

ARCPAC Science

Transits

Front Range

Fairbanks

Transit goals

- 1) All are science flights as far as operating instruments
- 2) To/from Fairbanks is a long flight
 - flight path and altitude for efficiency
 - probably without a fuel stop
- 3) Tampa -> Colorado
 - time for a short science objective
 - organic aerosols in Southeast US
 - ARM site (clear there?)
 - urban area? (Houston?)

Front Range goals

1) Of most interest:

Ozone

Particulate pollution

2) Springtime:

cooler, less sunlight => slower photochemistry

~ no biogenic emissions

together, may be easier to see urban source signatures

might see nitrate-dominated aerosol

3) Shakedown of instruments, flight planning, and data processing before Alaska

Alaska goals

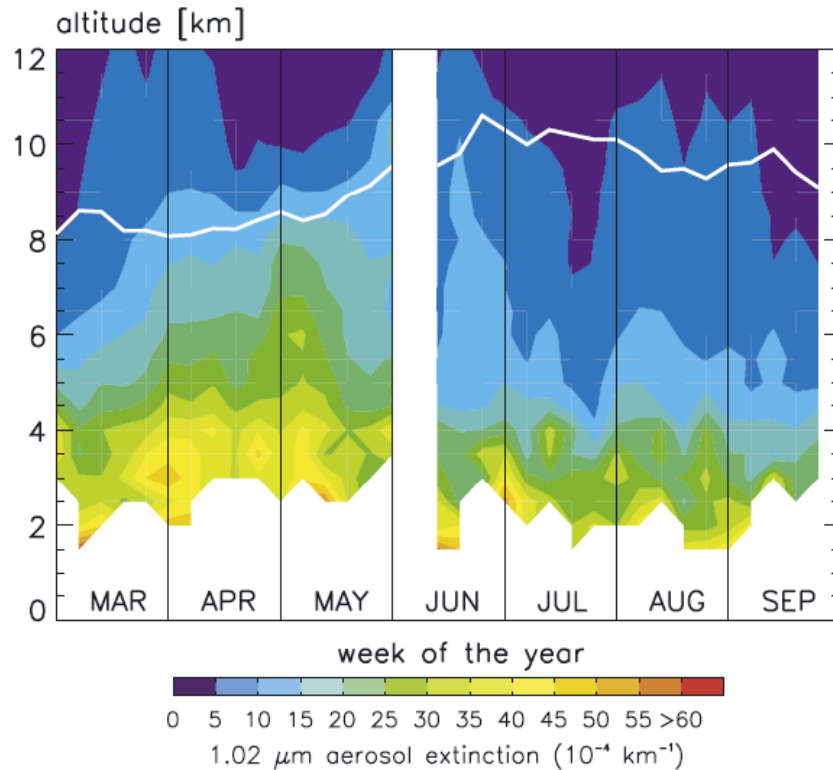
Aerosol, cloud, and radiative

Gas-phase

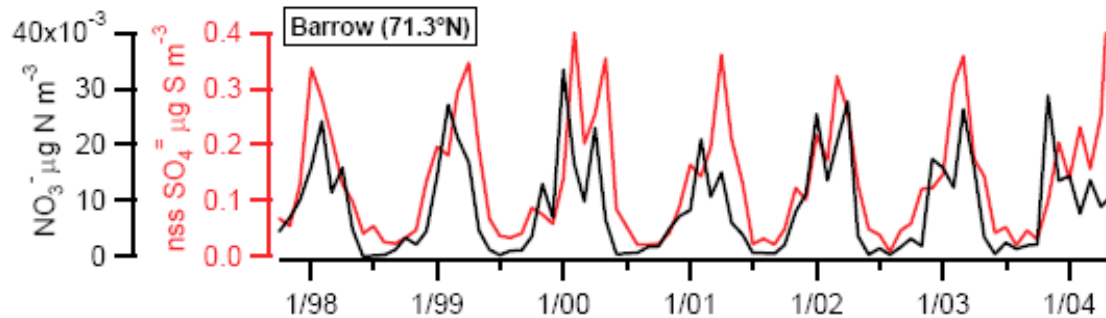
Air quality

Novel environment

Arctic aerosol

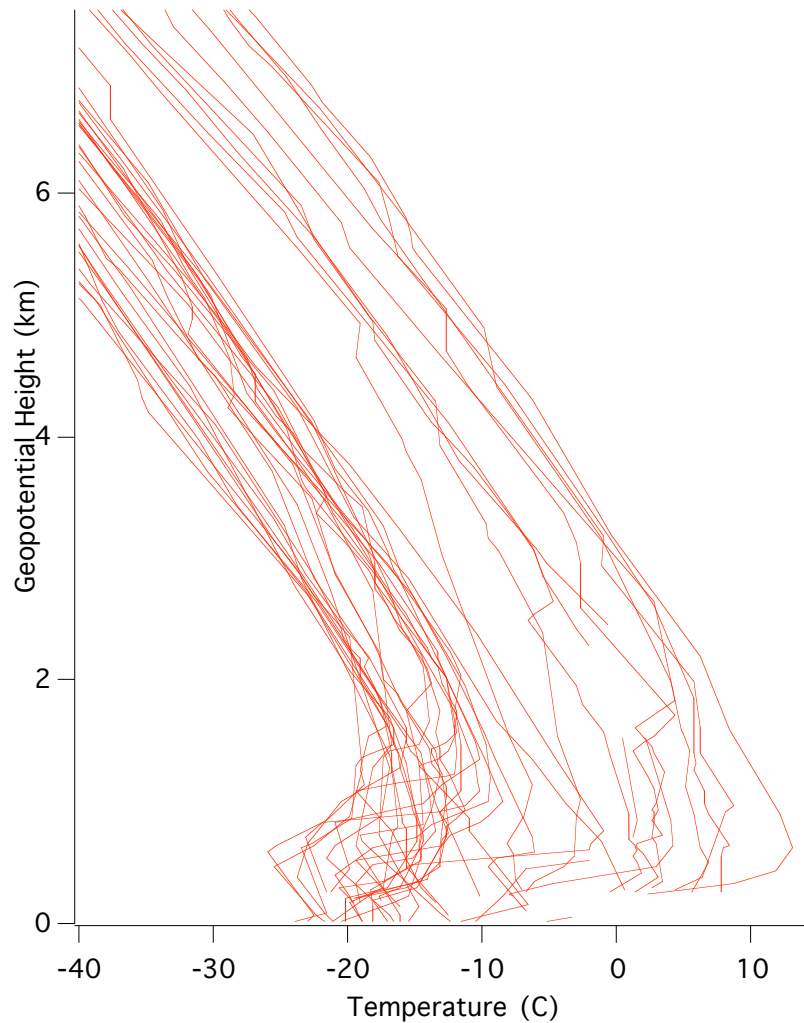


- *Ground level aerosol peaks Dec. - April*
- *Aerosol aloft peaks in March - May*
- *Surface observations suggest mostly sulfate, but significant other components even in mid-winter*



Temperature Profiles in Barrow:

Station: POINT BARROW
Sounding Date: 2005 April



- Strong inversion means surface often decoupled from air aloft.
- Also means that clouds can (and do) have liquid water

Aerosol, cloud, and radiative goals

Direct radiative effects:

- aerosol size, optical properties including BC
- radiative impact
- *implies sampling various altitudes (vertical profiles)*

Assess anthropogenic influence:

- aerosol chemistry, correlations with gas phase species
- *varied conditions, close connections to models*

Understand cloud radiative effects:

- examine cloud structure, origin of precipitation
- scavenging of black carbon
- *difficult goal with limited in-cloud capability*

Gas phase

Halogen and ozone depletion chemistry:

- bromine compounds, plus full payload
- bromine is from the surface

How to sample with strong inversion?

Photochemical aging

- low sun, cool temperatures
- *relative importance of processes may change*

Arctic air quality

Emissions near Prudhoe Bay

- assess emissions
- chemical impact in this environment

Be aware of local emissions near Barrow

Fairbanks has air quality issues

data on final approach are of interest

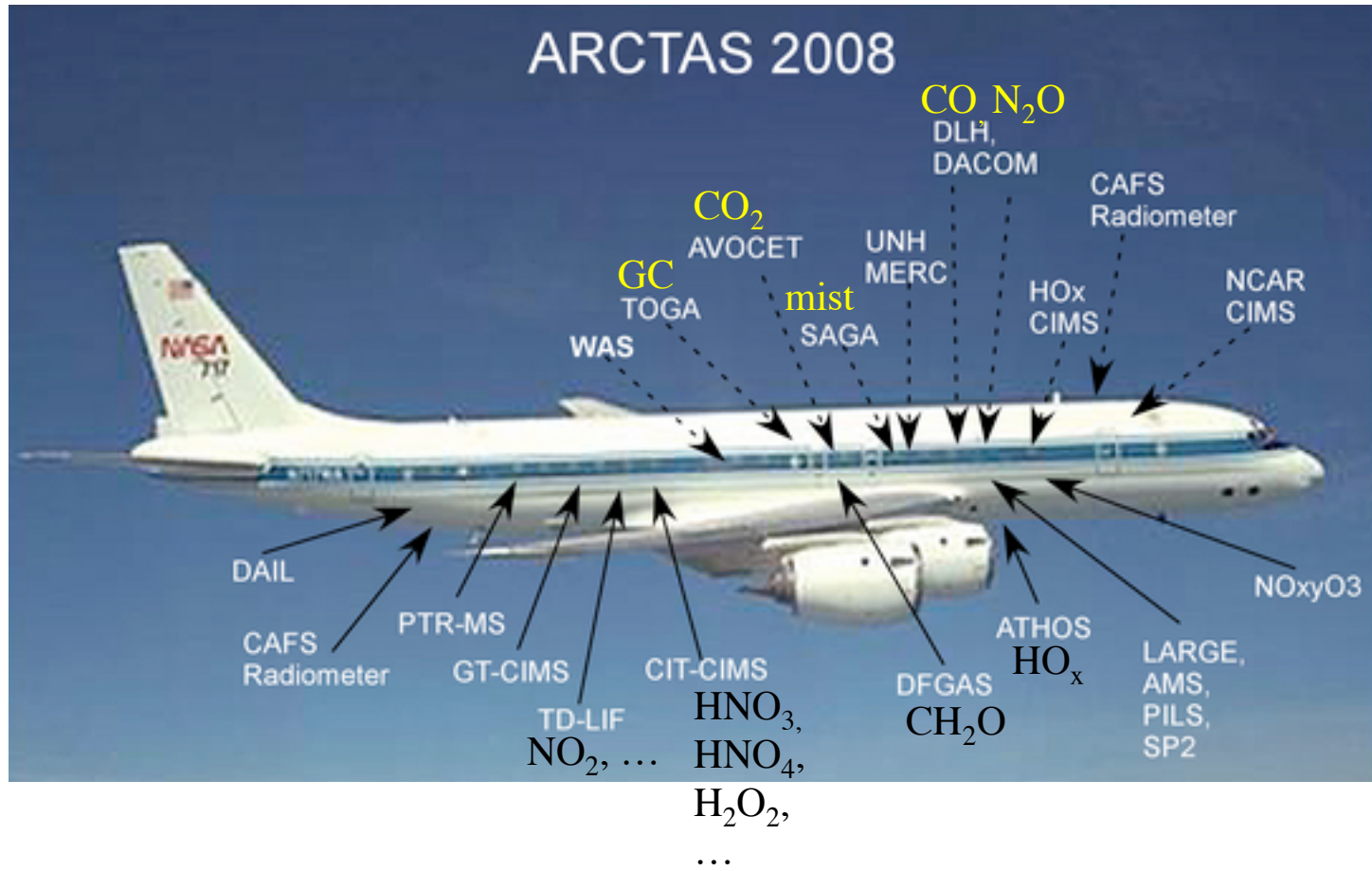
General

First deployment of powerful P3 payload in a new environment




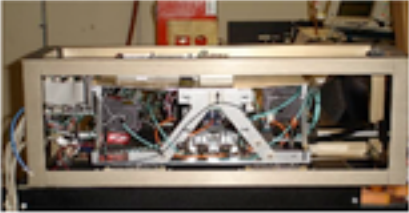
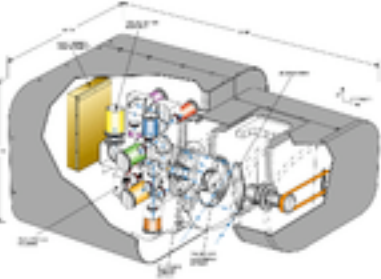
=> *strong possibility of new science*

DC8 payload

April 1-21
Thule flights first half



P3 payload April 1-21

<p>Ames Airborne Tracking Sunphotometer (AATS)</p>  <ul style="list-style-type: none"> • AOD • Ext • H₂O vapor 	<p>Solar Spectral Flux Radiometer (SSFR)</p>  <ul style="list-style-type: none"> • Flux $\uparrow, \downarrow(\lambda)$, albedo($\lambda$) 	<p>Broad-Band Radiometers (BBR)</p> <p>LW SW</p>  <ul style="list-style-type: none"> • Flux \uparrow, \downarrow, albedo
<p>HiGEAR Aerosols</p> <ul style="list-style-type: none"> • OPC & DMA dry size dist, volatility • Tandem Volatility DMA • Neph scat + PSAP abs • Humidified Neph f(RH) • Ultrafine & CN • Time of Flight Mass Spec size resolved chemistry • SP2 black carbon mass 	<p>AERO3X</p> <ul style="list-style-type: none"> • Cavity Ringdown ext (2λ) • Reciprocal Neph sca (2λ, RH)  <ul style="list-style-type: none"> • Nenes CCN • PVM cloud drop r_{eff} • TECO O₃ 	<p>Cloud Absorption Radiometer (CAR)</p> <ul style="list-style-type: none"> • Radiance, BRDF 
<p>Navigation</p>	<p>Meteorology: P, T, RH, ...</p>	<p>REVEAL</p>

B200 payload

High Spectral Resolution Lidar

Convair 580 payload

- Canadian National Research Council Convair aircraft
- Hangar at Fairbanks
- 50 hr/month flights between Deadhorse and Barrow
- *Cloud particle size distribution and image*
- *Total, refractory and cloud-borne aerosol size distribution and single-particle composition, CCN and IN concentration*
- *Cloud extinction, aerosol scattering & absorption*



Data policy

- Usual courtesies: Consult investigators *early*, offer co-authorship, ...
- ICARTT data format. Ken Aikin is data manager.
- Password-protected site

- In field: Preliminary data within 24 hours; a few exceptions
- July 1: All preliminary data due
- October 1: “Final” data due

Collaboration with NASA ARCPAC:

- Default is full two-way exchange (share site passwords)
field phase?



*Approximate
2 and 4 hour
P3 radii*

AMSR sea ice
April 15, 2006