Arctic haze observations with CALIPSO: Comparison to the GEOS-Chem Model

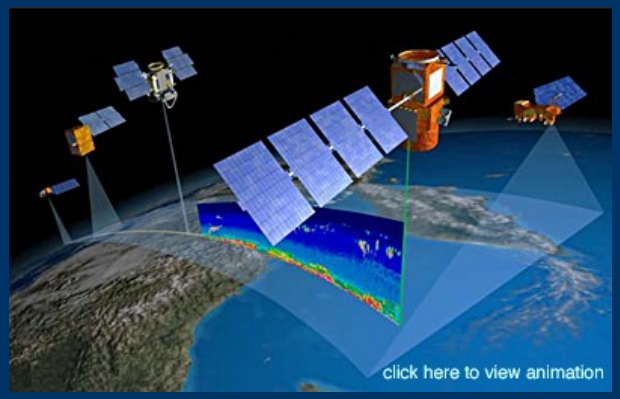
Maurizio Di Pierro
Lyatt Jaeglé
Tad Anderson
University of Washington

CALIPSO SATELLITE DATA: Orbits in the A-train, ~14 orbits a day, 60 m vertical resolution, began operations in June 2006

Carries on board CALIOP, nadir-viewing Lidar operating on 2 channels:

- 532 nm polarized
- 1064 nm

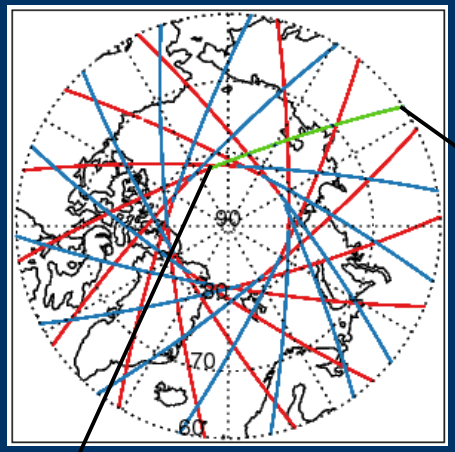
Data used: 5 km horizontal resolution Cloud and Aerosol Layer Level 2 Products



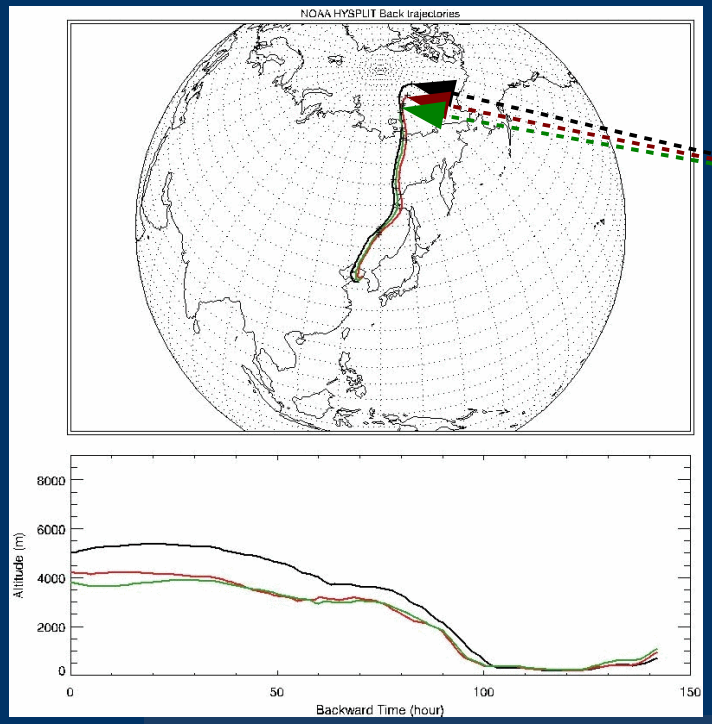
GEOS-Chem V.08-01-01, GEOS 5 Met Fields, 2x2.5º, 47 vertical levels
Coupled aerosol-chemistry simulation

Observations of Aerosols export to the Arctic on 2007/03/01

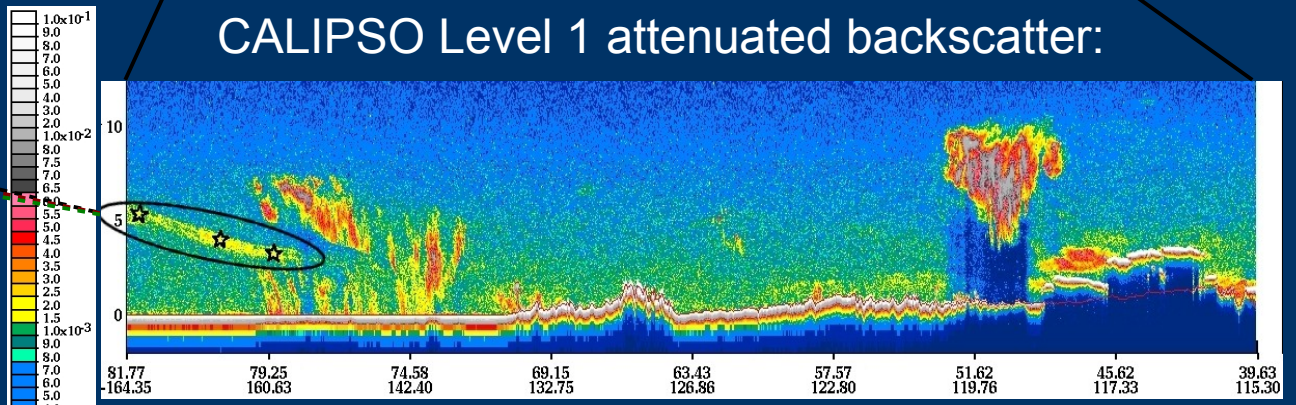
CALIPSO Orbits over the Arctic on 2007/03/01:
Red: daytime
Blue: Nighttime
Green: Highlighted orbit



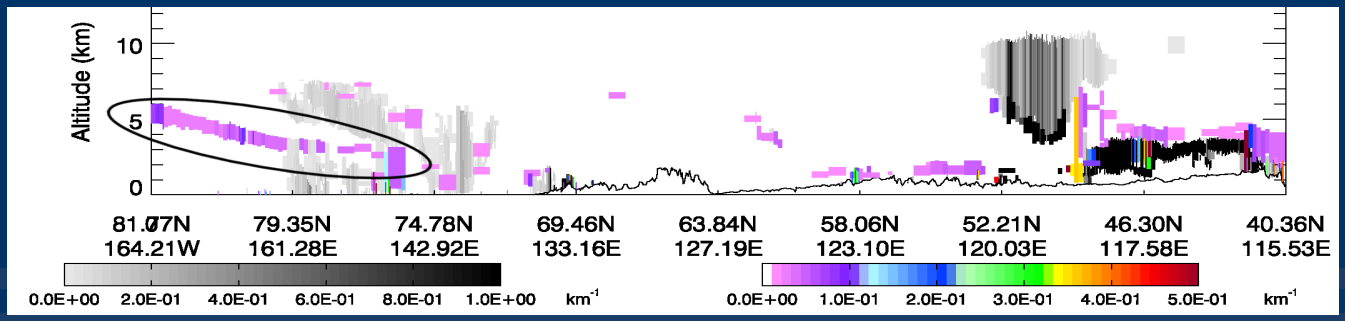
Back trajectories show East Asian Origin:



CALIPSO Level 1 attenuated backscatter:



CALIPSO Level 2 Cloud and Aerosol Extinction:

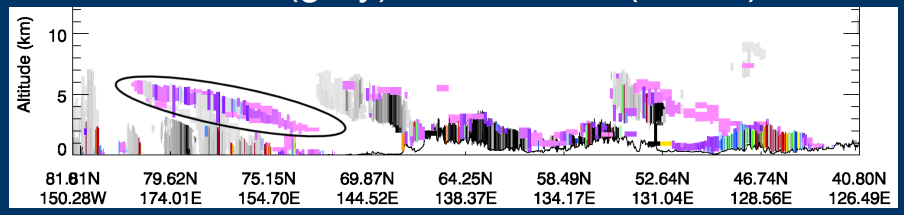


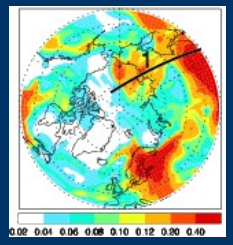
Evolution of Asian plume for 3 days over the Arctic:

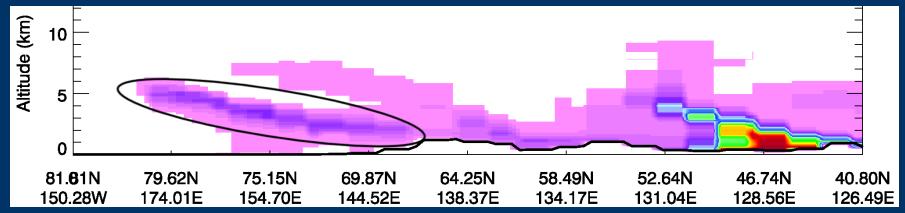
CALIPSO Extinction
Level 2 Cloud (grey) and Aerosol (colors)

February 28, 2007, 17:33 UTC

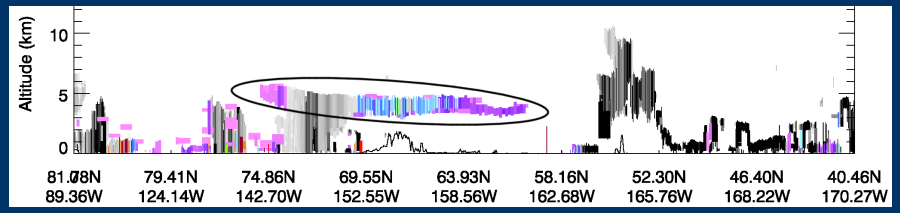
GEOS-Chem Extinction

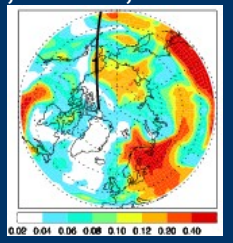


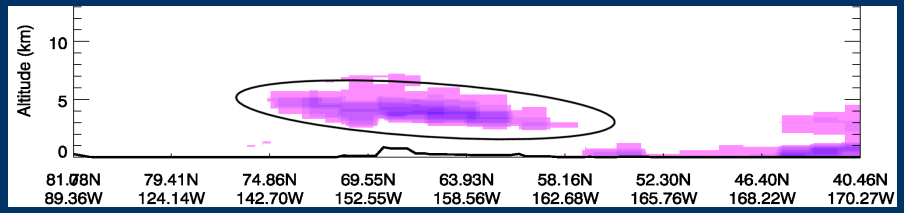




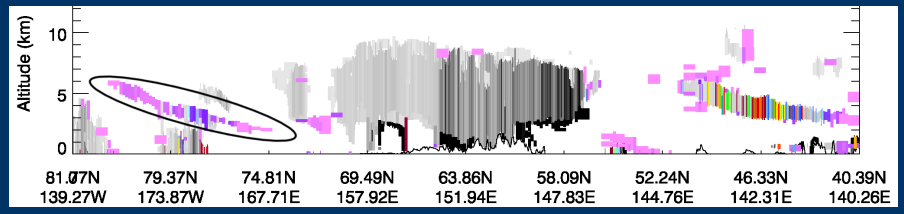
March 01, 2007, 13:20 UTC

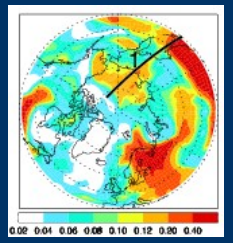


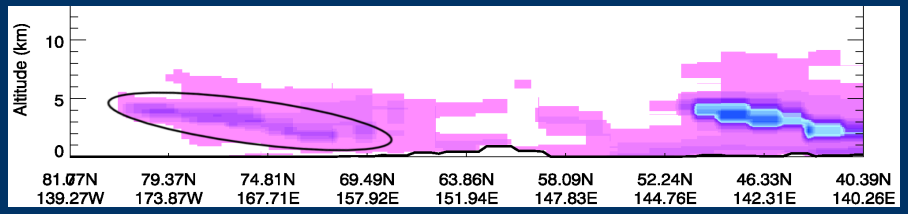




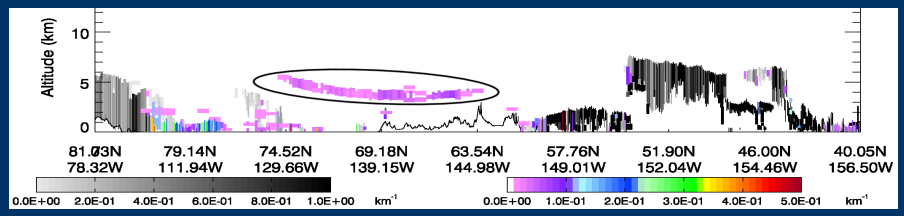
March 01, 2007, 15:39 UTC

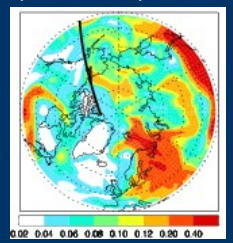


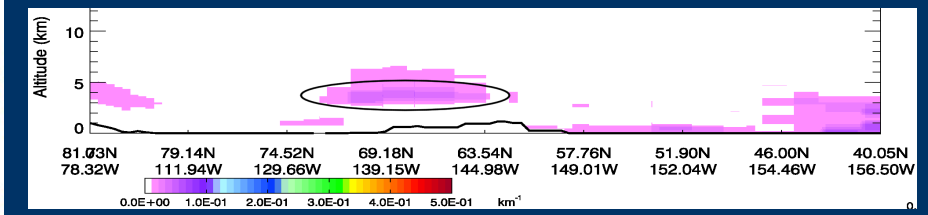




March 02, 2007, 12:24 UTC







AOD

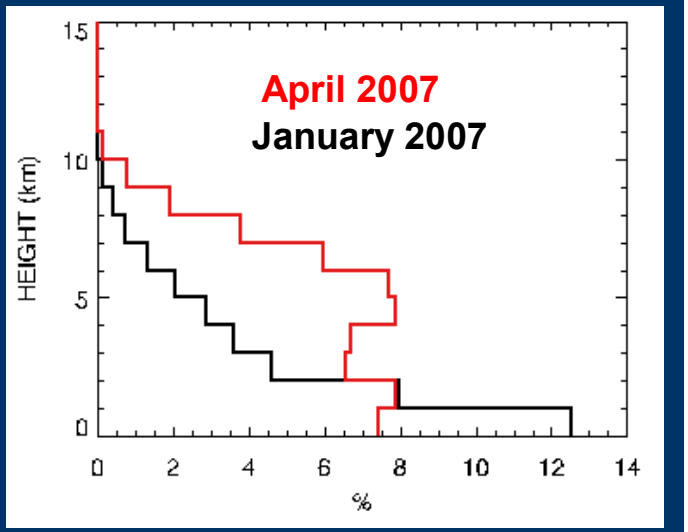
1) CALIPSO provides good sampling of aerosol export events

2) Model captures export events with fair accuracy

Seasonality of the vertical distribution of the aerosol load (2006/06-2009/02) poleward of 60°N

Occurrence frequency of aerosol layers:

Vertical distribution of occurrence frequency of aerosol layers:



%