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The U.S. Department of Energy's Atmospheric Radiation Measurement Climate Research Facilities on the North Slope of Alaska

American Geophysical Union Fall Meeting
December 16, 2008

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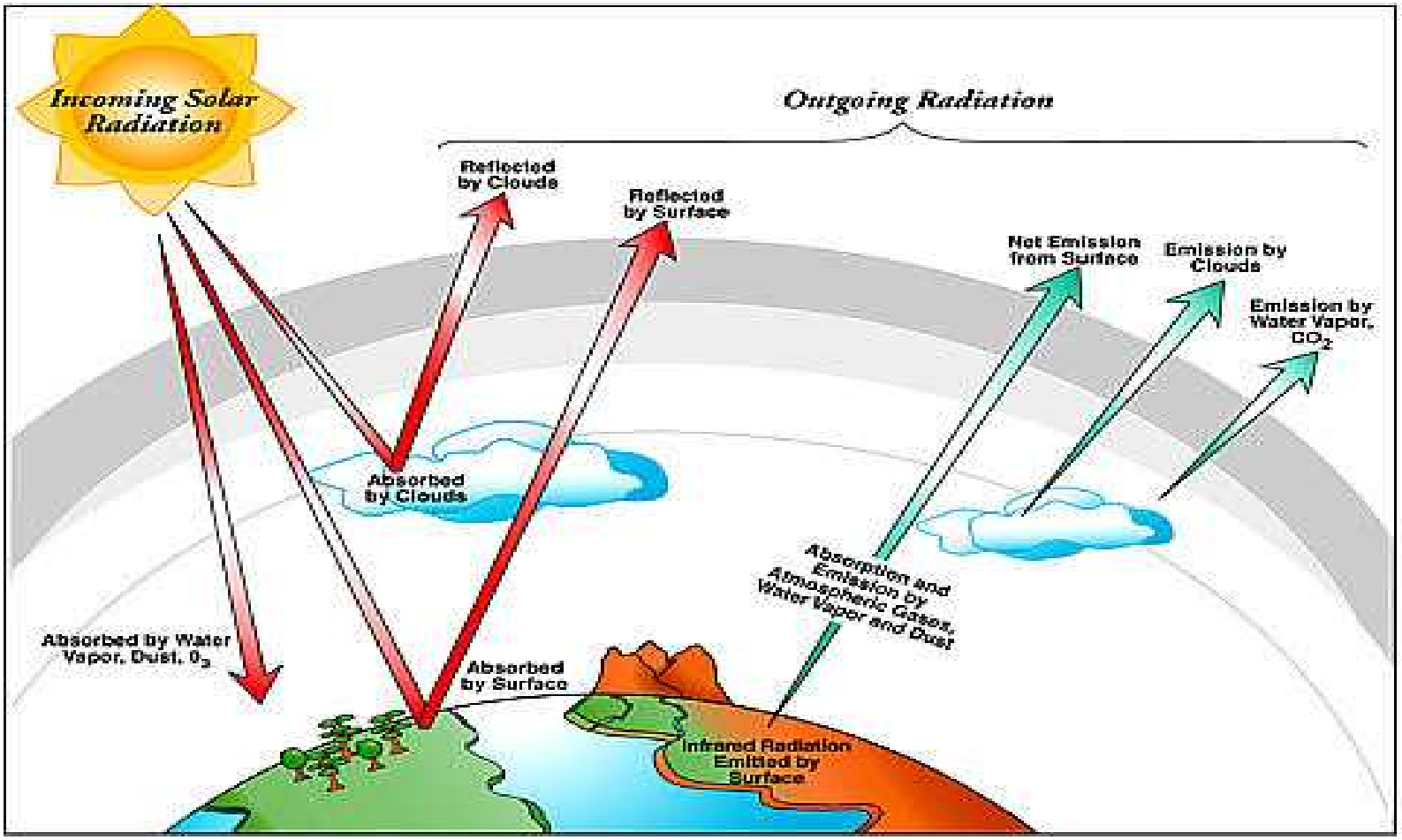
Atmospheric Radiation, Clouds, and Climate



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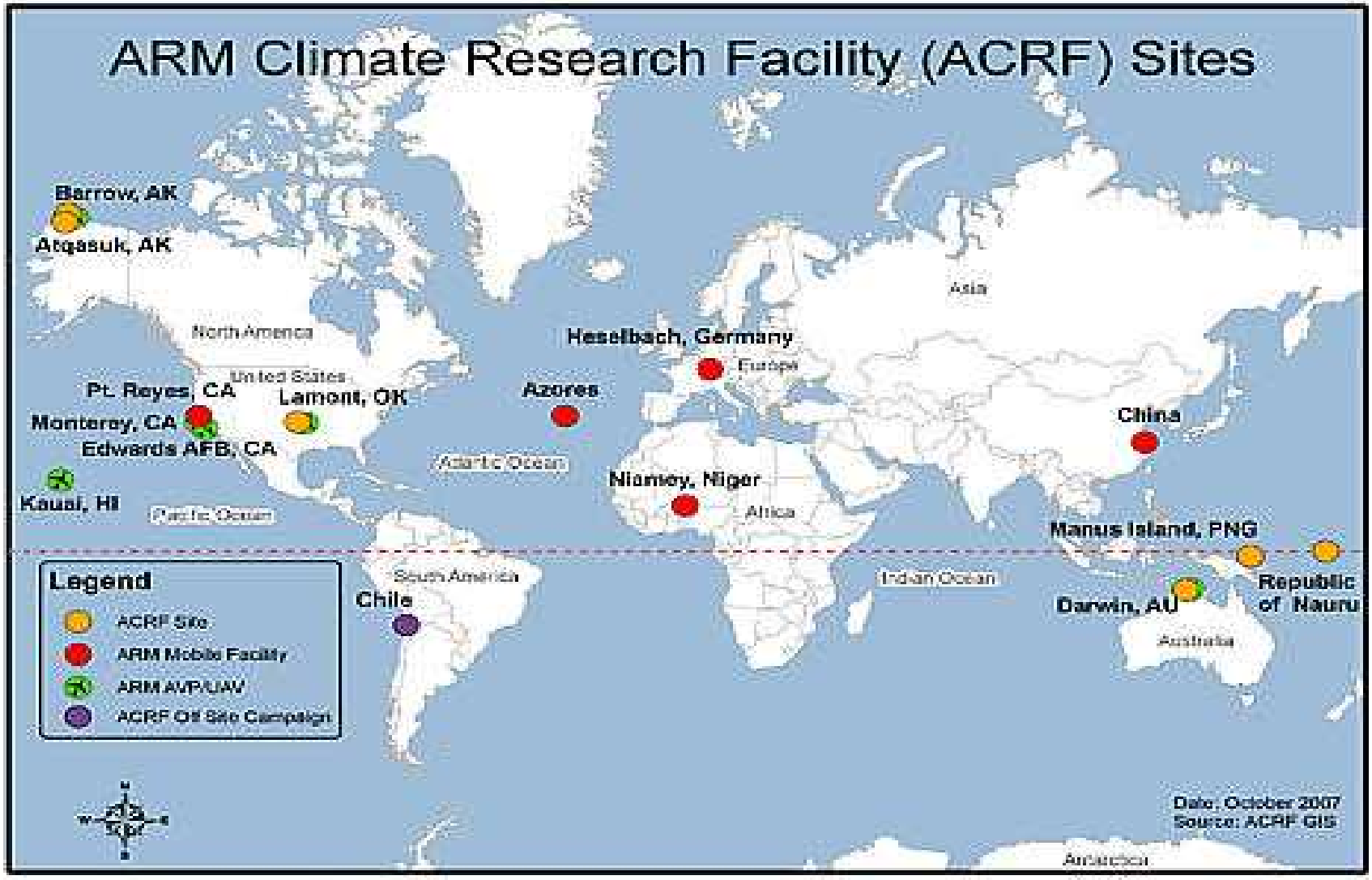

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Program Collaborators

DOE Laboratories

- Argonne National Laboratory, IL
- Brookhaven National Laboratory, NY
- Lawrence Berkeley National Laboratory, CA
- Lawrence Livermore National Laboratory, CA
- Los Alamos National Laboratory, NM
- National Renewable Energy Laboratory, CO
- Oak Ridge National Laboratory, TN
- Pacific Northwest National Laboratory, WA
- Sandia National Laboratories, CA/NM

Private

- Atmospheric and Environmental Research, Inc., MA
- General Atomics, CA
- Greenwood Aviation, GA
- Mission Research Corp., CA
- Raytheon Corp., CA
- Teledyne, Brown

Universities

- Boston University, MA
- Clark Atlanta University, GA
- Colorado State University, CO
- Desert Research Institute, NV
- Florida State University, FL
- Georgia Institute of Technology, GA
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- Lamont-Doherty Earth Observatory, NY
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- State University of New York at Albany, NY
- State University of New York at Stony Brook, NY
- Stevens Institute of Technology, NJ
- University of Alaska, Fairbanks, AK
- University of California, Los Angeles, CA
- University of California, San Diego, CA
- University of California, Santa Barbara, CA
- University of Colorado, CO
- University of Denver, CO
- University of Maryland, MD
- University of Massachusetts, MA
- University of Miami, FL
- University of Michigan, MI
- University of North Dakota, ND
- University of Oklahoma, OK
- University of Utah, UT
- University of Washington, WA
- University of Wisconsin, WI
- University of Wyoming, WY

International Collaborators

- Atmospheric Research Australia Western University, Australia
- Bureau of Meteorology (BOM), Australia
- CSIRO, Division of Atmospheric Research, Australia
- Canadian Centre for Remote Sensing (CCRS), Canada
- Dalhousie University, Canada
- McGill University, Canada
- Meteorological Service of Canada
- University of British Columbia, Canada
- Laboratoire de Meteorologie Dynamique, France
- Japan Marine Science Technology Center, Japan
- National Institute of Polar Research, Japan
- Tohoku University, Japan
- Meteorological Research Institute (MRI), Japan
- Nauru
- Royal Dutch Institute (KNMI), Bilthoven, Netherlands
- Papua New Guinea
- Central Aerological Observatory, Russia
- Institute for Atmospheric Optics (IAO), Russia
- Institute of Atmospheric Physics (IAP), Russia
- European Centre for Medium-Range Weather Forecasts (ECMWF), United Kingdom
- Hadley Centre for Climate Prediction, United Kingdom

Other Government Offices and Laboratories

- Air Force Phillips Laboratory
- Alaska State Water Survey
- NASA Ames Research Center
- NASA Earth Observing System (EOS) Project Science Office
- NASA Goddard Institute for Space Studies
- NASA Goddard Space Flight Center
- NASA Jet Propulsion Laboratory
- NASA Langley Research Center
- National Center for Atmospheric Research
- National Marine Fisheries Service
- National Science Foundation
- National Severe Storms Laboratory
- Naval Research Laboratory
- North Slope Borough Government
- NOAA Aeronomy Laboratory
- NOAA Climate Monitoring and Diagnostics Laboratory
- NOAA Environmental Technology Laboratory
- NOAA Geophysical Fluid Dynamics Laboratory
- NOAA National Center for Environmental Prediction
- NOAA National Environmental Satellite, Data, and Information
- NOAA Office of Global Programs
- NOAA Pacific Marine Environmental Laboratory
- NOAA Surface Radiation Research Branch

(continued)

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ARM Data Archive
www.arm.gov

Finding Data and Data Holdings

- **Catalog of Data Streams -** sorted by ARM site and file format (updated monthly)
- **Finding Data** - overview of how ARM data are organized
- **Quick Looks** - Accessing Quick Looks for ARM Data Files
- **Early ARM Data** - information generated before July 1993

Obtaining and Using Data

- **User Interface Overview**
- **Standing Orders -** processing and access instructions
- **Automatic Standing Order Downloading**

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ARM Climate Research Facilities in Alaska

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Barrow and Atqasuk

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ARM Climate Research Facility - Barrow

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Atmospheric Soundings in Barrow

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Barrow User Facility Shelter

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Barrow User Facility with IR Loss Experimental Setup

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USAF “DEWLINE” Station and ACRF Site

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USGS, DOE, and NOAA Facilties in Barrow

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ACRF Site in Atqasuk

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Atqasuk

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Atqasuk Instrument Shelter

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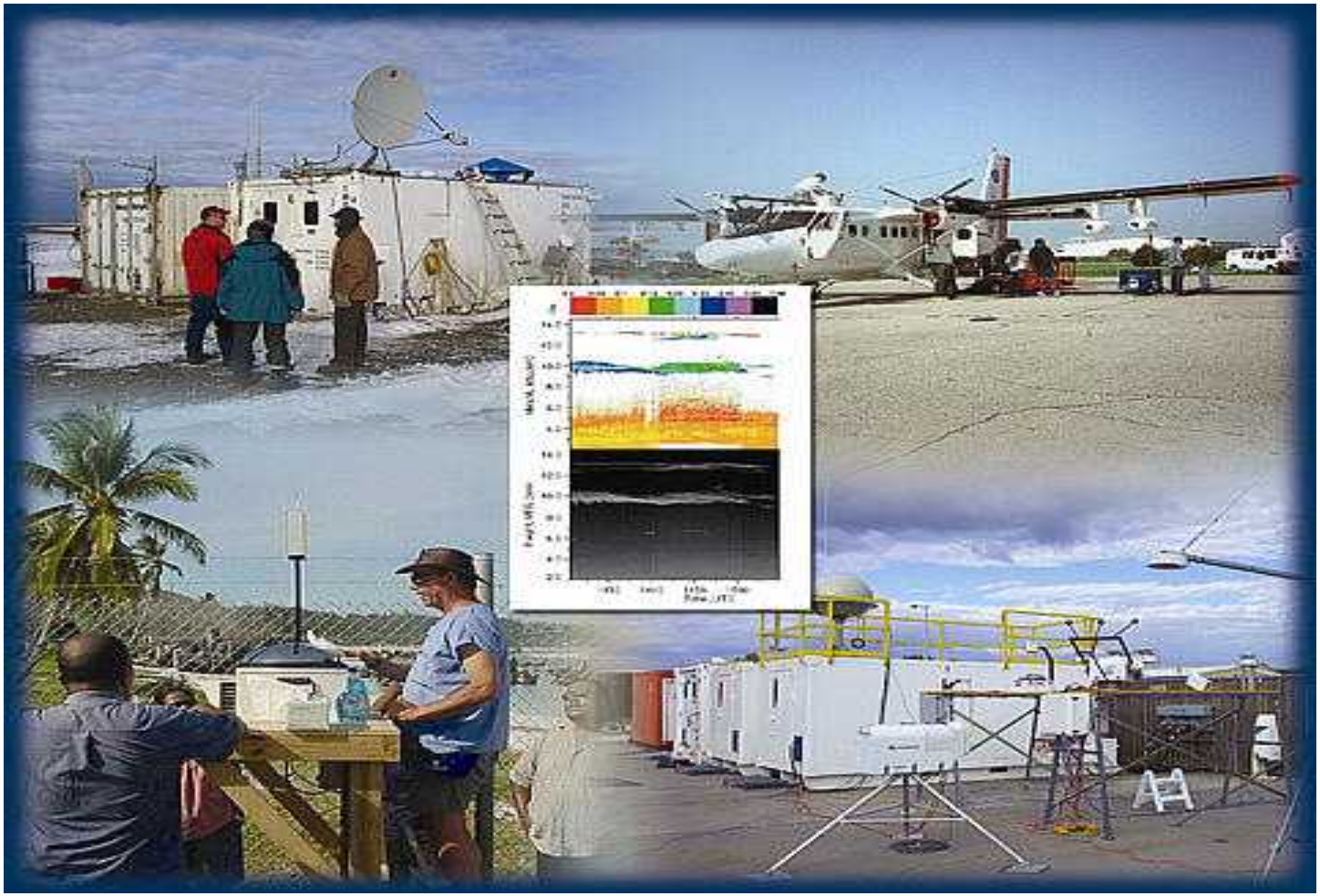
Intensive Operating Periods



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Radiative Heating in Underexplored Bands Campaign (RHUBC), 2007: IOP Team

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“TAFTS” Instrument, RHUBC

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ARM Climate Research Facility (ACRF)
Office and Accommodations Duplex in Barrow

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ACRF Duplex in Barrow

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Mixed-Phase Arctic Cloud Experiment, Oliktok

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Mixed-Phase Arctic Cloud Experiment, 2004, Experimental Domain

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Tethersonde Operations at Oliktok

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Tethersonde at Oliktok

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National Research Council's Convair– Indirect and Semi-indirect Aerosols Campaign, April 2008

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Mixed-Phase Arctic Cloud Experiment (October 04)

- **Documented very low IN, generally low CCN concentrations**
- **Cloud Resolving Model studies:**
  - **cannot produce observed ice crystal concentration and liquid water content**
  - **needed to invoke new primary ice nucleation mechanism**

08 April 2008, Flight #16
Korolev and Strapp

Indirect and Semi-Direct Aerosol Campaign (April 08)

- How do properties of Arctic aerosol in April differ from those measured I M-PACE in October?
- To what extend to differences in aerosol properties produce differences macro- and microphysical properties of clouds and the surface energy budget?
- How well can cloud models and parameterizations used in climate mode simulate the sensitivity of Arctic clouds and surface energy budget to th differences in aerosols between April and October?
- How well can long-term surface-based measurements at the ACRF Barro site provide retrievals of aerosol, cloud, precipitation and radiative heati in the Arctic?

Canadian NRC
Convair 580

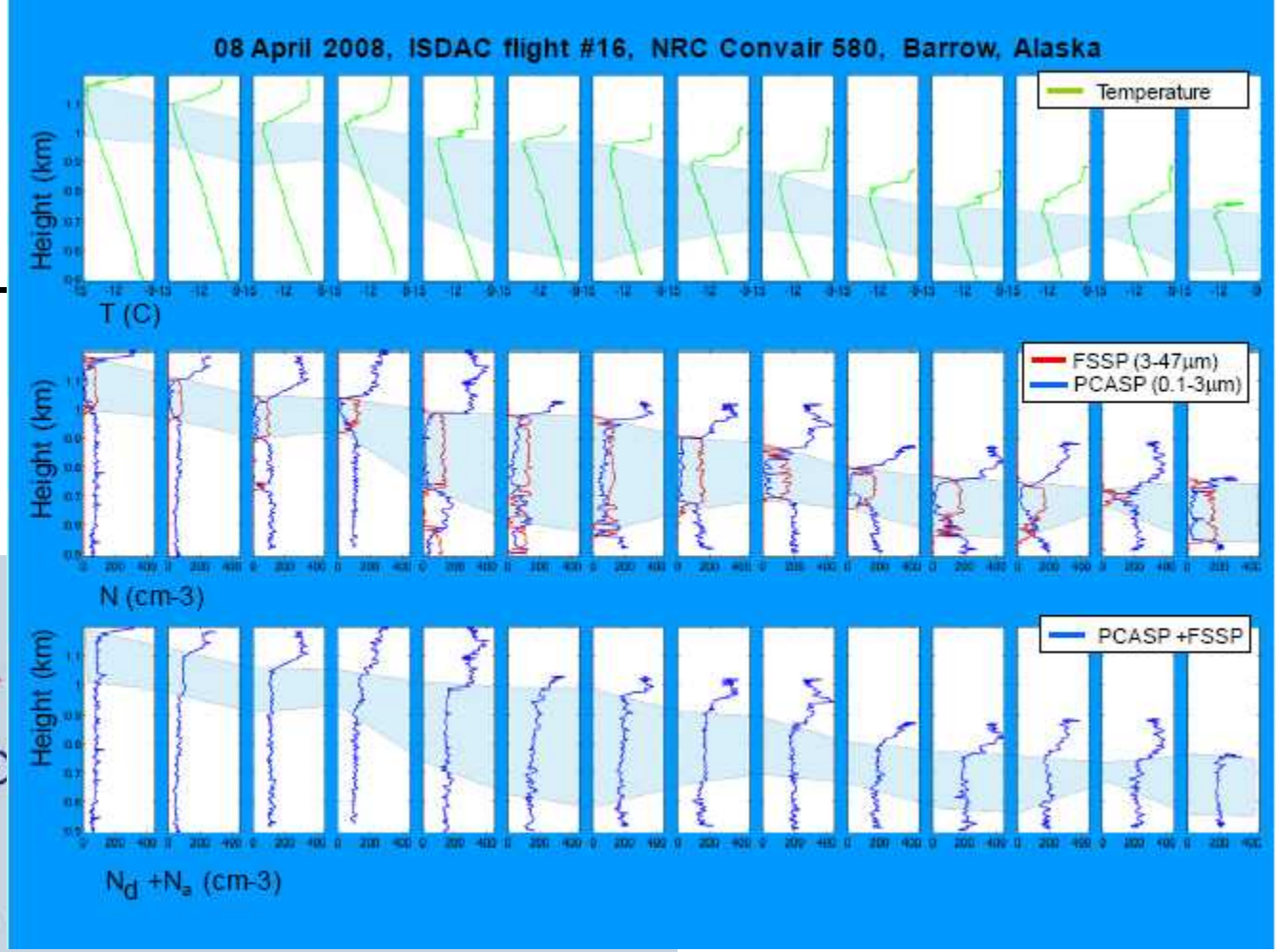
104 hrs on 12 days
aerosol and
microphysics
measurements

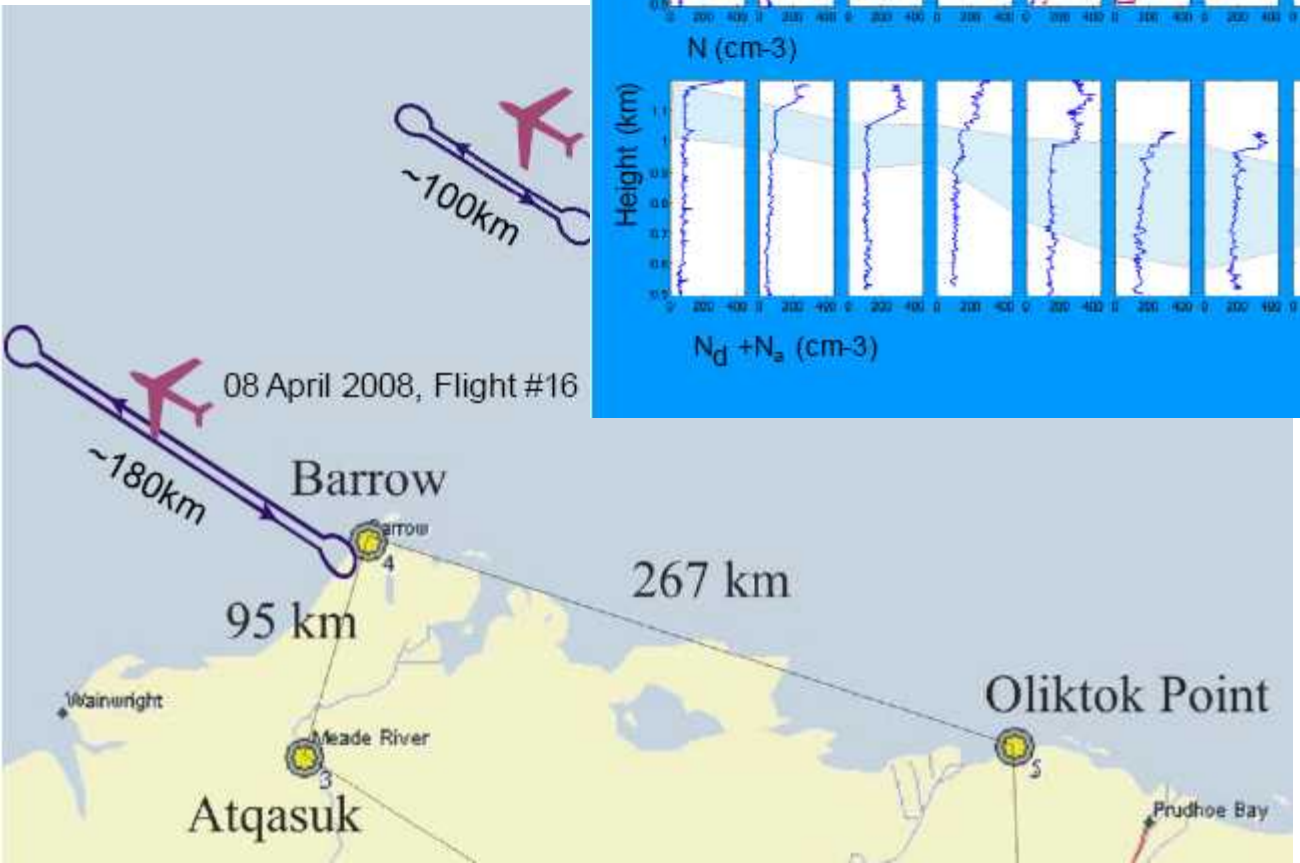
Example Analysis

Alexei Korolev
Environment Canada

8 April 2008

Single layer case
Mixed-phase cloud





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Teamwork in Barrow

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The Palms of Barrow

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