Contrasting Ice Production Characteristics in Stratiform Mixed-phase Clouds over the North and South Poles

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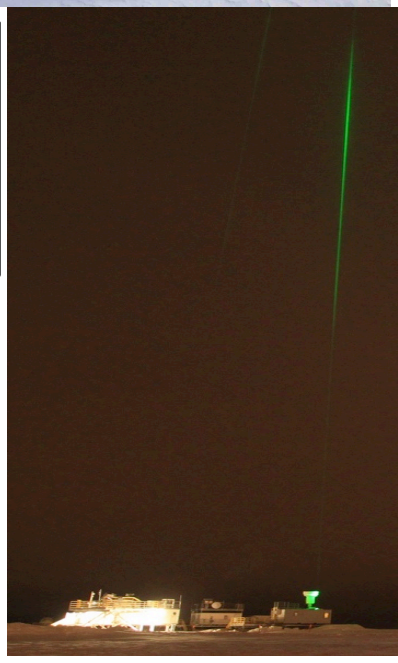
0313, 2017

Different Aerosol and Dynamical Environment

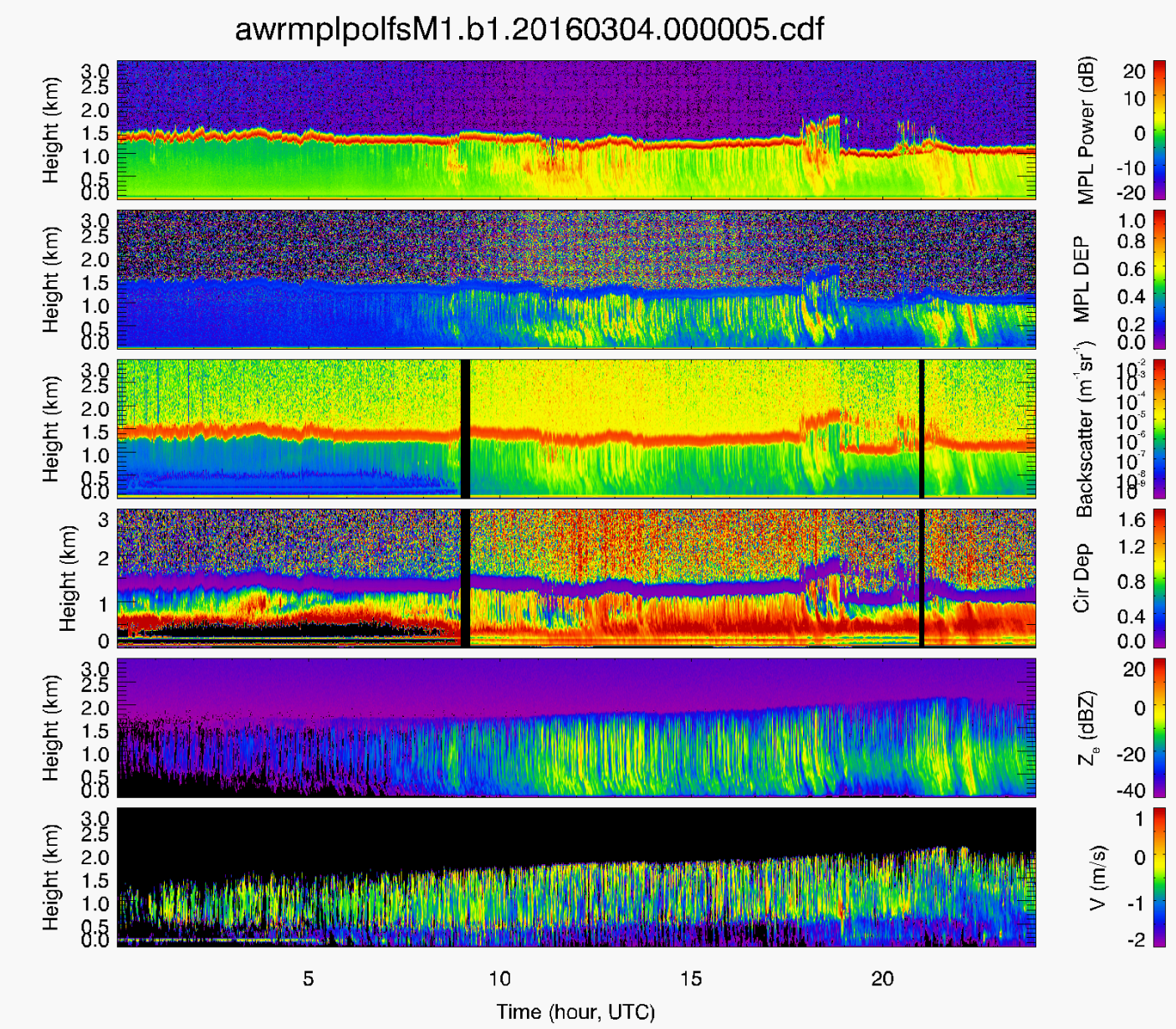
- NSA, a polluted and less dynamically active state.
- McMurdo, a pristine, colder, and more dynamically active state.
- Coincident lidar and cloud radar measurements for identifying stratiform mixed-phase clouds

NSA Barrow	2011.07-2015.12
AWARE McMurdo (AWR)	2015.12-2017.01
CloudSat / CALIPSO	2006.06-2010.06

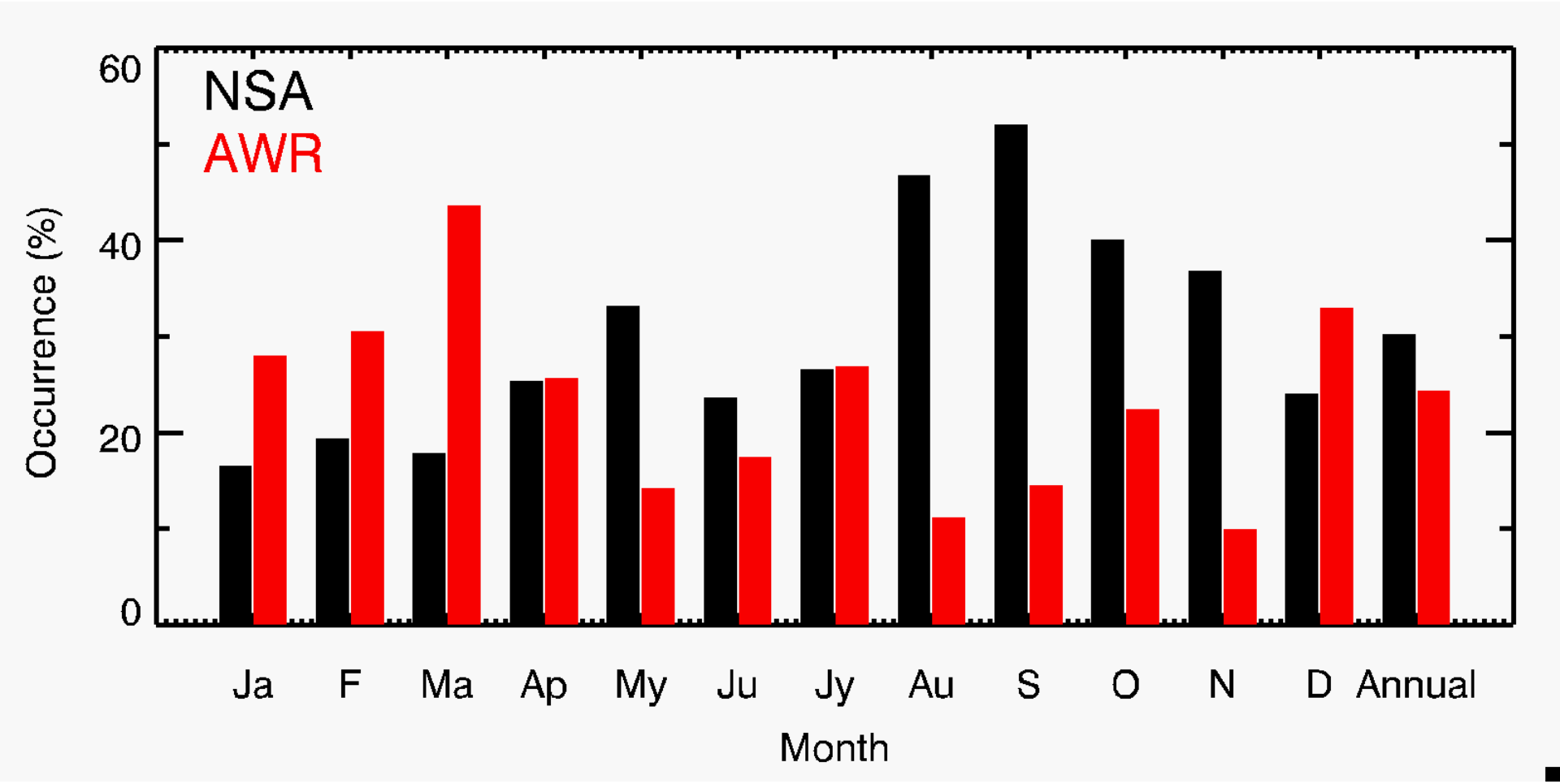
Cloud radars and lidars at McMurdo



AWARE MPL+HSRL+KAZR case

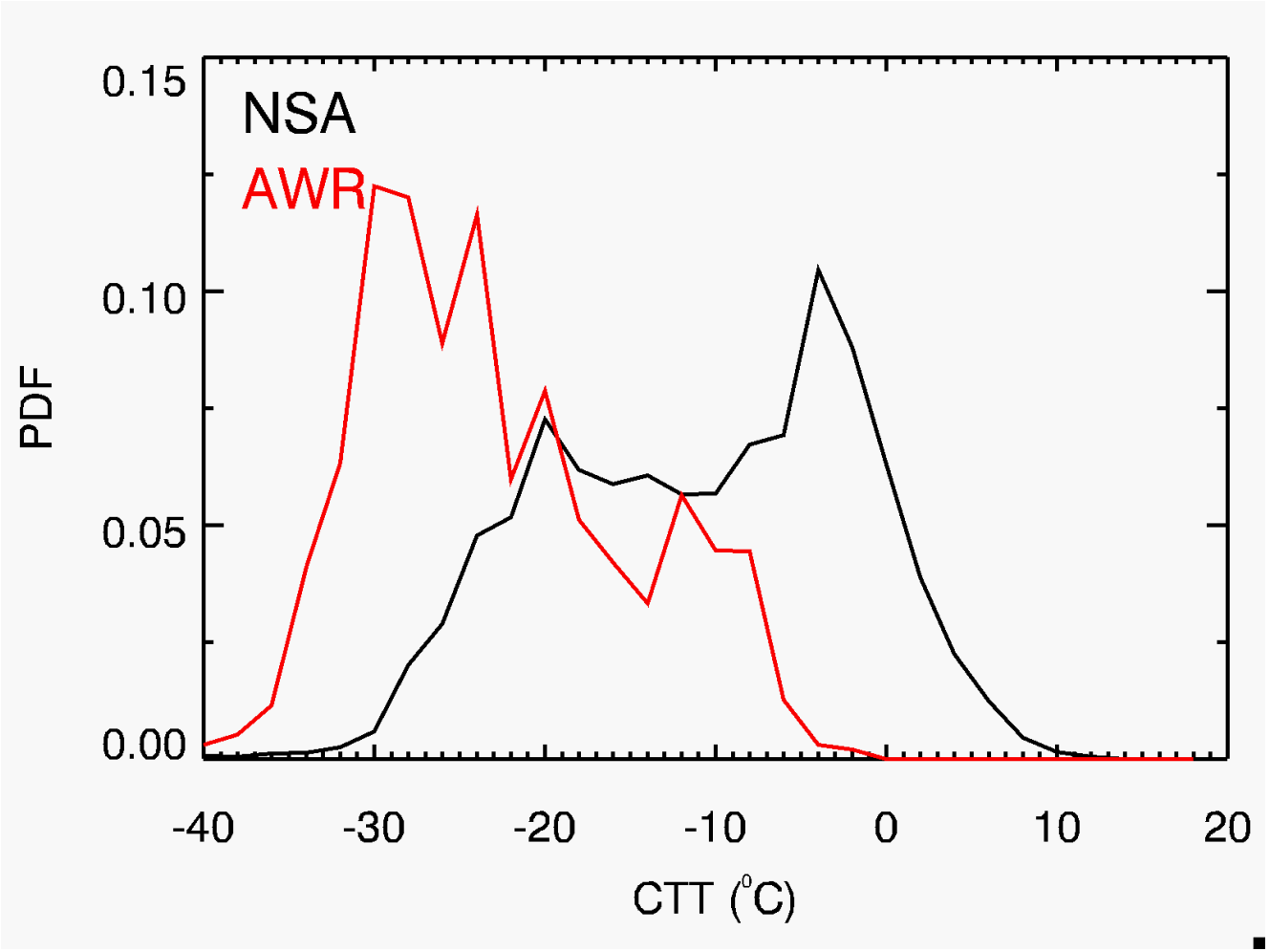


Stratiform Cloud Occurrences



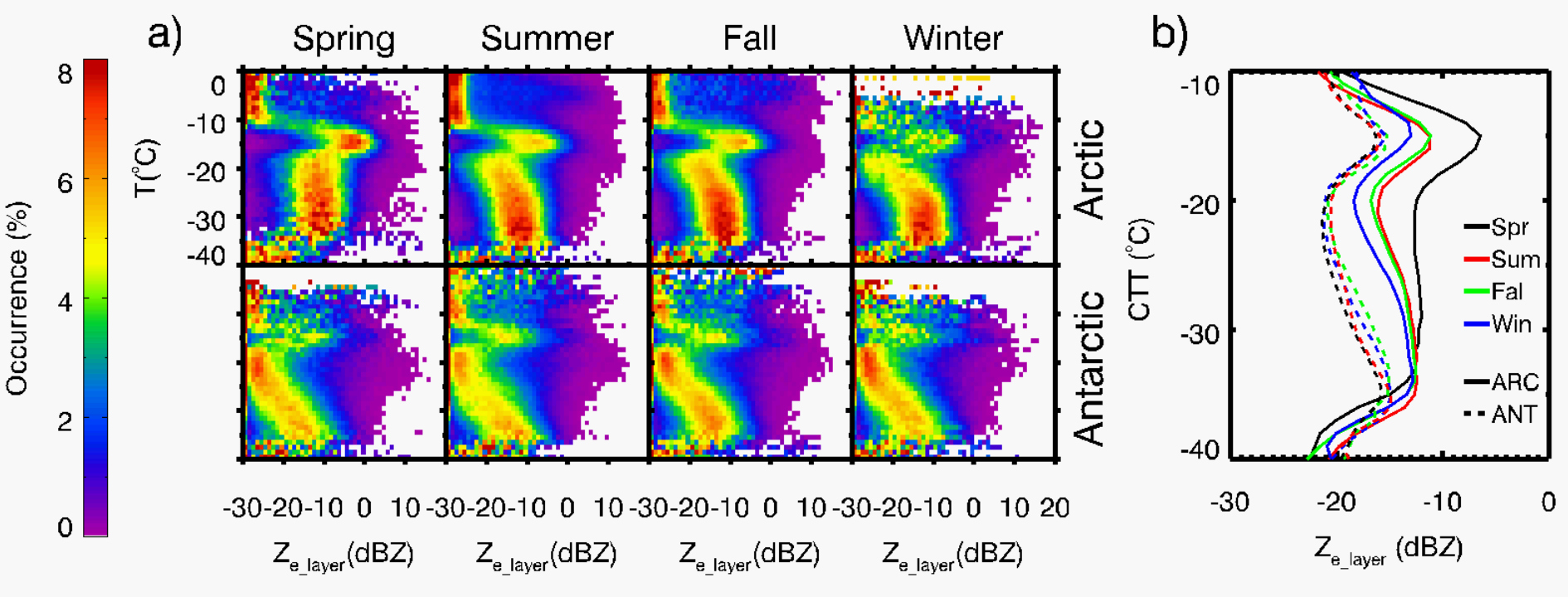
- Annual stratiform cloud occurrence of 30% at NSA and 24% at AWR.
- Maximum occurrences during Summer at both NSA and AWR.

Stratiform Cloud Occurrences



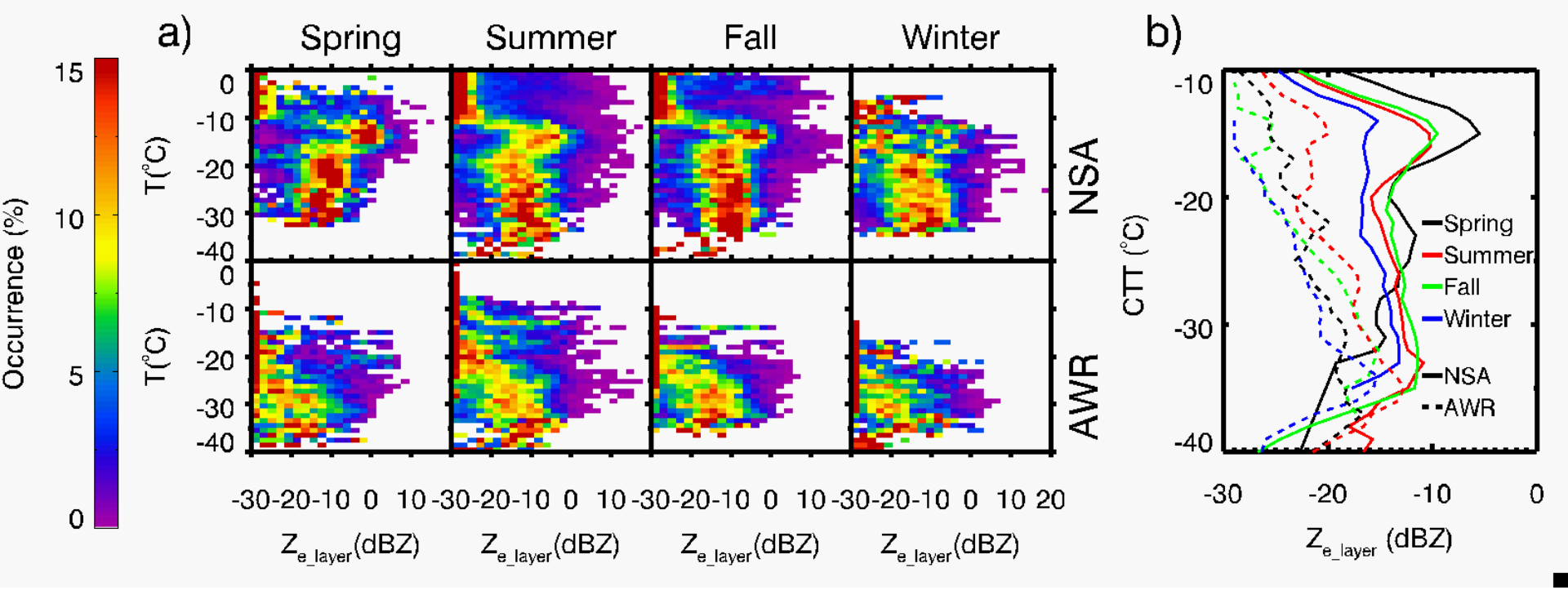
- Most stratiform clouds have cloud top temperatures (CTTs) in the range between -40 and 0 °C.

Ice Production Characteristics in Polar Stratiform Mixed-phase Clouds (SMCs)



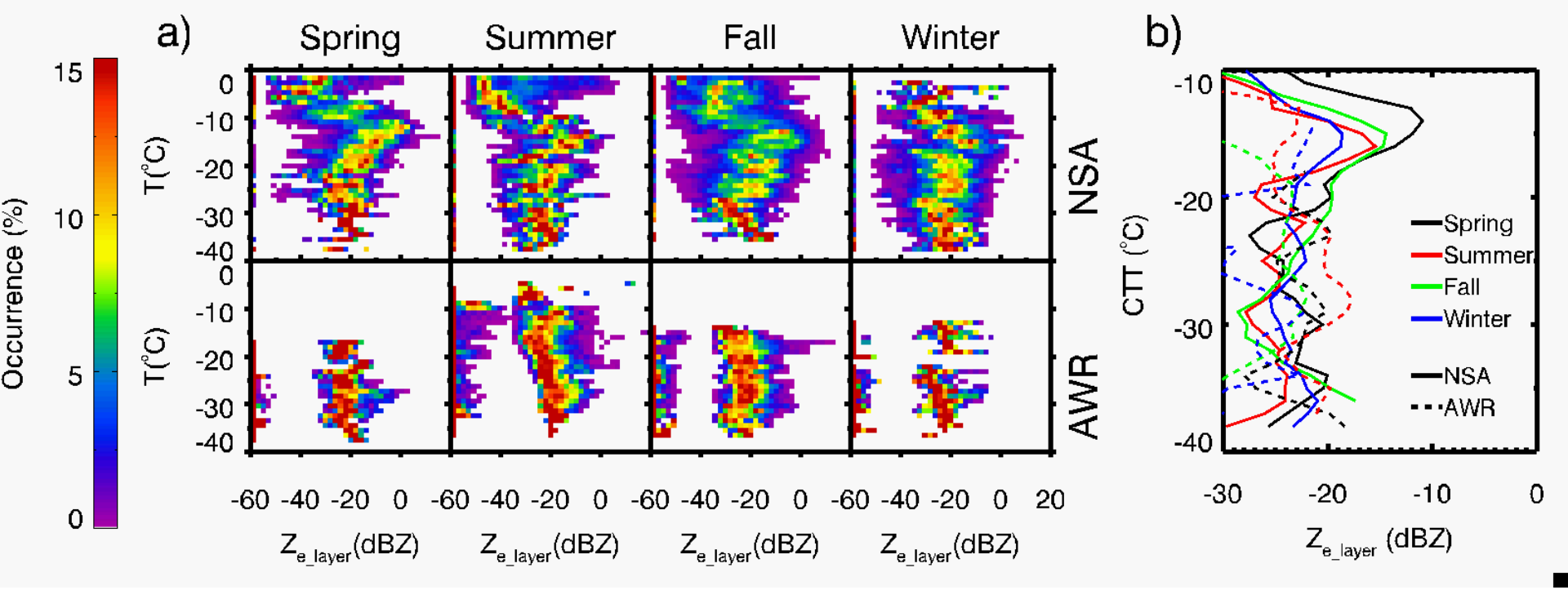
- A-Train measurements over entire Arctic and Antarctic.
- Z_{e_layer} (mean Z_e between cloud top and 500 m below) strongly depends on cloud top temperature (CTT).
- Strong seasonal variations of Z_{e_layer} over the Arctic.

Ice Production Characteristics in Polar SMCs



- A-Train measurements within a 5° (Latitude) x 10° (Longitude) box centered in NSA and McMurdo.
- AWR has maximum Z_{e_layer} during austral Summer and minima during Winter.

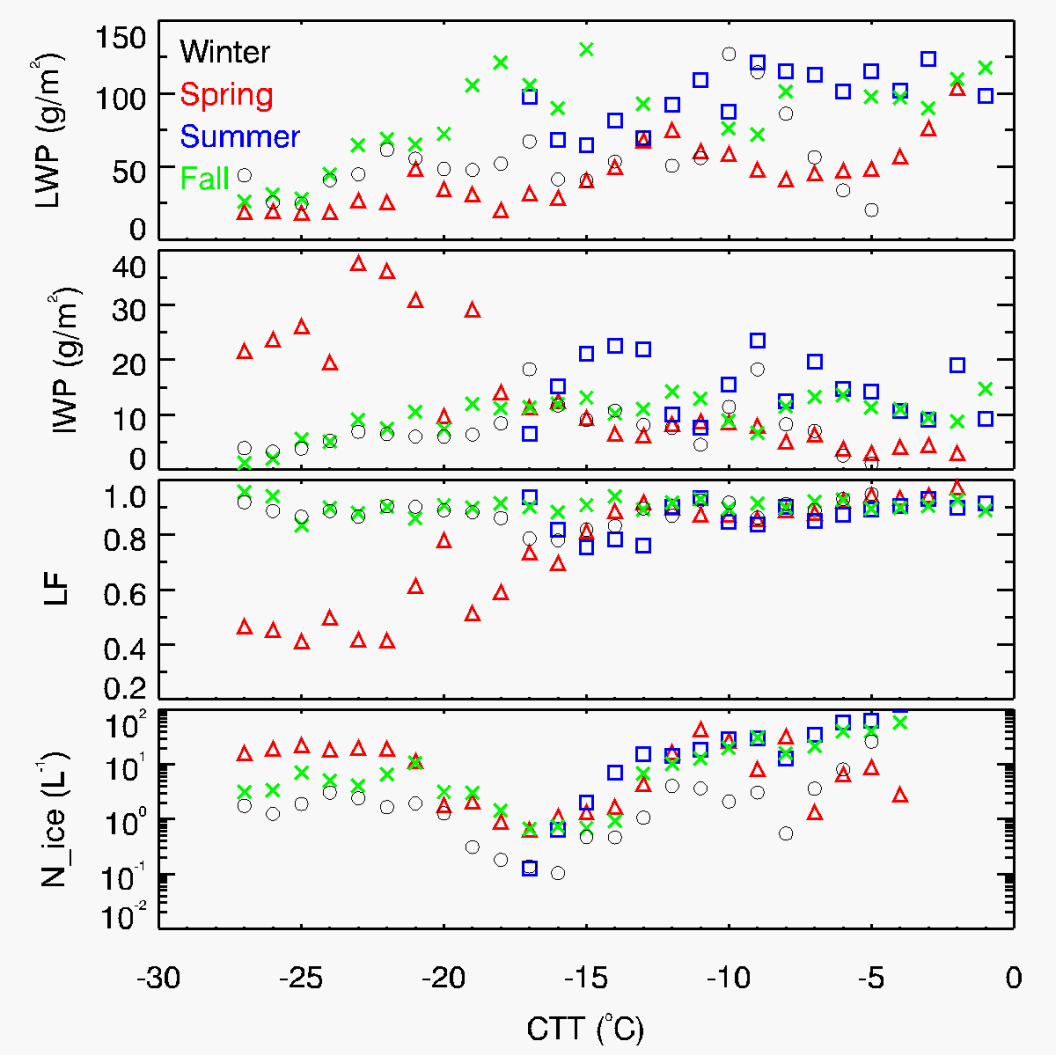
Ice Production Characteristics in Polar SMCs



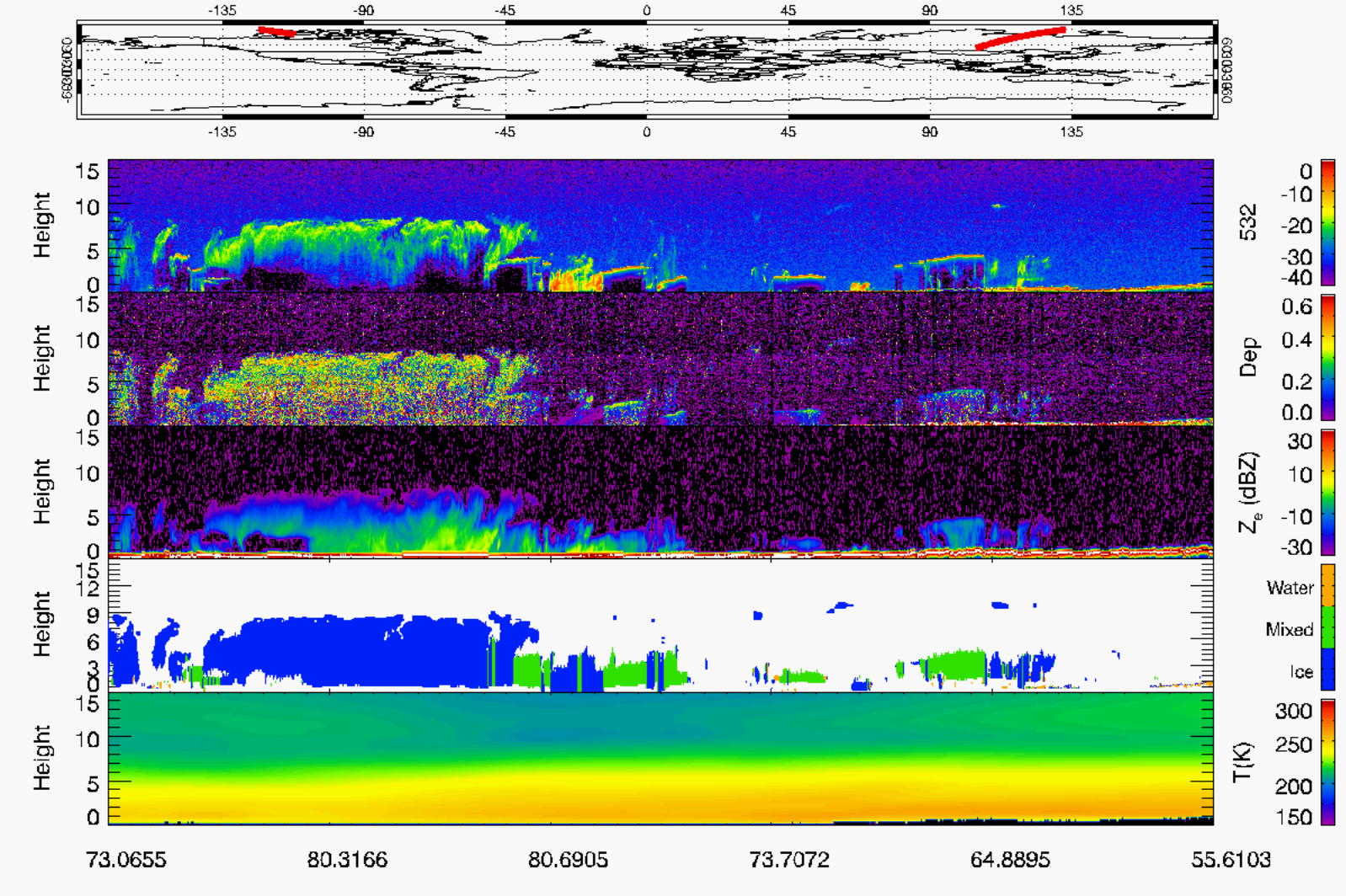
- Ground-based remote sensing measurements over NSA and McMurdo.

Liquid Mass Fraction in SMCs over the NSA site

- Spring season has the smallest LWP at all CTTs and the largest IWP and $N_{\_ice}$ at CTT lower than –15 °C.
- Higher IWP and $N_{\_ice}$ during Spring season could be related to more dust events (Zhao, 2012).
- LFs are high (>0.8) most of the time, different than in convective clouds.

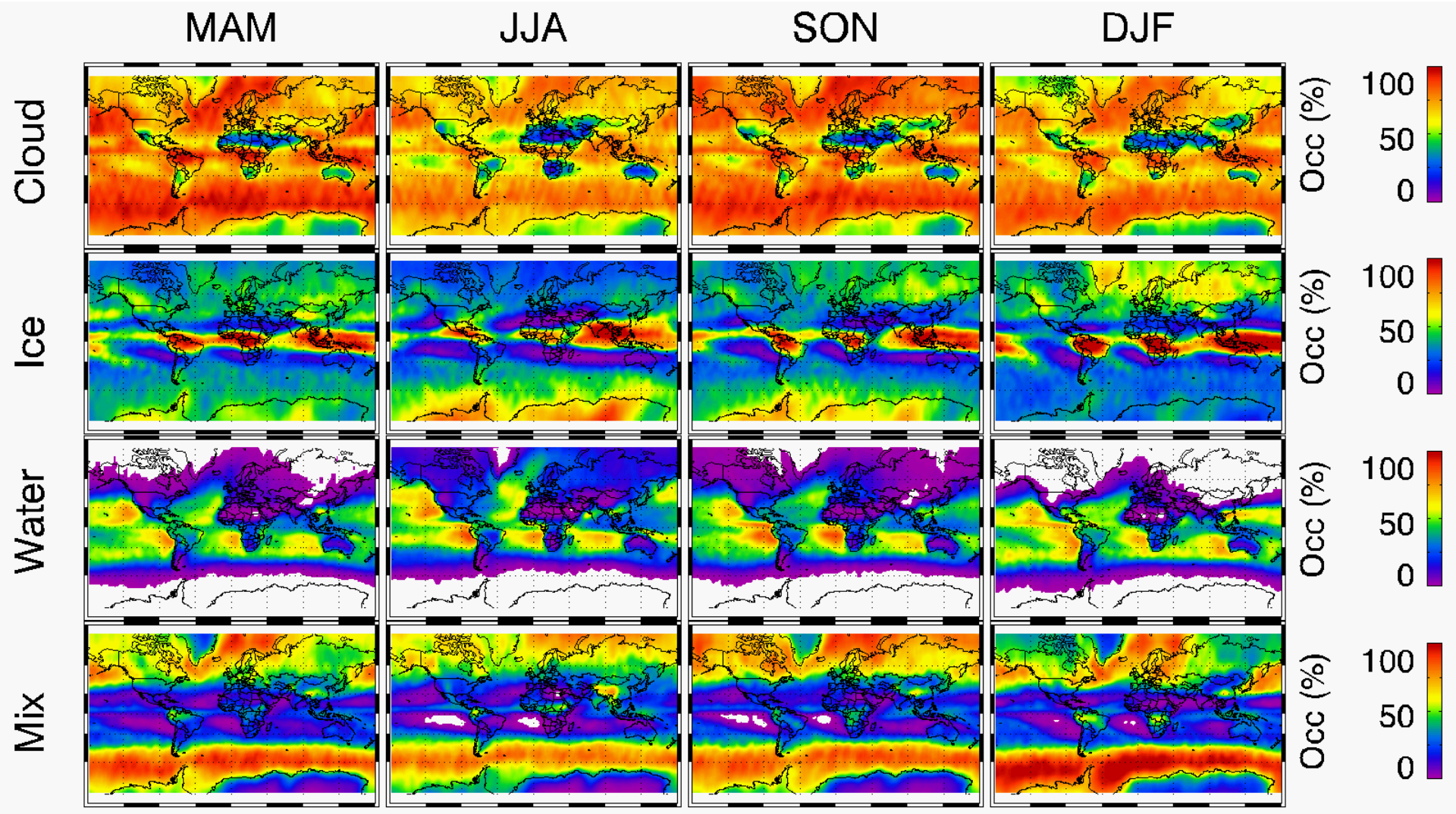


CloudSat 2B-CLDCLASS-LIDAR Product



CloudSat DO-op mode: Relax the distance criteria to find closest 5 CALIOP profiles.

Global Cloud Thermodynamic Phase Distribution



Mass Liquid Water Fractions