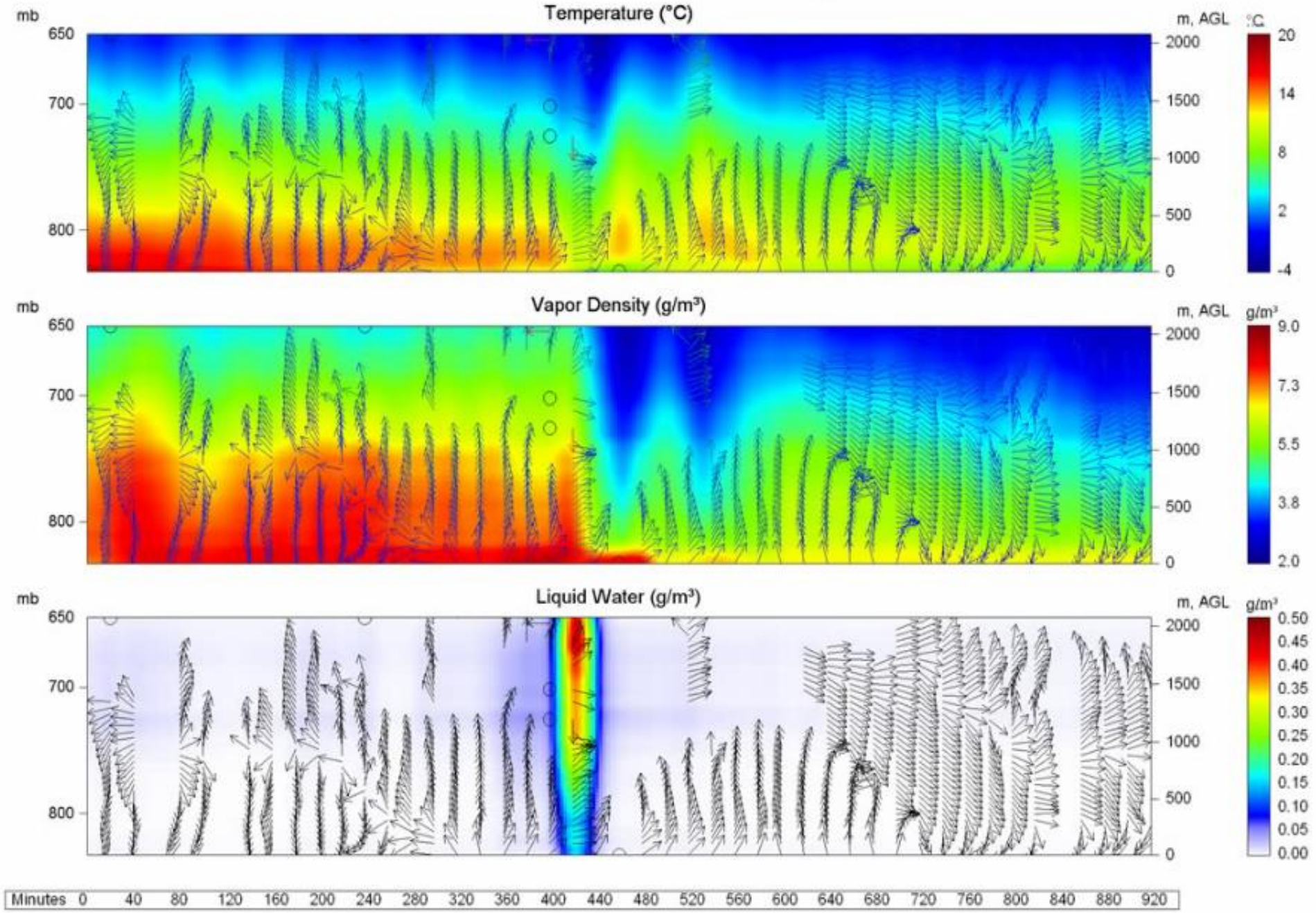
New York State MesoNet (NYSM)

- 17 microwave radiometer and wind lidar sites -- several near international airports
- These data can be assimilated in high resolution numerical weather models
- Model Output Statistics provide synoptic fog prediction parameters



Thermodynamic and wind (WindCube lidar) profiles (Nelson et al, 2013)

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Opportunity

- Fog is created by local and synoptic scale weather conditions
- Meteorological data on both scales are needed for accurate fog prediction
- NYSM: fog prediction using local (thermodynamics and winds) and synoptic (Model Output Statistics) information