

PENNSTATE



Penn State University

Mixed-Phase Arctic Cloud Experiment  
M-PACE

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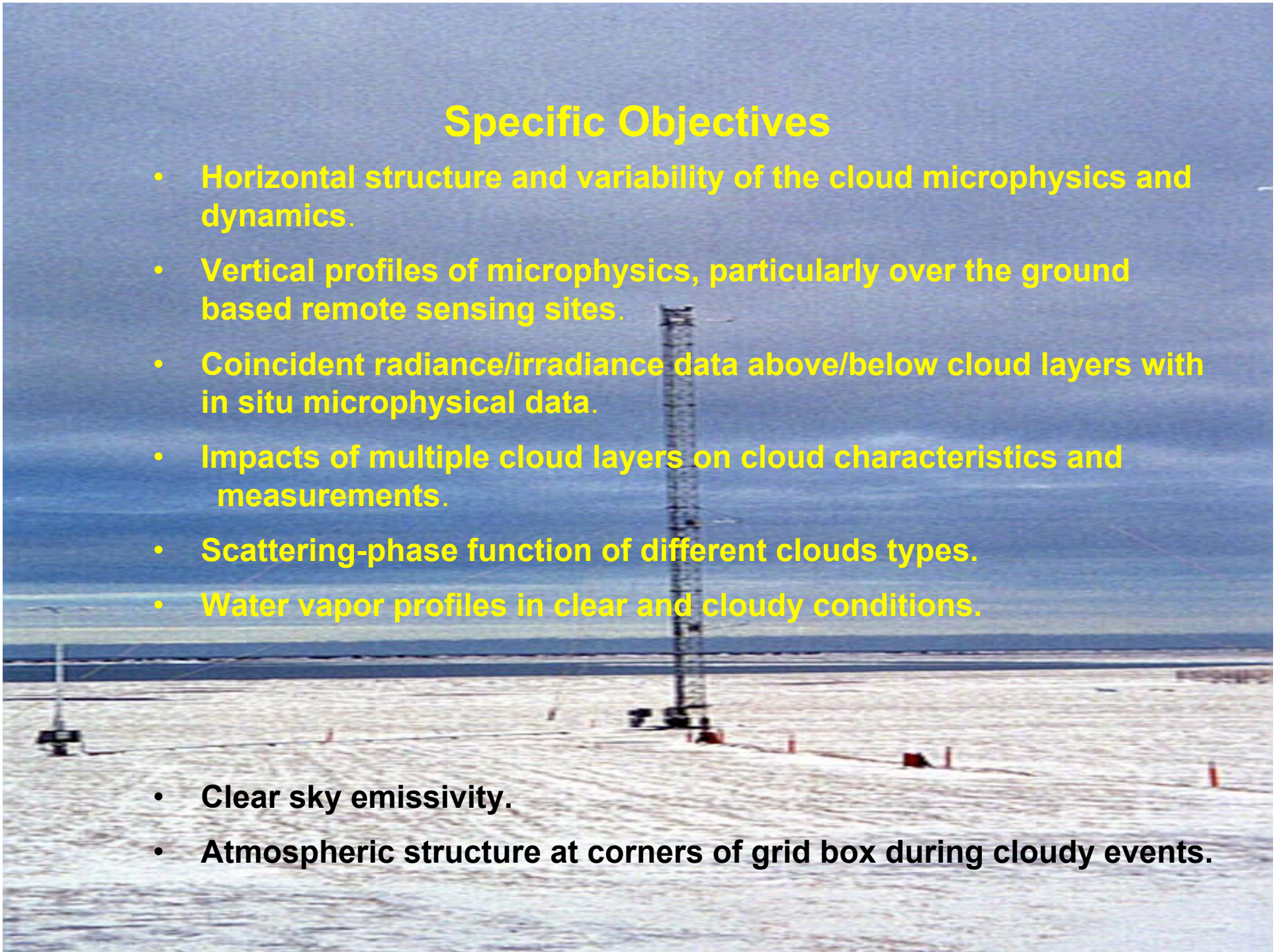
## Science Questions

### How are mixed-phase cloud microphysics, radiation, and cloud dynamics linked?

- *Local Effects: Mixed-phase microphysics (growth, spatial and temporal distributions) and the subsequent direct and indirect links to radiation and cloud turbulence. How well do cloud models capture these processes?*
- *Large-Scale Effects: How important is large-scale convergence/divergence of heat and moisture to mixed-phase longevity (vs. local processes)?*
- *Connections to Observations: Can we use radar/lidar retrievals (which provide measures of cloud properties and turbulence) in a synergistic fashion with cloud models to improve retrievals?*

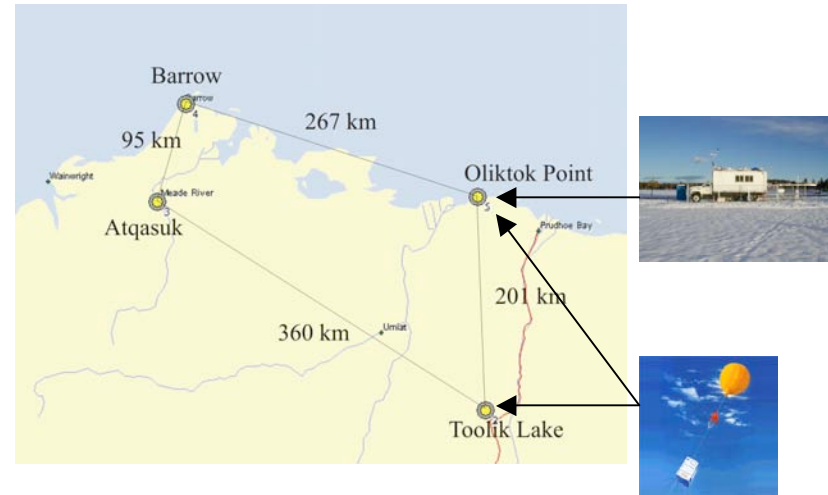
## Specific Objectives

- Horizontal structure and variability of the cloud microphysics and dynamics.
  - Vertical profiles of microphysics, particularly over the ground based remote sensing sites.
  - Coincident radiance/irradiance data above/below cloud layers with in situ microphysical data.
  - Impacts of multiple cloud layers on cloud characteristics and measurements.
  - Scattering-phase function of different clouds types.
  - Water vapor profiles in clear and cloudy conditions.
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- **Clear sky emissivity.**
  - **Atmospheric structure at corners of grid box during cloudy events.**



# Experimental Design

1. DOE-ARM ground base observing sites at Barrow and Atqasuk supplemented with depolarization lidar
2. Oliktok Point – PNNL Atmospheric Remote Sensing Laboratory.
3. Enhanced radiosonde releases at Barrow, Atqasuk, Oliktok, and Toolik Lake.
4. In-situ aircraft – UND Citation (microphysical inst.), based in Deadhorse
5. Remote sensing aircraft – DOE UAV (Proteus) with lidar, cloud radar, and in-situ microphysical inst. Based in Fairbanks.
6. Aerosonde



Experimental Domain

