

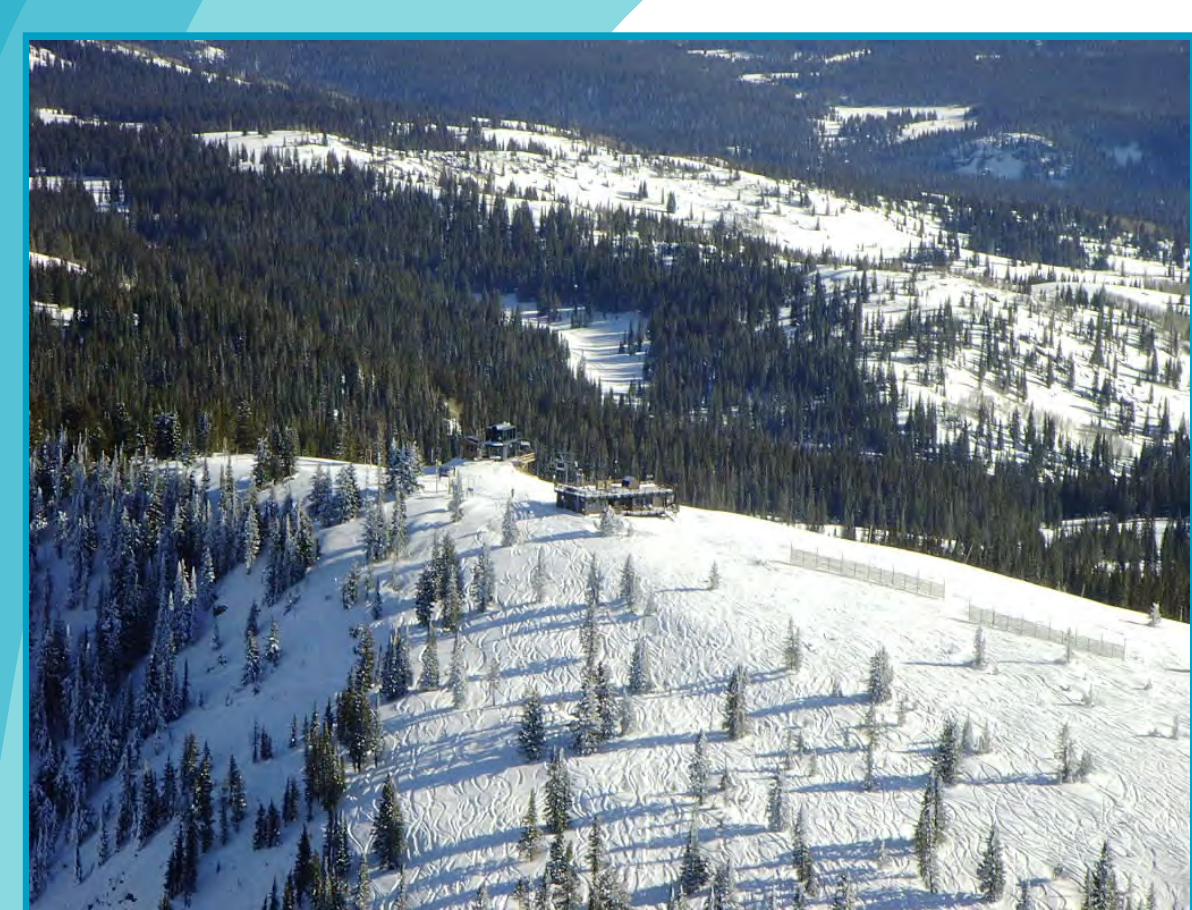
StormVEx - The Storm Peak Lab Cloud Property Validation Experiment

An ARM Climate Research Facility - AMF2 Maiden Deployment



Project Team

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Aerial view of SPL



Rime covering SPL



Summer/Fall at SPL



Winter/Spring at SPL



Science team at AMF2 location during Winter 2009 site visit



Doppler Spectra Analyses in "Mixed-Phase" Clouds

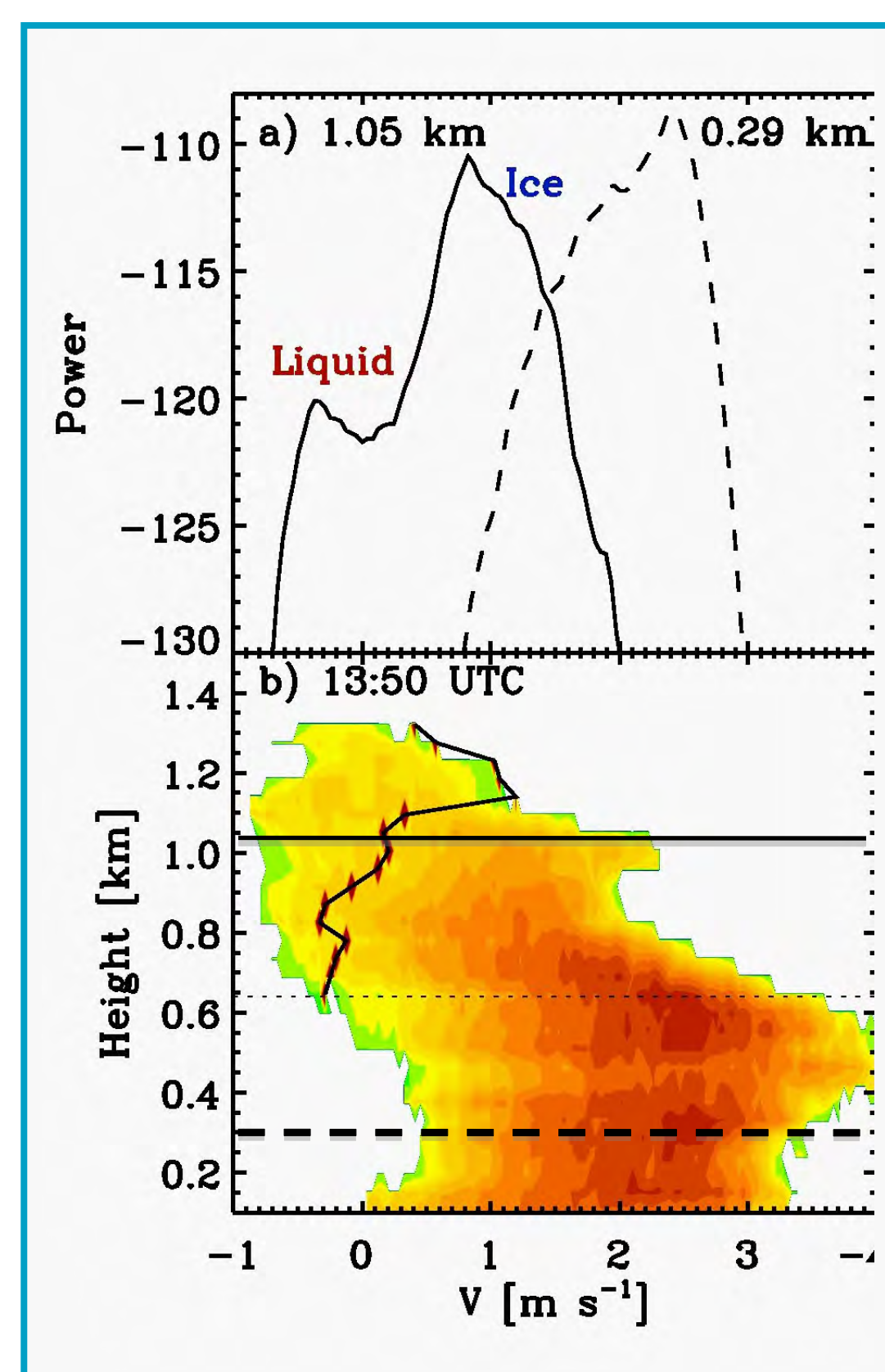
Graphic (bottom) shows returned power as a function of Doppler velocity (i.e. Spectra).

Graphic on top extracts power spectra from two heights – 0.29 km (dashed) and 1.05 km (solid).

"Mixed-Phase" spectrum near cloud top has distinct contributions from both liquid and ice particles (bimodal).

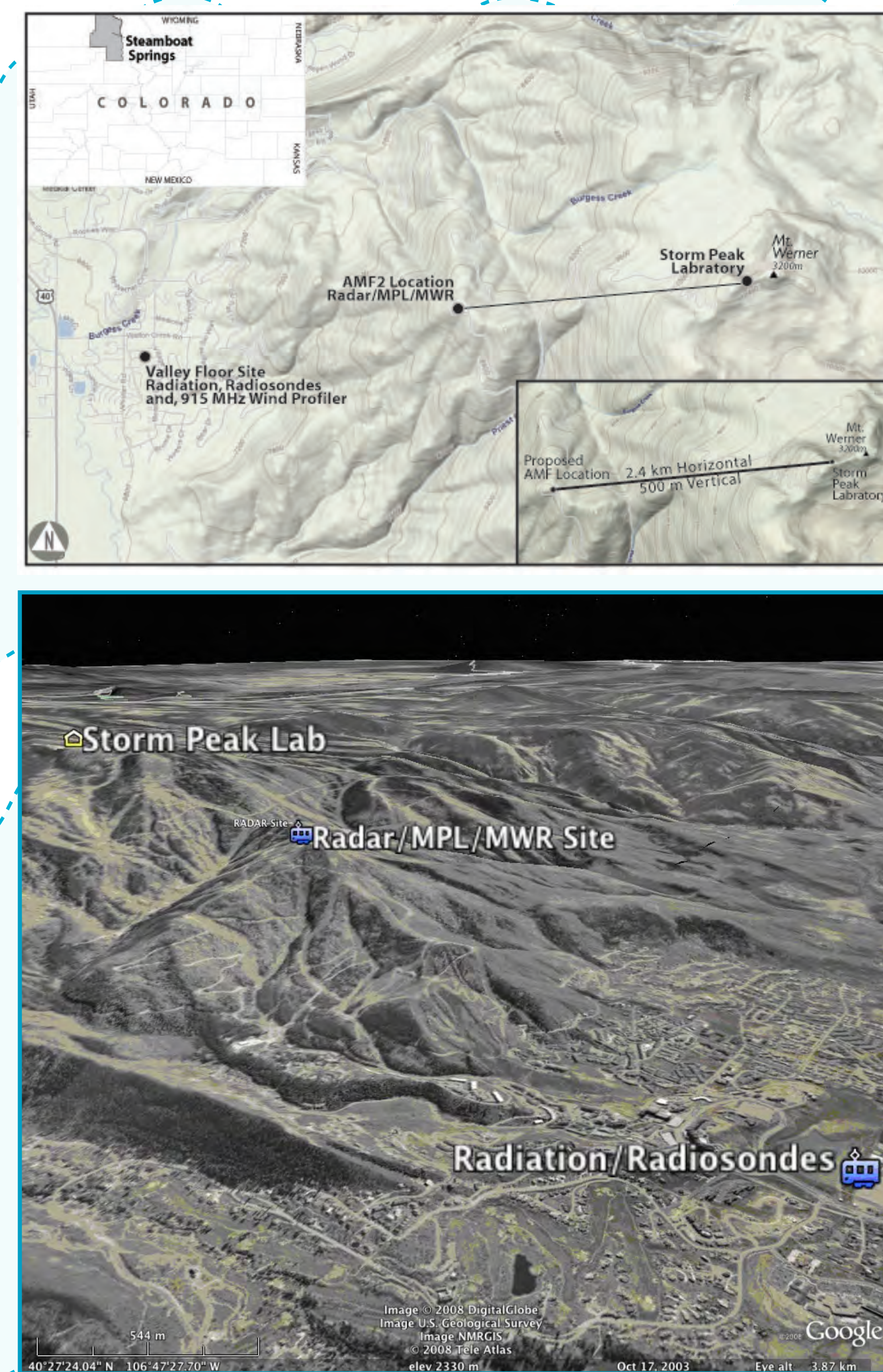
Spectrum near the surface (0.29 km) is characteristic of ice/snow (monomodal).

In some cases the contributions from each phase can be distinguished and used for retrievals.

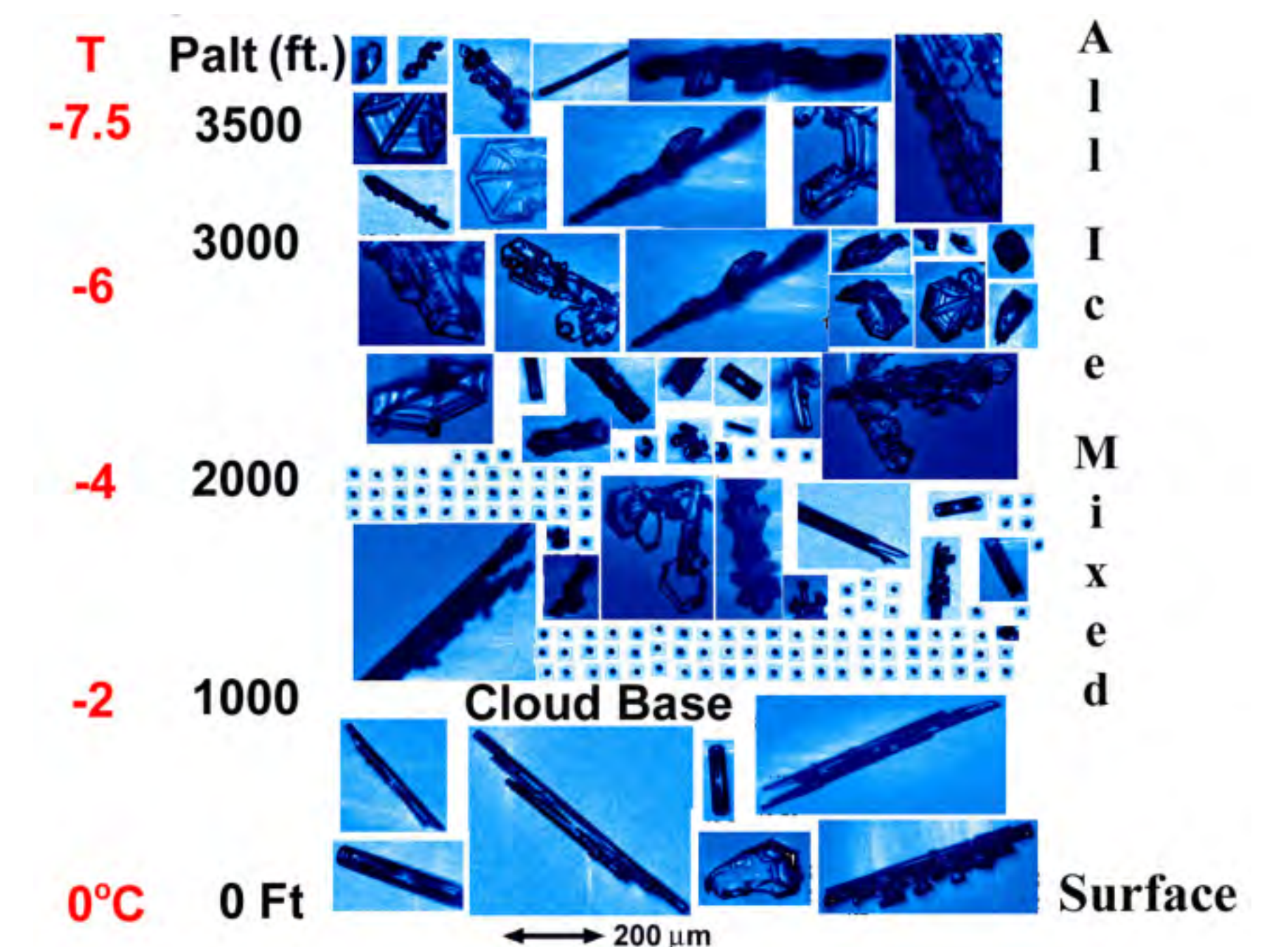
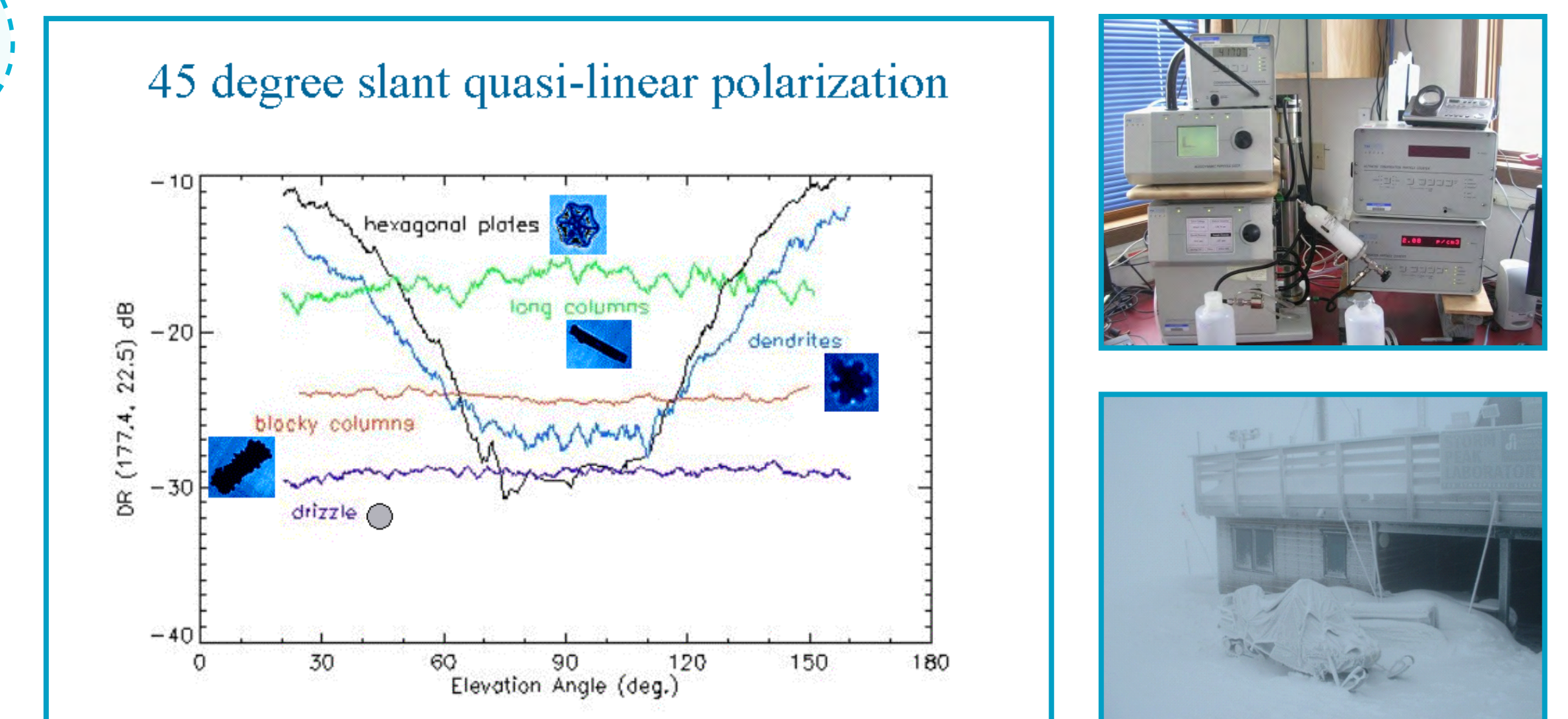


StormVEx Question:

Can these distinctions be made in orographic clouds with snow flakes, water droplets, and active dynamics?



K-band depolarization versus elevation angle for different ice crystals



The core goal of ACRF is improving the representation of clouds in global models. The ability to convert the remote sensing measurements to cloud properties has been hampered by a critical shortage of correlative data for validation and development of new algorithms. Such data sets are normally created by episodic and expensive aircraft measurements. StormVEx will create a correlative data set equivalent to ~200-300 aircraft flights in liquid and mixed phase clouds. This will be achieved by placing the AMF2 in close proximity to an elevated platform heavily instrumented with aerosol, cloud, and precipitation sensors.

Storm Peak Lab (SPL), located near Steamboat Springs, Colorado, is a well established cloud and aerosol research facility operated by DRI. SPL is located 3210 m asl and is above cloud base 25% of the time in the winter. StormVEx will augment the already extensive instrument suite at SPL with additional state of the art instruments, typically used for airborne cloud research by the Stratton Park Engineering Corporation (SPEC). SPL and SPEC will collect in situ cloud and precipitation measurements while the AMF2 operates 2.4 km west and 500m in elevation below SPL from October 2010 through April 2011. In addition, the Cloud-sat Project, which shares many of the same scientific objectives as ACRF, is sharing costs for this endeavor.

StormVEx will address three long-standing ACRF objectives:

1. From a cloud property retrieval perspective, the type of clouds that will be observed during this period will range from stable liquid phase boundary layer clouds to mixed phase clouds to heavily precipitating snow. These cloud types represent some of the most unique challenges for cloud property retrievals and the full Doppler spectra from the scanning cloud radar combined with other AMF2 measurements correlated with continuous in situ data will facilitate development of new algorithms and statistically significant validation of the algorithm results.
2. The data set will be collected in a region of complex terrain. Collecting such a data set has been a long standing goal of ACRF and it will present a unique challenge and opportunity for modeling groups.
3. The extensive aerosol data set that will be collected at SPL will allow for investigation of the role of natural and anthropogenic aerosol in cloud and precipitation processes.