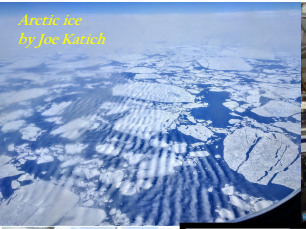
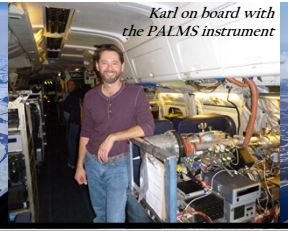
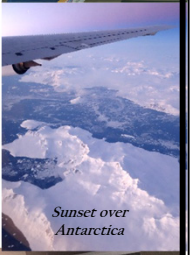






Global-scale measurements reveal cirrus clouds are seeded by Mineral Dust Aerosol

Karl Froyd, NOAA CSL & CIRES

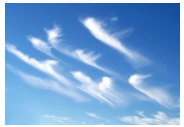
Pengfei Yu, Gregory Schill, Charles Brock, Agniezska Kupc, Christina Williamson, Eric Jensen, Eric Ray, Karen Rosenlof, Glenn Diskin, Paul Bui, Daniel Murphy

A suspected link between dust aerosol and cirrus clouds

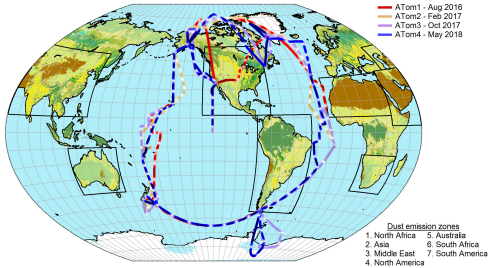
Mineral dust aerosol can act as natural cloud seeds for cirrus

Cirrus clouds are important regulators of Earth's climate

We cannot accurately predict cirrus formation because dust aerosol abundance is unknown

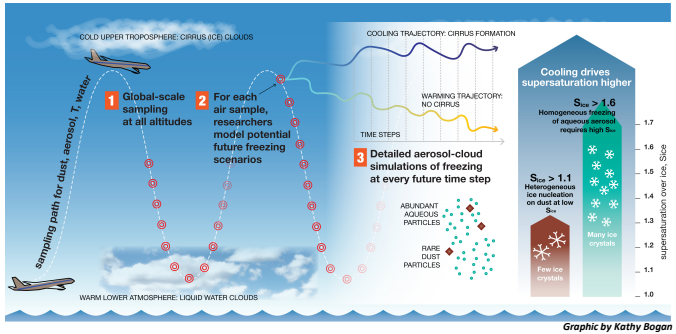


Global airborne sampling campaign



The NASA ATom campaigns sampled the remote global atmosphere, continuously measuring over 500 different aerosol, chemical, and physical parameters

An innovative analysis approach combines (1) the new map of dust aerosol, (2) simulated future trajectories of each sampled air parcel, and (3) a detailed cirrus formation model at each future time step

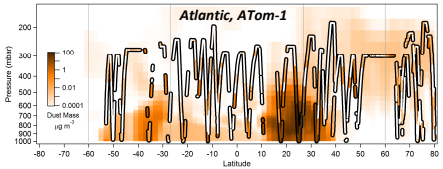


Graphic by Kathy Bogan

Key Messages

- This study confirms that mineral dust aerosol are abundant enough to affect (and sometimes dominate) cirrus cloud formation in the background atmosphere
- Unequivocally ties mineral dust emissions to cirrus clouds, which are important regulators of Earth's climate.
- Future dust emissions are highly uncertain due to uncertainty in human influence on deserts and climate sensitivity.

New global-scale dust aerosol measurements



- Froyd and colleagues create the first global-scale map of mineral dust aerosol (lines)
- Measurements are used to train global models of dust (background)

Cirrus clouds predicted by the combined analysis

- Most cirrus clouds form on dust aerosol (70%).
- Cirrus sometimes form via other mechanisms in the less dusty SH