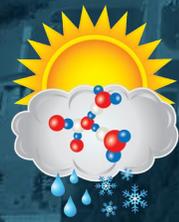


Vertically-Resolved Atmospheric Cluster Observations

Chongai Kuang, Tamanna Subba

SNL ARM TBS: Darielle Dexheimer, Casey Longbottom



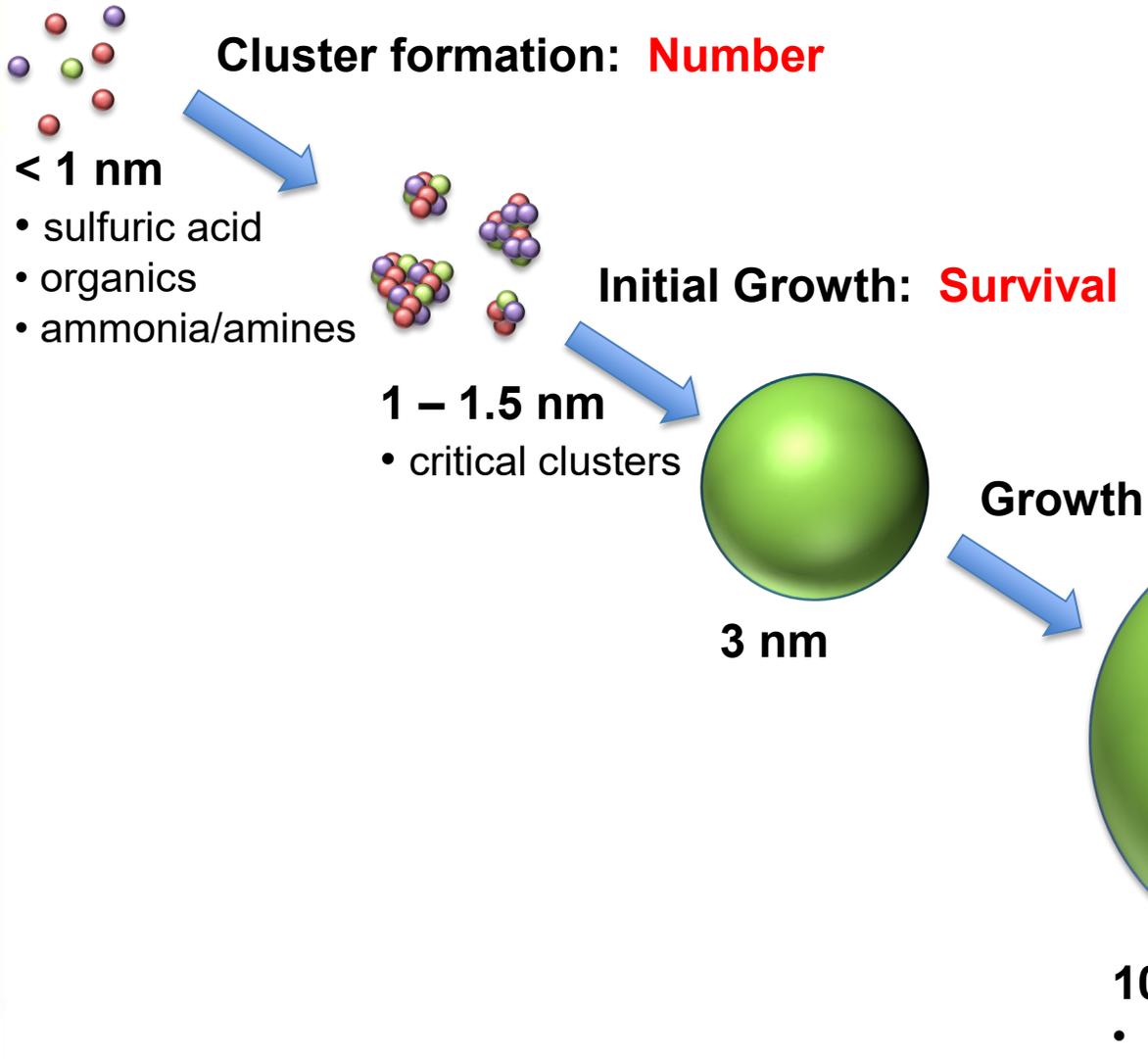
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System Research

ARM



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Aerosol Properties and Processes that Impact the CCN Budget

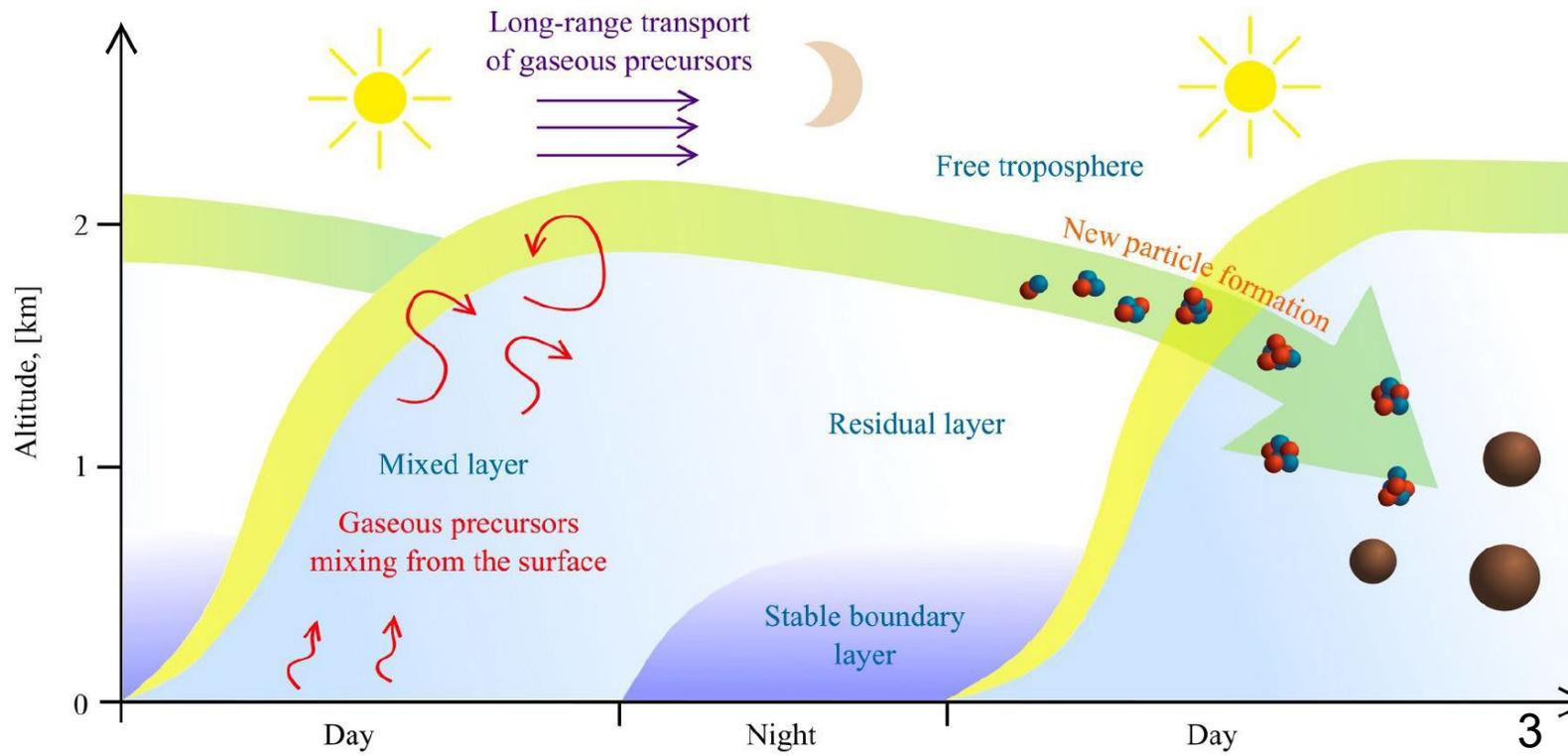


New particle formation (NPF) can enhance BL CCN globally by up to 50% [Spracklen et al., 2008]

Vertically Resolved NPF and Boundary Layer Dynamics

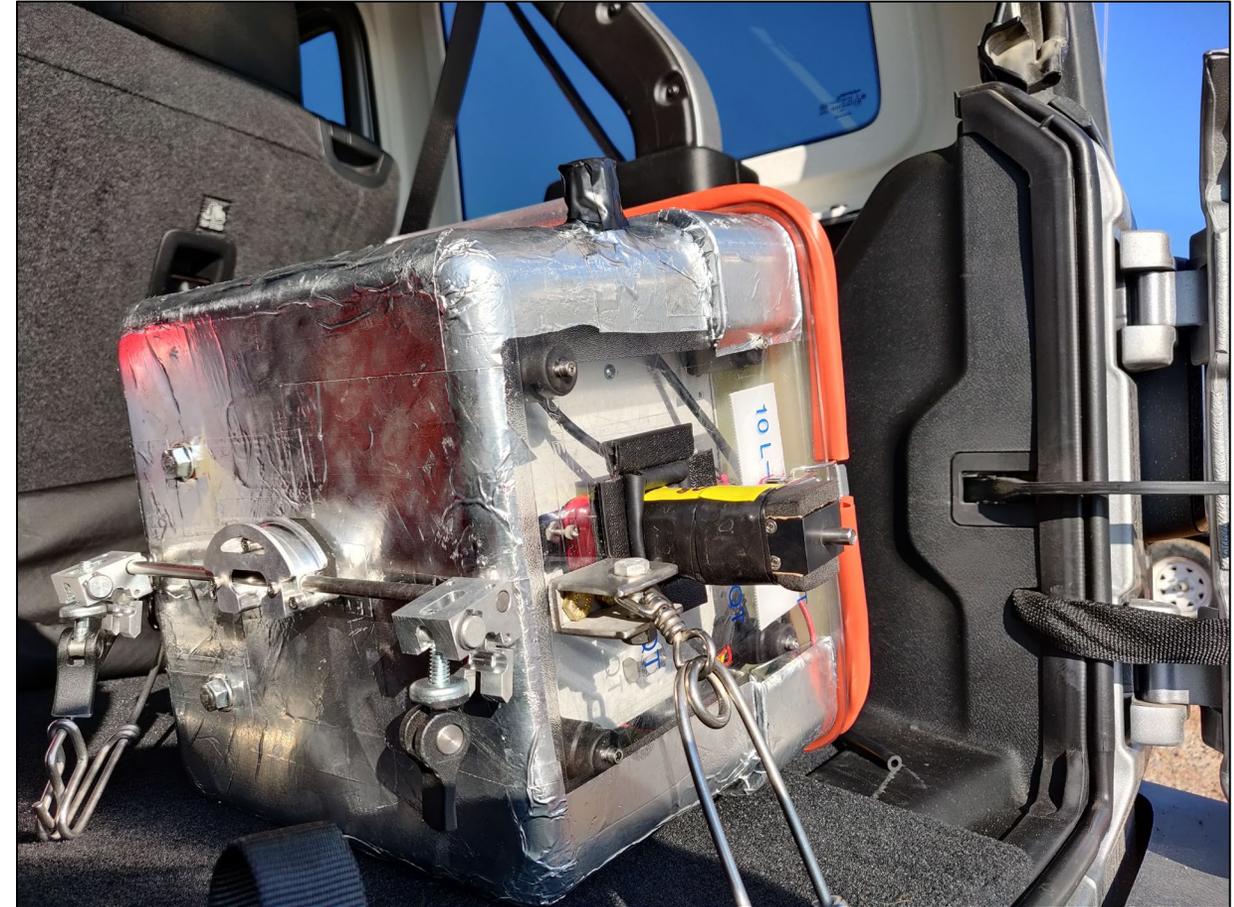
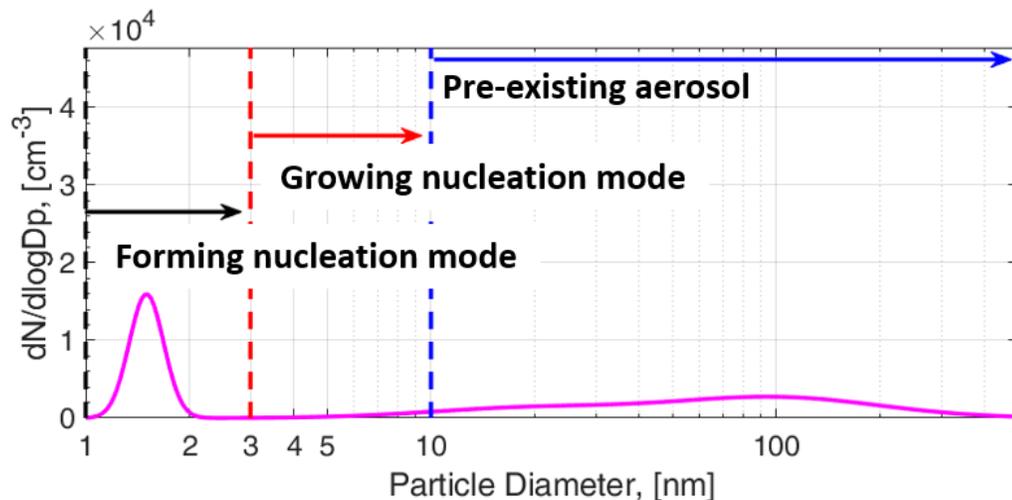
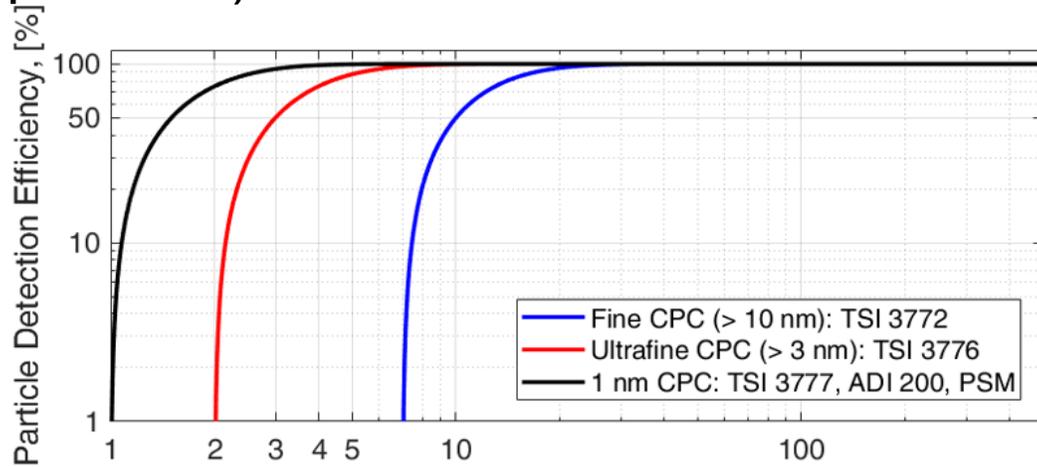
Motivation

- NPF aloft followed by transport to the surface could be an important source of CCN.
- NPF model parameterizations based on surface observations → missing initial NPF?
- There are **limited vertical NPF observations** → **challenging measurement**.
- The spatial distribution and timing of NPF could be strongly controlled by boundary layer processes and meteorology.



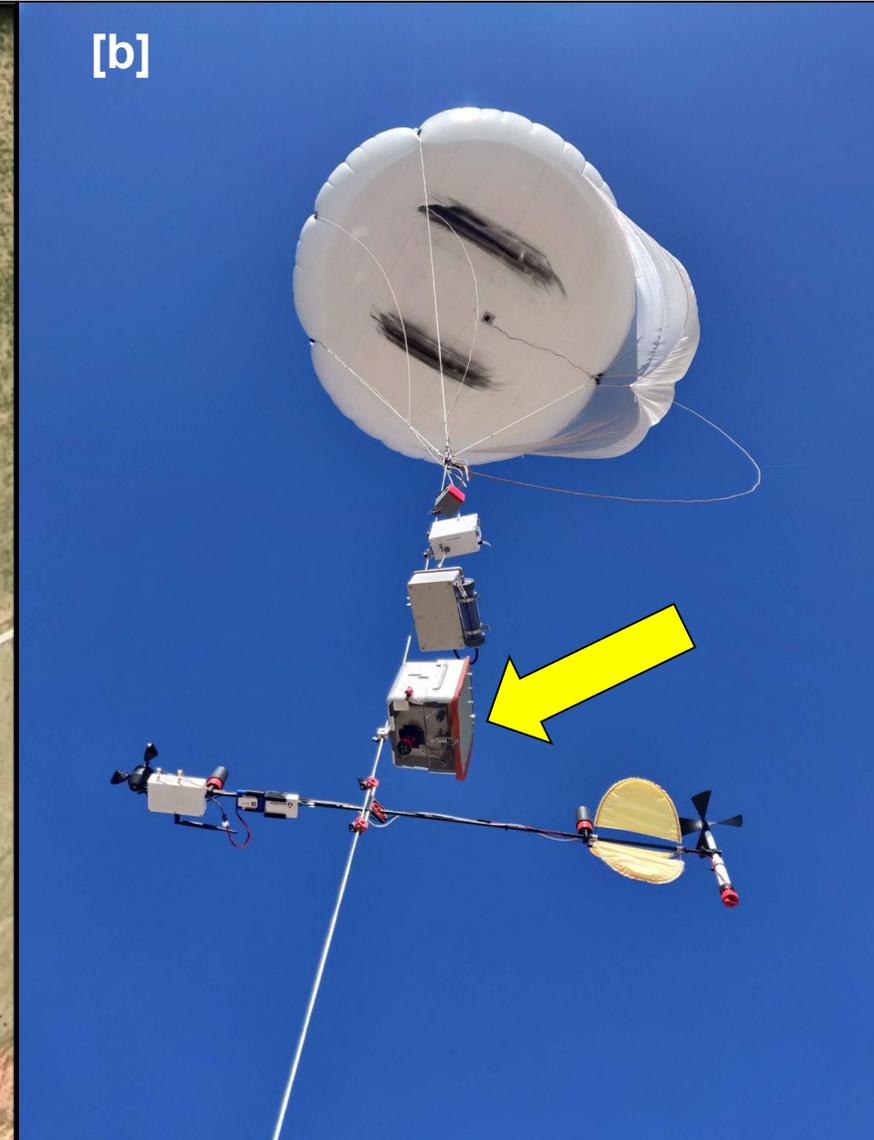
Aerosol Processes Dictate Measurement Platforms

- Need to simultaneously meet: [1] measurement requirements (1 nm detection) and [2] operational requirements for TBS deployment (lightweight, small footprint, low/battery-powered)

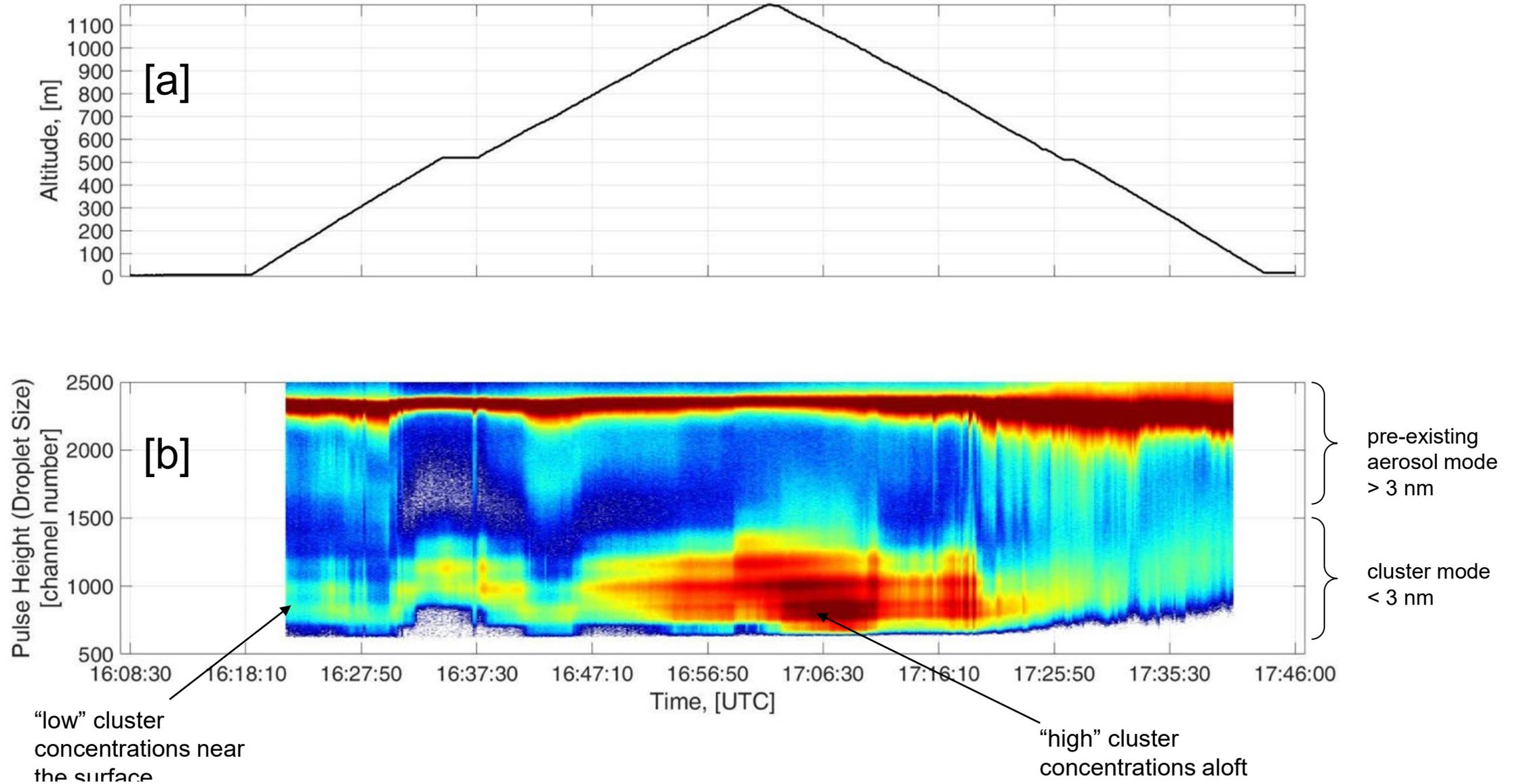


Prototype ADI DEG-MAGIC CPC*

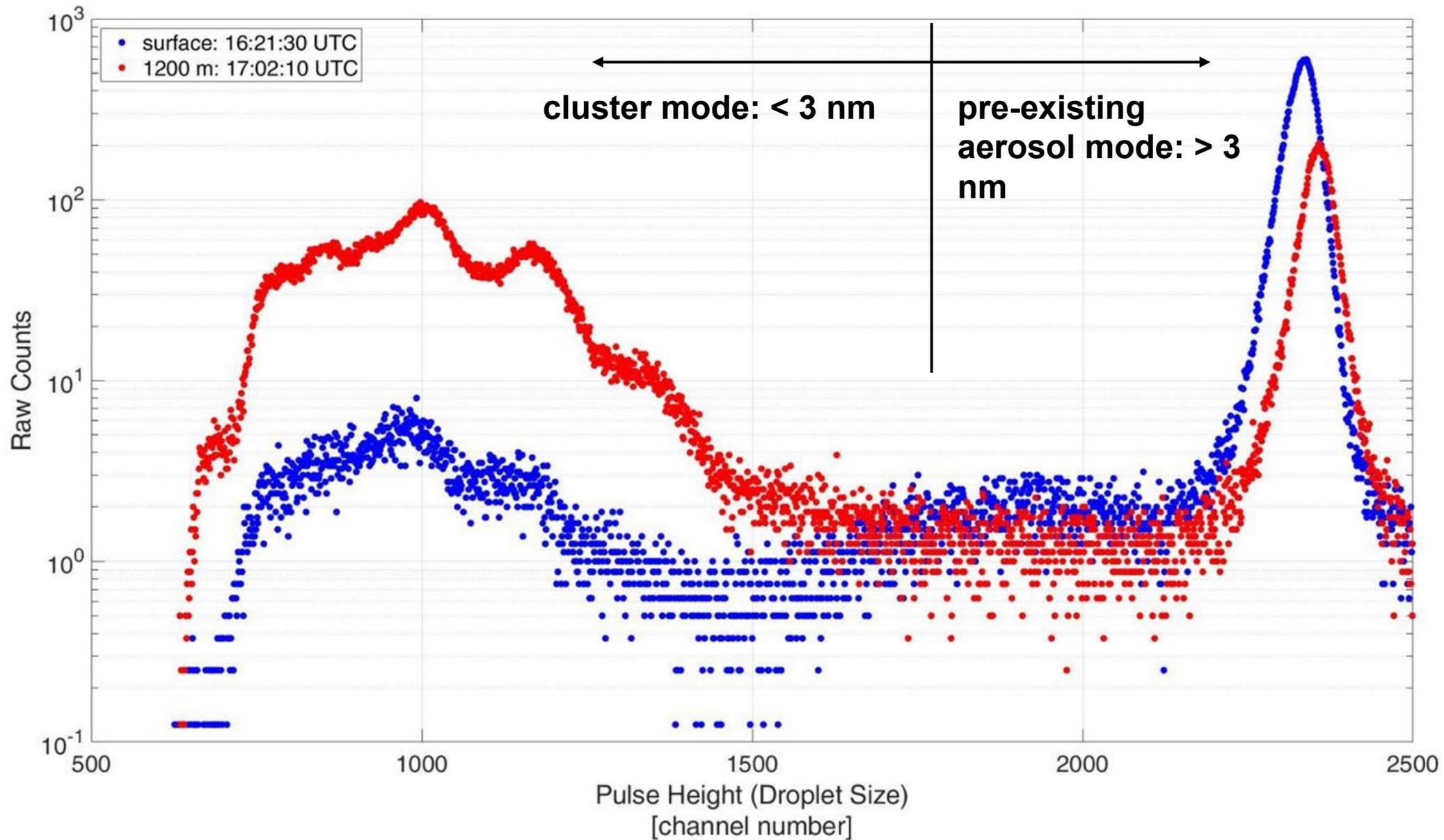
TBS Images: (a) Looking Down... (b) Highlighting the 1 nm CPC



October 5th, 2021: Profile 2, 16:08 - 17:46 UTC

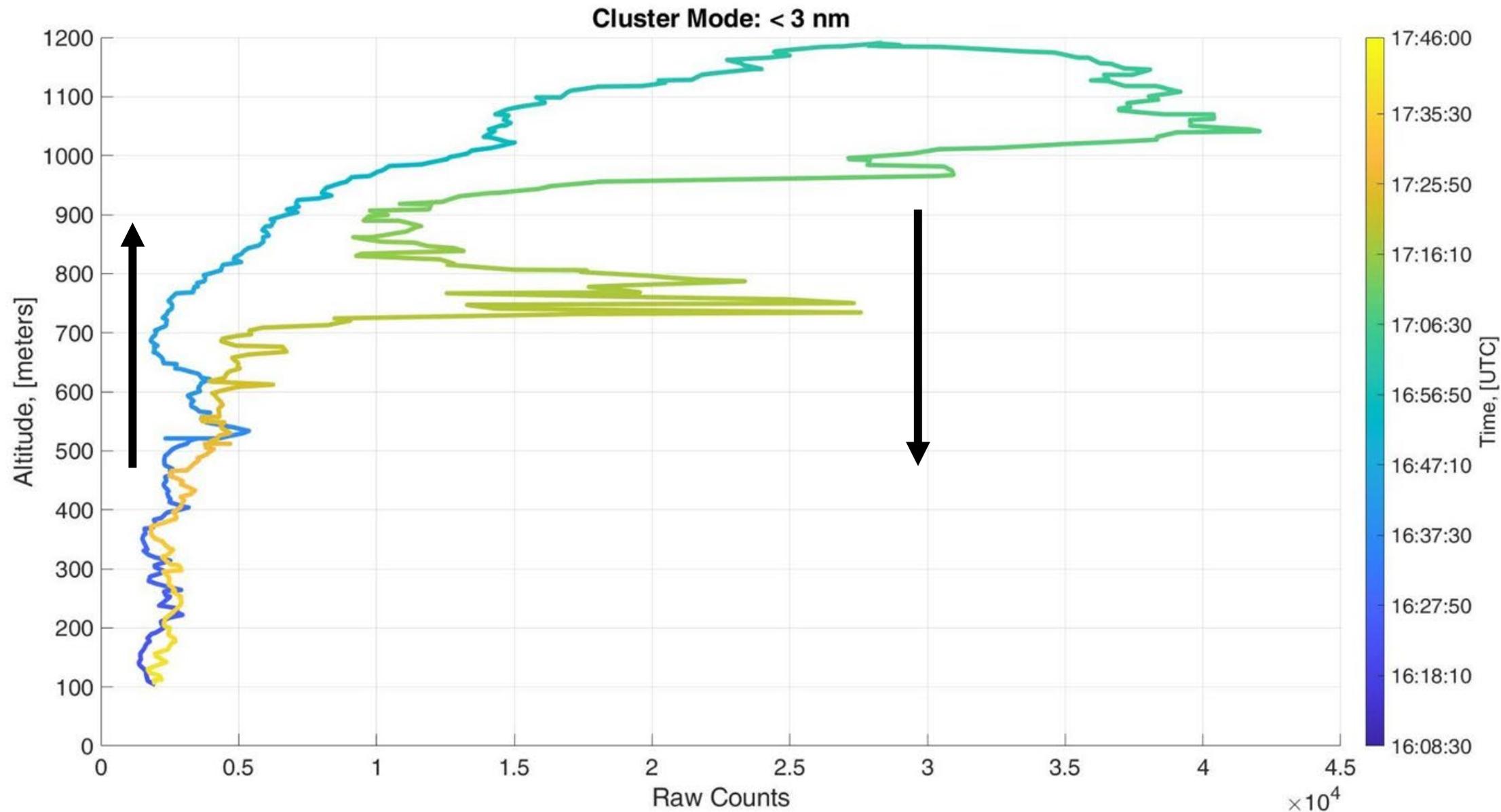


[a] TBS profile altitude as a function of profile time. [b] pulse height contour plot as a function of profile time with pre-existing aerosol mode (> 3 nm, > 1500 channel number) and cluster mode (< 3 nm, < 1500 channel number).



pulse height spectra observed near the surface (16:21:30 UTC) and at 1200 m (17:02:10 UTC).

October 5th, 2021: Profile 2, 16:08 - 17:46 UTC



Cluster mode (< 3 nm) vertical profile during ascent (up arrow) and descent (down arrow).

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- ARM SGP site operations staff
 - ARM TRACER site operations staff
 - SNL ARM TBS team
 - Aerosol Dynamics, Inc.
-
- **What's Down the Road?**
 - TRACER 2022
 - SGP 2023
 - AMF3 BNF (potential)

