Comparison of Antarctic and Arctic Aerosol Profiles and Cloud Properties Using ARM Ground-based Remote Sensing Measurements

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ARM/ASR Meeting

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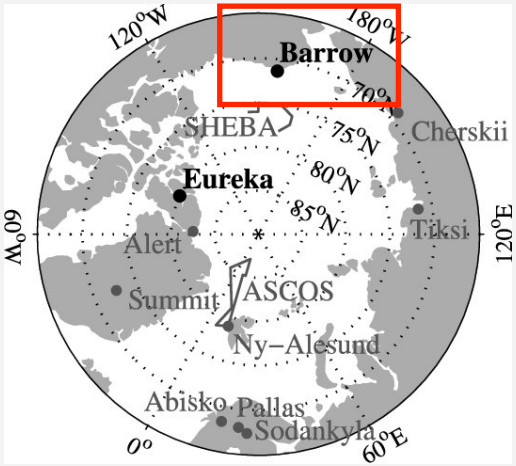
Atmospheric Radiation Measurements (ARM) Dataset

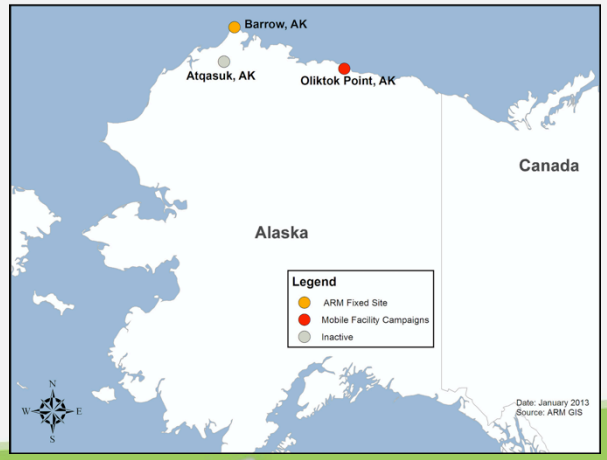
ARM West Antarctic Radiation Experiment-AWARE (Dec 2015 – Jan 2017)

Contrasting Background Conditions

- High Spectral Resolution Lidar (HSRL)
- Ka-Band (35 GHz) ARM Zenith Radar (KAZR)
- ARM AOS CCN measurements

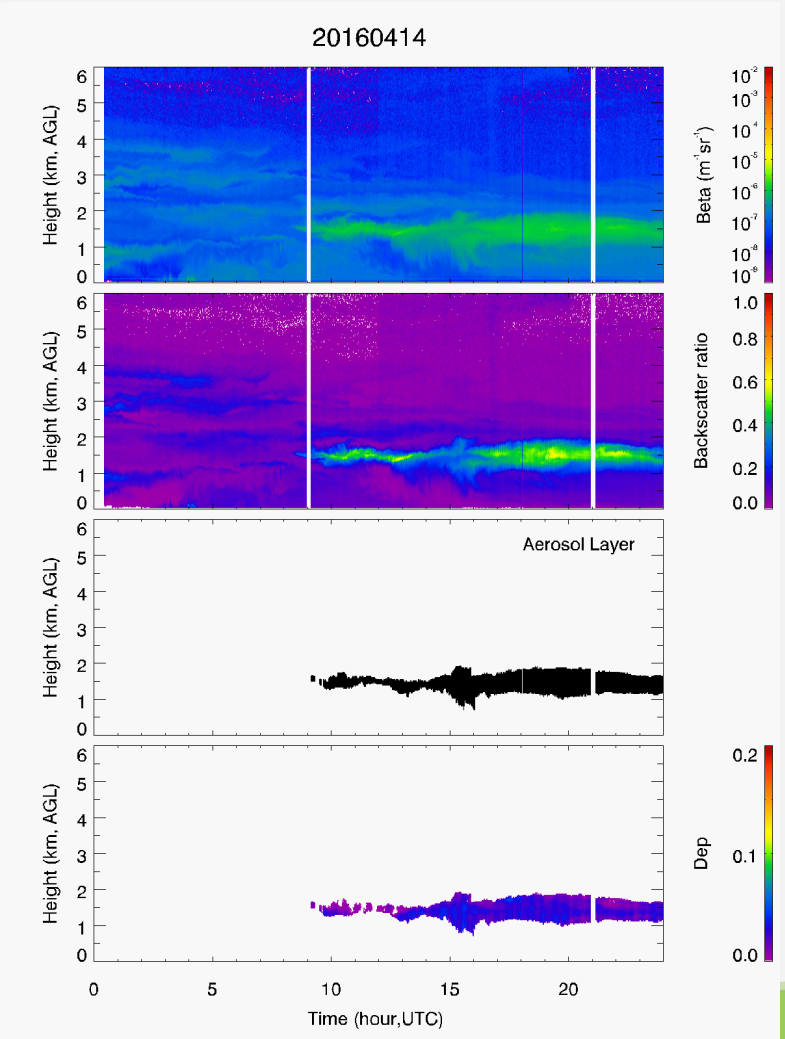
NSA Utqiaġvik (formerly known as 'Barrow') (Jan 2015 – Jan 2017)



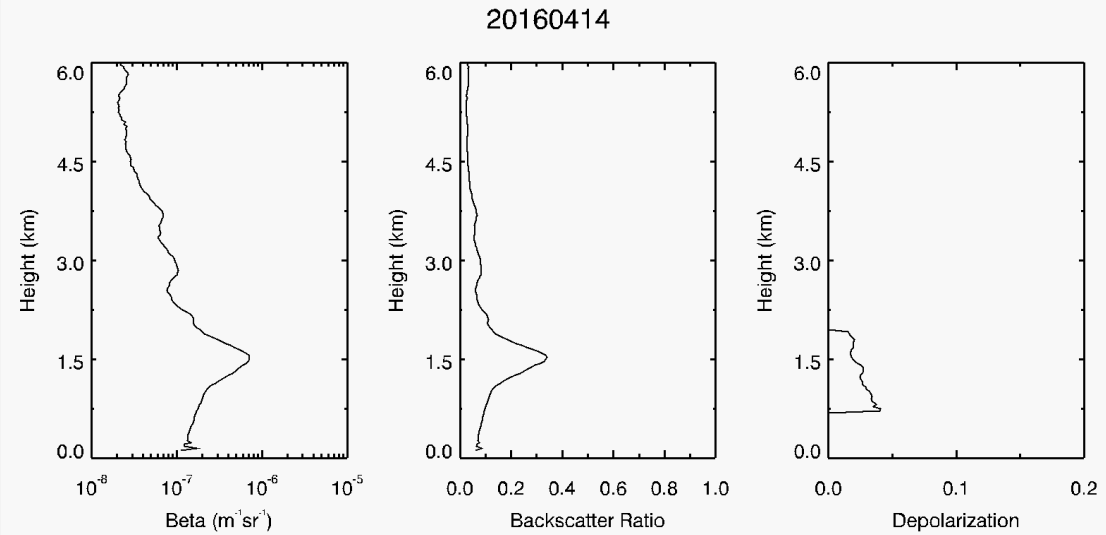


Aerosol Profiles Observed with HSRL Measurements

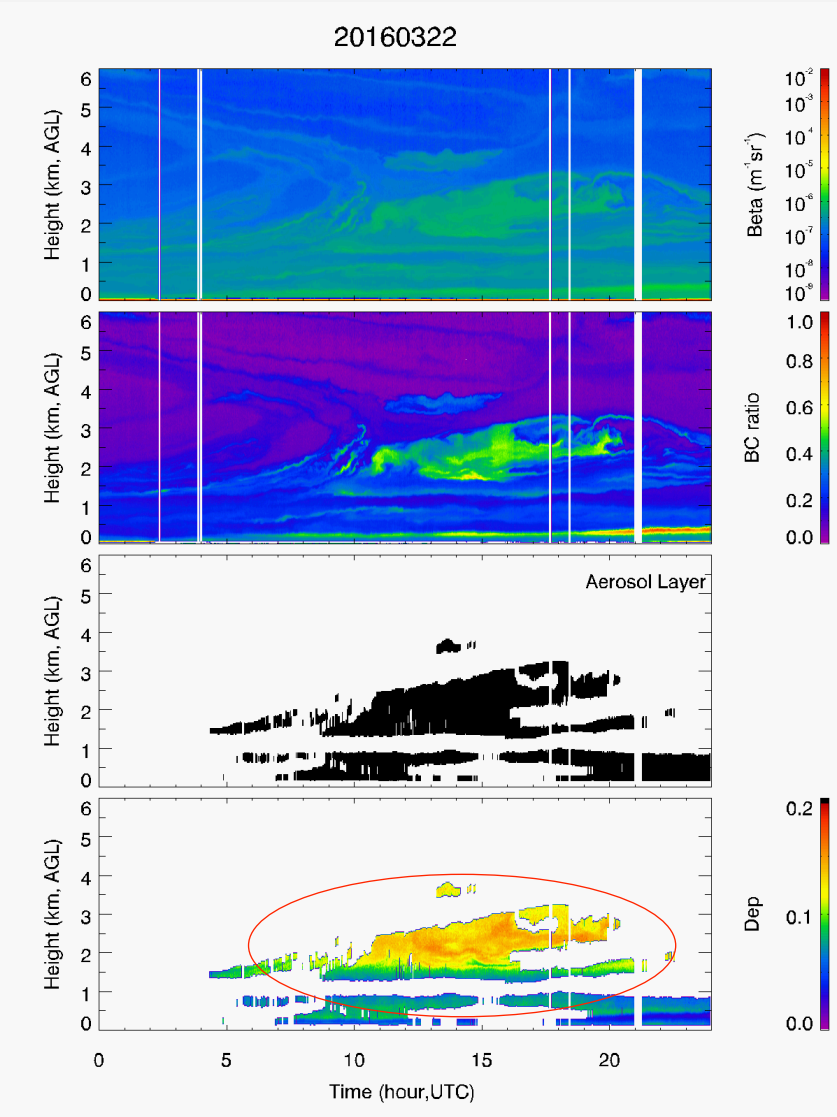
- Cloud free profiles determined with lidar and radar measurements
- HSRL Depolarization profiles of aerosol layers



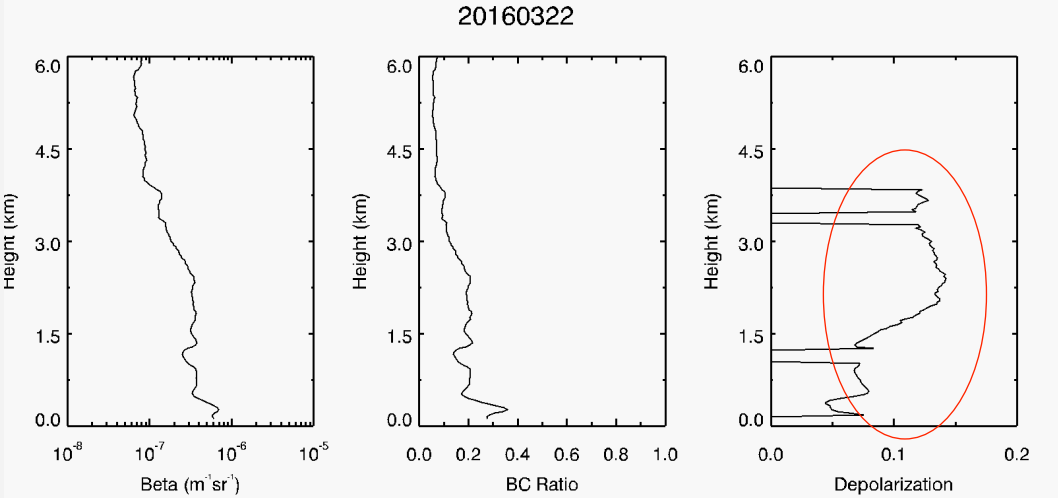
An aerosol layer case at McMurdo



Aerosol Profiles Observed with HSRL Measurements

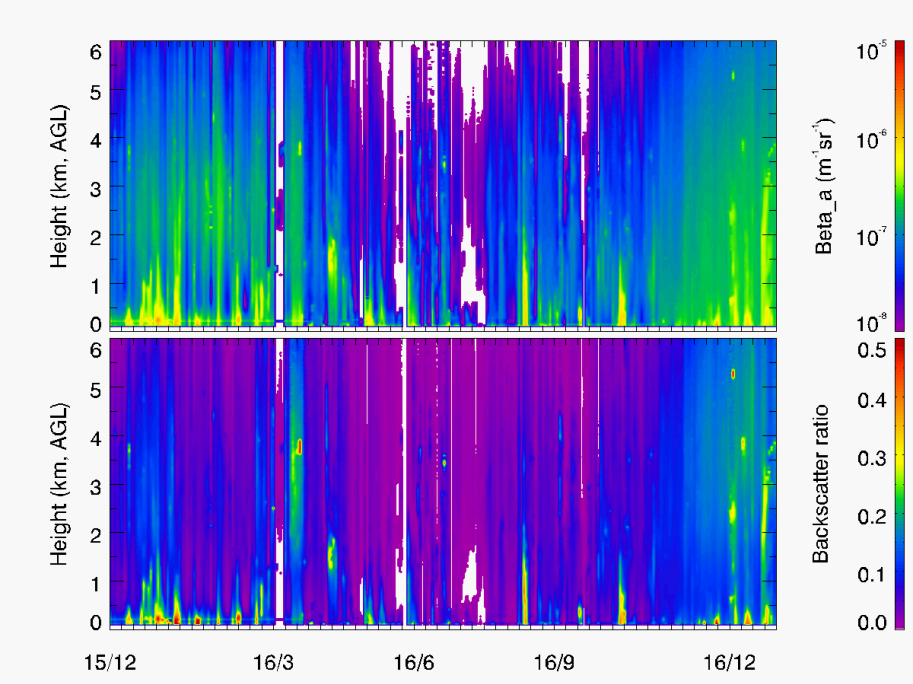


A Dust layer case at Utqiaġvik

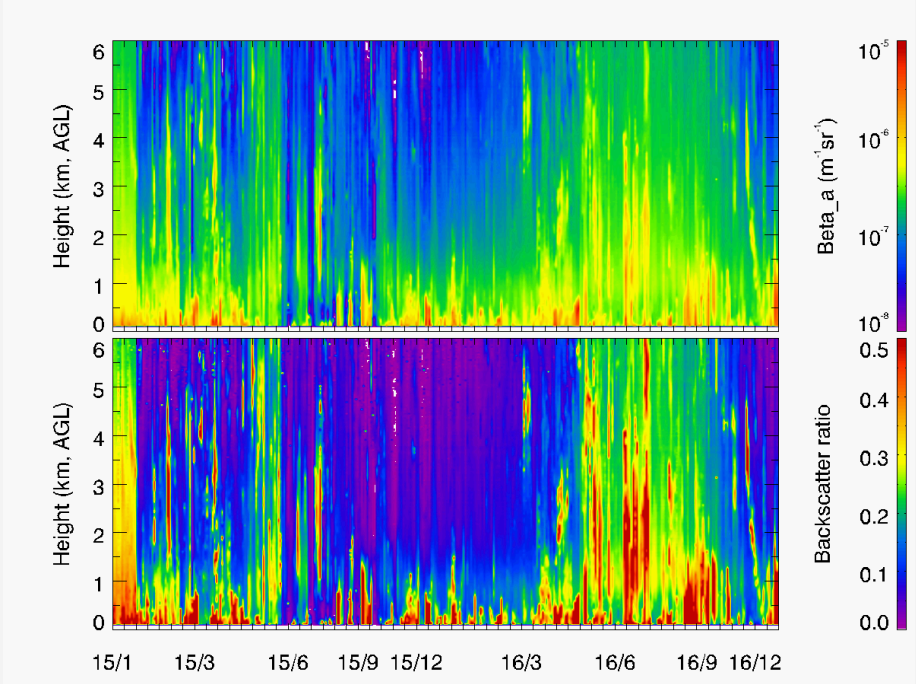


Polar Aerosol Profiles

McMurdo



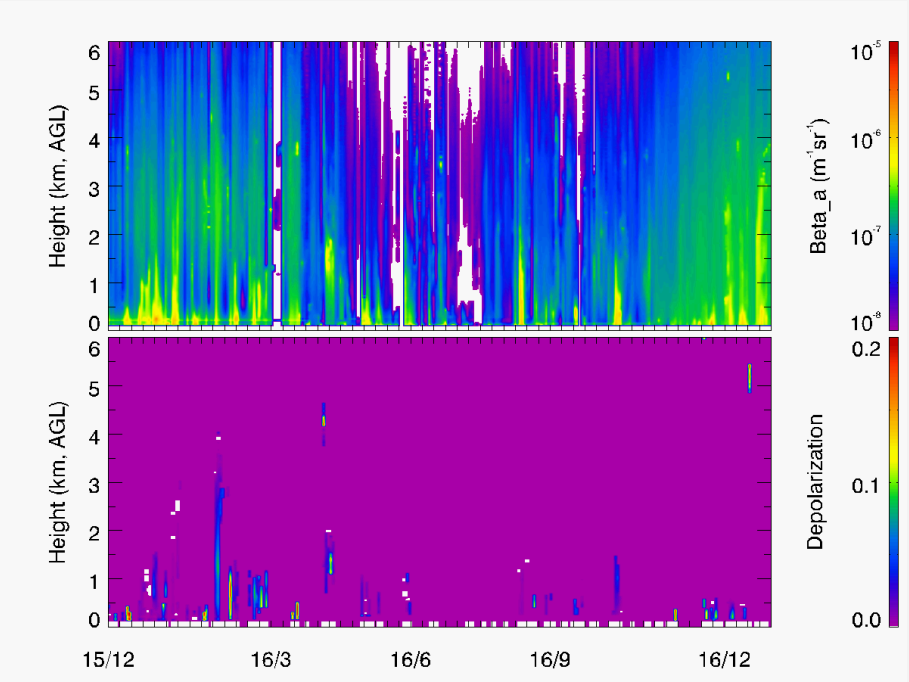
Utqiagvik



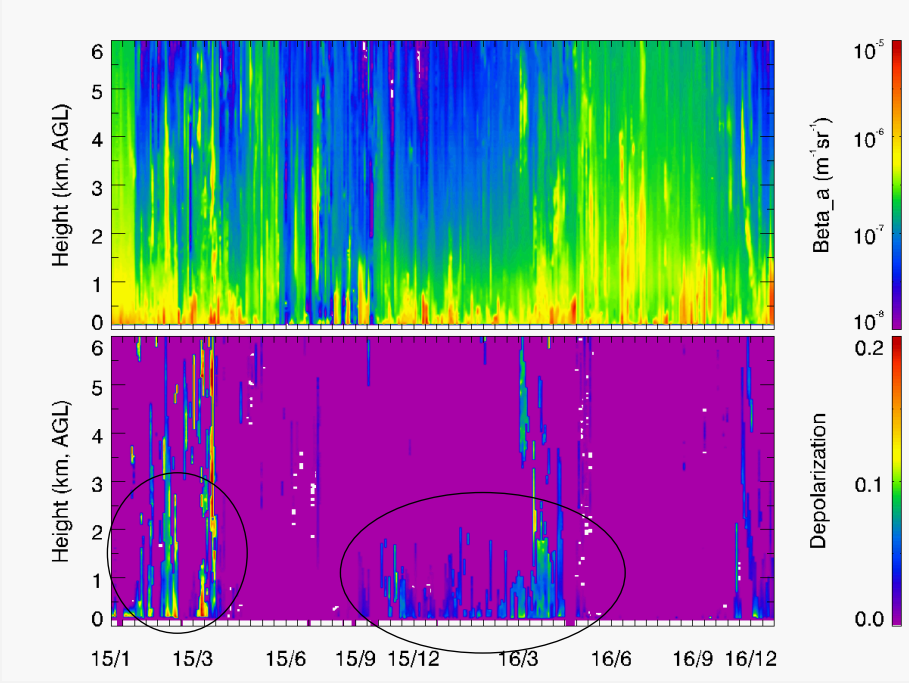
- Aerosol profiles show clear seasonal variations and generally have largest backscatter in summer at McMurdo and in spring and early summer at Utqiaġvik

Polar Aerosol Profiles

McMurdo

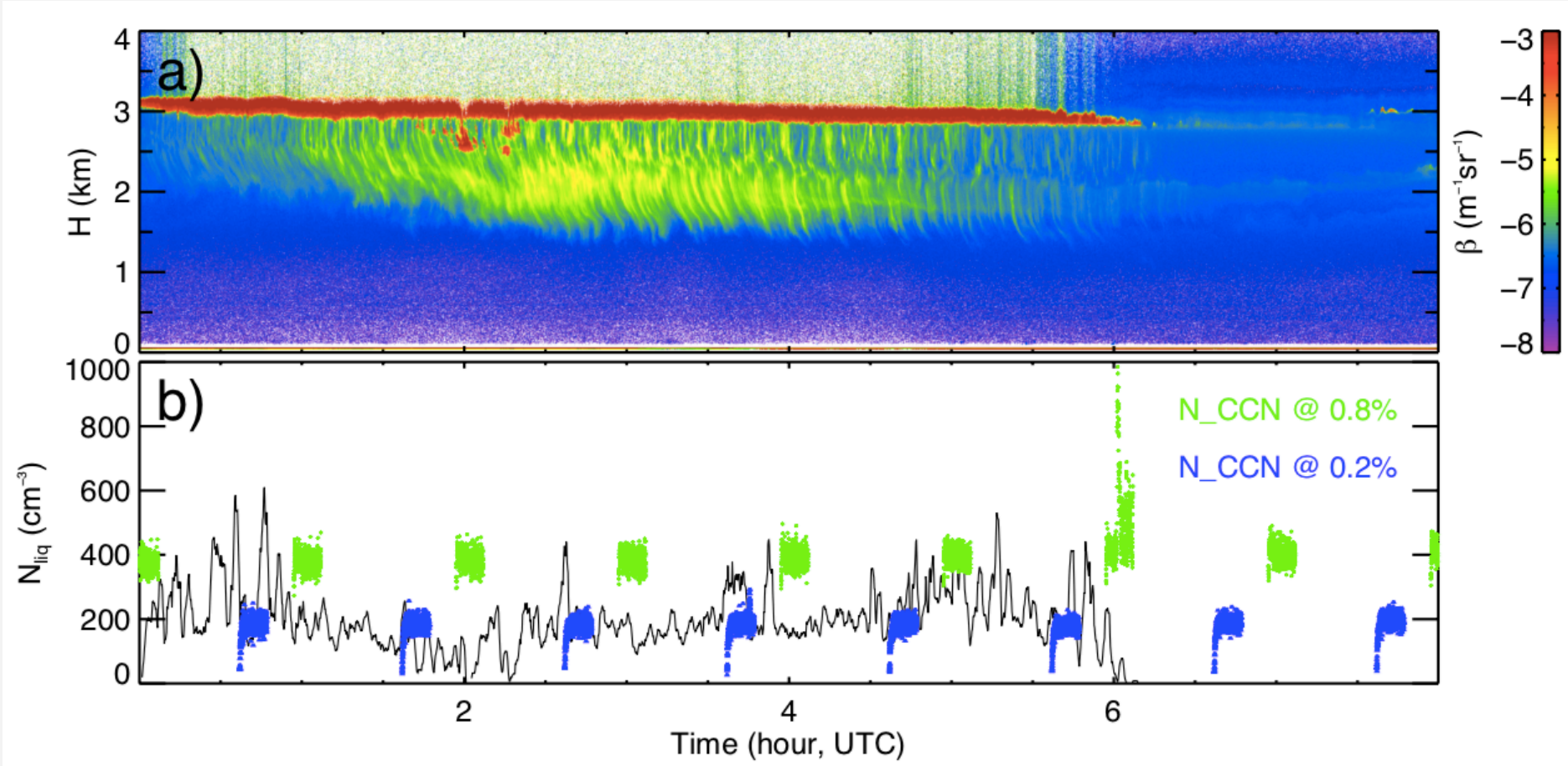


Utqiagvik



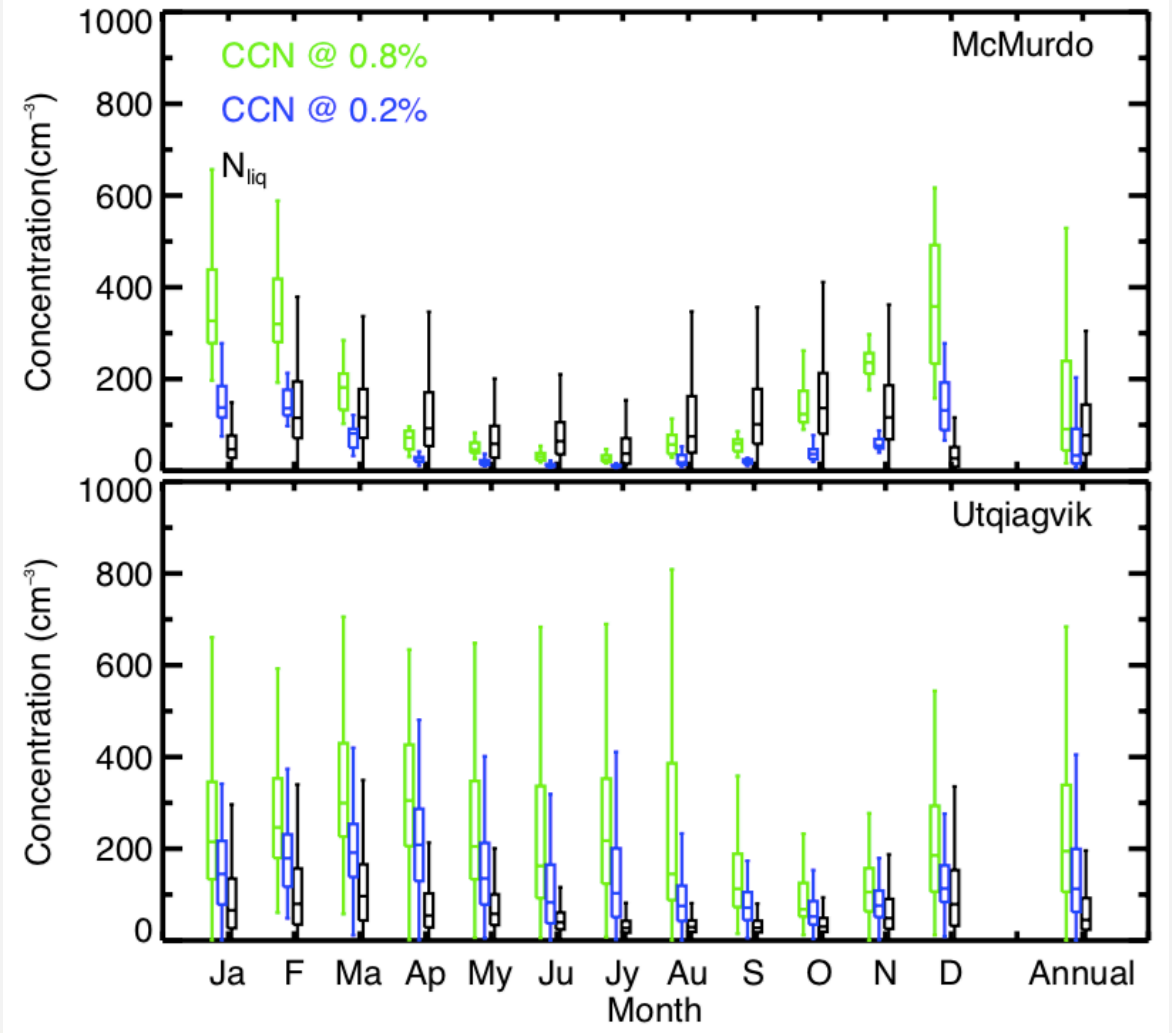
- Frequent dust events in early spring at Utqiaġvik

Surface CCN and Cloud Droplet Concentration (N_{liq}) of Stratiform Mixed-phase Clouds



Lidar-based retrieved N_{liq} compare well with *in situ* measurements during ACE-ENA campaign (poster # 57, Wed 5:00-6:30 pm)

Surface CCN and Retrieved N_{liq} Annual Variations



- N_{liq} and CCN have similar annual trends except during the summer season
- Surface CCN at Utqiagvik is about 2 times of that at McMurdo
- N_{liq} is higher at McMurdo

Summary

- Aerosol profiles show clear seasonal variations at both Utqiagvik and McMurdo
- Frequent dust events in early spring at Utqiaġvik
- Surface CCN at Utqiagvik is about 2 times of that at McMurdo, but retrieved N_{liq} in stratiform mixed-phase cloud is lower at Utqiagvik than at McMurdo