

ISDAC Mission Summary Journal

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WEEK 1: March 30, 2008 - April 5, 2008

Sunday, March 30, 2008

Weather Summary

N/A

Commentary

With the arrival of the Convair-580 yesterday, most of the team is now on site. Everyone has spent the past day or so checking through their shipments and getting their work spaces situated, both in the hangar and in the adjacent offices. A key activity today was an all-hands meeting at 11am for everyone involved with the campaign. Beat Schmid welcomed everyone (approximately 40 people) and started the introductions. Debbie Ronfeld then gave an overview of logistics at the hangar, including security, access, and parking. Beat then reviewed the “typical” daily schedule, followed by Lynne Roeder who briefly discussed media activities planned with NASA and NOAA for April 14. Greg McFarquhar and Steve Ghan then reviewed the science objectives for the campaign, and Walter Strapp provided a status on the aircraft instrumentation. Immediately after the meeting, everyone gathered in the hangar for a team photo in front of the Convair – chances are it will be extremely difficult to get everyone together in the same place at the same time again!

At 1:30, the flight planning team met to discuss the potential for a test flight the next day. Based on the weather briefing, conditions looked good, so flight plans were developed for the next day.



Left to right: Alexei Korolev and Rob Reed from Environment Canada pretend to ignore the camera while Brad Baker and Mike Carrithers from SPEC Inc. take it in stride.



All Hands Meeting



The ISDAC team poses for a group photo in front of the Convair after the all-hands meeting on March 30. Most people mingled for a short while afterward to get to know each other.



Left to right: The two ISDAC PIs, Steve Ghan from Pacific Northwest National Laboratory and Greg McFarquhar from the University of Illinois; Mike Carrithers from SPEC Inc. visits with Alexi Korolev from Environment Canada; Hans Verlinde and Chad Bahmann from Penn State University share a laugh with Matt Freer from the University of Illinois.

Monday, March 31, 2008

Weather Summary

Fairbanks: Light morning snow in area, lightening up late morning, with overcast skies remainder of day. Daytime temps in the upper 30s, low 40s ° Fahrenheit.

Barrow: n/a

Commentary

Today's aircraft mission was a local test flight. The Convair took off at noon and flew north-northeast to Fort Yukon and back. Instruments took measurements above, within, and below a low-level stratus deck. Cloud probes operated fine and aerosol and counterflow inlets were tested. No issues noted with aircraft. Total flight time: 2.7 hours.

Meanwhile, on the ground at Barrow, ACRF operations staff worked on installing the CIMEL sunphotometer (<http://www.arm.gov/instruments/instrument.php?id=csphot>) on the roof of the Great White instrument shelter. The 183 GHz radiometer arrived at the site today, and installation for that instrument began as well. The microwave radiometer profiler (MWRP) is being repaired at Radiometrics and is expected to arrive in Barrow soon. All other ACRF instruments at Barrow are operating normally.



Some members of the ISDAC team pose for a photo in front of the Convair before its test flight on March 31. Walter Strapp, third from left, is the team lead for cloud instruments from Environment Canada; he joined the crew on the plane right after the photo was taken. The rest of group, from left are: John Hubbe, Noojan Shayvard, Debbie Ronfeld, Lynne Roeder, principal investigators Steve Ghan and Greg McFarquhar, Dan Cziczo, and Alexei Korolev.



The Convair takes off from Fairbanks International Airport.

Tuesday, April 1, 2008

Weather Summary

Fairbanks: Partly cloudy with high cloud base. Daytime temps in the upper 40s/low 50s °F.

Barrow: Cloudy, with snow and fog banks blowing through. Daytime temps around 20°F.

Commentary

A very successful day, with all science and operational objectives met. The Convair took off at noon and flew a track beneath the A-Train satellites (CALIPSO, CLOUDSAT) near Barrow, mostly in-cloud. After completing some profiling flights over the ACRF Barrow site, the aircraft landed at Barrow at about 4pm to refuel for another flight. On the second flight, 30 minutes of additional sampling was completed over the ACRF Barrow site. During this time, there were persistent clouds continuously in the Barrow area, especially over the open water region at the northern section of the city. This was the case for most of last 3-4 days. There were several layers of the clouds over the open water. It was very windy at the surface and ice crystals were usually small, including some dendrites and stellar ice crystals with branches. For about 2 hours, ice particles were like columns and their size was less than 500-1000 micron size range.

Instruments at the site operated properly. However, for small ice crystals, the extinction and precipitation sensor missed the particles, resulting in no extinction coefficients and high visibilities. This could suggest that precip. amounts at the surface are not accurate when

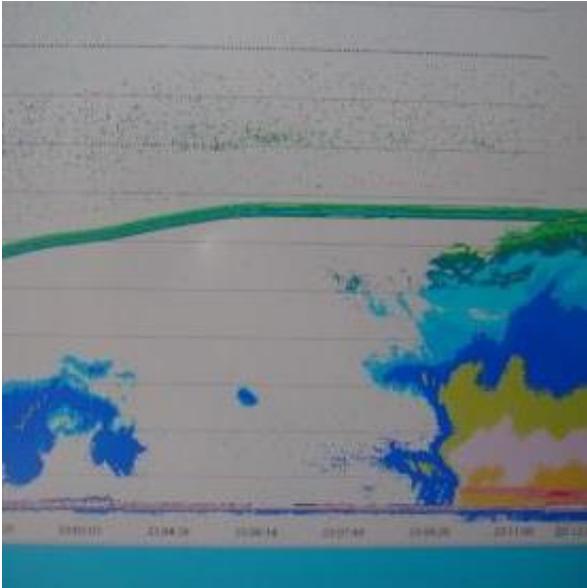
averaged over extended time periods. Once the science flights over Barrow were completed, the aircraft flew through more clouds for additional aerosol instrumentation testing, then flew back to Fairbanks. Total flight time: 7.2 hours!



Images of ice crystals taken at the ACRF Barrow site around 1 pm local time on April 1.



Mengistu Wolde, ISDAC lead for the National Research Council of Canada, monitors data during the April 1 flight.



This radar image from the April 1 flight shows several cloud systems beneath the Convair as it moves through the Barrow area. The reflectivity signals on the far right indicate a deep, precipitating system in contrast to the other two weaker systems.



This surface picture from the ACRF Barrow site was taken just after noon on April 1, likely when the Convair was overhead.

Wednesday, April 2, 2008

Weather Summary

Fairbanks: Partly cloudy, daytime temps in the upper 40s ° F.

Barrow: Mostly sunny, daytime temps in the upper 20s ° F. Heavy snowfall in evening.

Commentary

Today is a no-fly day to work on aircraft maintenance, instrument checks, data review, etc. At Barrow, there was a very deep stratus cloud over the Arctic ocean, which stayed there all afternoon. Because of its color, it likely included significant amounts of liquid. Further east, clouds appeared to include more ice than water.

No-fly days like today provide needed balance with flights days, and are very busy on the ground, as everyone is bustling around working on their instruments, checking data, etc. A typical “day” actually begins the day before, with a weather briefing to review the forecast for the next day! And it goes from there...

A Typical “Day”

Day Before Flight

- 15:00 *Meteorological briefing for all ISDAC participants*
 - 15:30 *Flight planning discussion for all ISDAC participants*
 - 16:00 *Flight decision-making group (includes off-duty flight crew if CV-580 airborne); if next day is suitable, preliminary flight plan produced. Alert all crew and instrument support of possible flight*
 - 17:00 *Decision announced. E-mail: isdac@arm.gov, web site (<http://acrf-campaign.arm.gov/isdac/>), white board at Everts entrance, Flight Planning group meeting room.*
-

Day of Flight

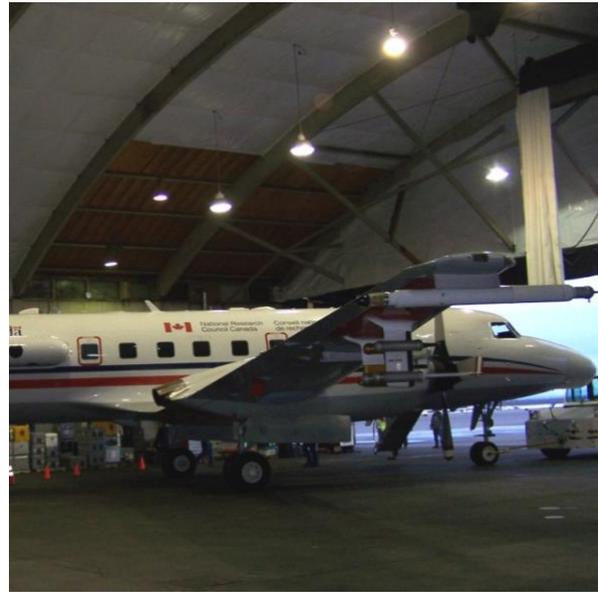
- 05:30 *Meteorological briefing for flight decision-making group; preliminary flight plan reviewed*
- 06:00 *Access to hangar begins*
- 07:00 *Official flight plan finished*
- 07:15 *Scientific crew and instrument support on aircraft preparing for mission*
- 07:45 *Pull aircraft out of hangar*
- 08:00 *Crew access to aircraft outside*
- 08:00 *Brief pilots on expected mission profile*
- 08:15 *Weather brief for Pilots*
- 09:00 *Final ‘go/no-go’ decision from flight decision-making group; fuel aircraft*
- 09:15 *All non-crew members off the aircraft – doors closed*
- 09:45 *Takeoff Fairbanks – conduct science mission*

- 15:00 *Met. briefing for next day, etc...*
- ~18:30 *Land Fairbanks*
- 19:00 *Flight debriefs and plans for next day announced/discussed*
- 20:30 *Hangar access ends*

Long days!



From the shoreline near the ACRF Barrow site, a very deep stratus cloud hovers above the Arctic Ocean most of the afternoon on April 2, 2008.



The Convair enjoys some alone-time in the hangar before the arrival of NOAA's P-3.



Rob Reed from Environment Canada takes advantage of the no-fly day to check on the cloud probes.

Thursday, April 3, 2008

Weather Summary

Fairbanks: mostly cloudy, daytime temps in the 30s °F.

Barrow: mostly sunny, daytime temps near 0 °F.

Commentary

Flight plans for today were cancelled due to non-ideal cloud conditions over Barrow, and the need to choose between today and tomorrow for flight days. So today is another no-fly day for instrument work, etc. We will definitely fly tomorrow, unless cloud conditions at Barrow worsen dramatically.

Traffic in the hangar is picking up with the recent arrival of the NASA P-3 and DC-8. Folks are coming and going onto the ramp, keeping our badged staff alert and on their toes. In addition, NOAA's P-3 is scheduled to arrive tonight and will be sharing a hangar with the Convair; NASA's planes are staying on the ramp outside the hangar. More than 100 people are onsite for the various campaigns: ISDAC (DOE), ARCPAC (NOAA) and ARCTAS (NASA).

Friday, April 4, 2008

Weather Summary

Fairbanks: Mild, partly cloudy, daytime temps in the 30s °F.

Barrow: Complicated cloud system in vicinity, temps in the single digits °F.

Commentary

The Convair took off at 9:30am and arrived at the first science waypoint south of the Barrow site around 10:30am. Cloud conditions were variable and complex, with lots of mixed-phase cloud layers, making it difficult to stay with one layer during the prescribed "box pattern" flight legs. Hans Verlinde, NSA Site Scientist, noted that these conditions are typical at this time of year, so these data are quite valuable from a statistics perspective. The crew also observed a notable difference in cloud properties over the ocean versus over land. This flight was coordinated with NASA's King Air B200, which obtained additional aerosol measurements around 10 km; these measurements will be a valuable addition to the ISDAC data set.

After about 2 hours of data collection, the Convair landed in Barrow to refuel, giving the crew a needed break. For the second flight, they changed the pattern to straight legs, with one end of the line at Barrow and the other end over the water. The shorter cycles were better suited to keeping up with quickly evolving conditions. They spiraled up to the top of the lower cloud layer (about 10,000 ft) and porpoised between the points. The onboard instrument team noted that both drop and aerosol concentration increased with altitude.

During the flight debrief, Alexei Korolev gave an excellent narration of the many photos he took during the days flights, which helped put the flight data into perspective. In describing the large

changes in cloud microphysical and aerosol composition, in particular noting six separate liquid layers in the clouds, he said he'd never encountered anything quite like it.

Total flight time: 8.9 hours.

Saturday, April 5, 2008

Weather Summary

Fairbanks: Light snow and wind, daytime temps in the teens °F.

Barrow: Localized snow storm, light winds, daytime temps in the upper 20s °F

Commentary

Another fly-day, with conditions in Barrow much like yesterday. On the ground at the ACRF site in Barrow, Ismail Gultepe from Environment Canada reported observing two cloud systems; one over the ocean with two layers, and a cloud deck over the ground site. Snow started heavily shortly after noon and continued the rest of the day. His guest instruments (17 of them) are operating normally, except for the ice particle counter; it is expected to arrive on Monday. The Convair took off at 9:30am from Fairbanks amid light snow flurries.

The flight team characterized the west side of Barrow and did spiral over Barrow, then flew a residual run to the west of Barrow. Total water content of clouds ranged from 0.2 -0.4 g/m³, and they found no liquid water layers; mainly deep glaciated clouds.

The second flight consisted primarily of spirals over the ACRF Barrow site for evaluation of ground-based remote sensing retrievals. They completed several soundings and missed approaches in deep glaciated clouds with sporadic thin liquid layers that were extremely difficult to track. High total water contents in the lower portions of the clouds.

The Convair landed in Fairbanks at 7pm local time. Total flight time: 8.8 hours

Today the Barrow community celebrated the start of the whale hunting season with a parade through town. Whale hunting holds special cultural significance to the local Inupiat population, as it represents a traditional source of food and sustenance. The AVP team consulted with the whaling captains in Barrow to make sure that flight operations would not impact their whale hunting activities.

WEEK 2: April 6, 2008 - April 12, 2008

Sunday, April 6, 2008

Weather Summary

Fairbanks: Snow flurries, daytime temps in the 20s °F.

Barrow: Fair, daytime temps in the single digits °F

Commentary

After a very busy first week of flying, today was a “hard” down day to give people a rest, meaning no hangar access or aircraft power. However, there was short science team meeting in the afternoon to meet and discuss the preliminary data collected thus far. The primary purpose of the meeting was to determine the appropriateness of the flight profiles and revisit the flight sampling strategy as necessary.

After the science team meeting, there was a short weather briefing and flight planning discussion, followed by a group dinner.

Monday, April 7, 2008

Weather Summary

Fairbanks: snow flurries in morning, partly sunny in afternoon, daytime temps in the 20s °F.

Barrow: cloudy, daytime temps in the teens °F.

Commentary

Today was a no-fly day to work on instrument calibration and testing. At the afternoon weather briefing, conditions in Barrow looked favorable for an early morning flight tomorrow.

Tuesday, April 8, 2008

Weather Summary

Fairbanks: morning snow flurries clearing to partly sunny, daytime temps in the 30s °F.

Barrow: cloudy, snow flurries, temps in the single digits° F.

Commentary

Convair Strikes Gold in Alaska!

Today turned into the first official “golden day” for the campaign thus far in terms of examining cloud/aerosol interactions. The Convair completed three separate science flights above, within, and below a single mixed-phase cloud layer near Barrow. Today’s flights resulted in an extensive set of data that gives the complete vertical picture of what is happening in, above and below cloud.

Based on the good conditions forecasted by the Penn State team of Hans Verlinde and Chad Bahmann, the flight planning team decided to go for a 7am takeoff – a little earlier than past flight days – to arrive in the Barrow area at the optimum time. During transit from Fairbanks to Barrow the Convair encountered a solid stratus deck with a “glory” on top indicative of liquid droplets. After a spiral over Barrow, the plane worked a line between two points (A-B), flying legs above cloud top, then a residual leg beneath the cloud, an aerosol leg beneath the cloud and then a leg porpoising from cloud top to cloud base before landing in Barrow. Because of

the good conditions, a decision was made to fly a 4 hour-mission to continue sampling the cloud, rather than complete only 2 more hours and returning to Fairbanks.

The second flight continued working the same cloud deck (which went from horizon to horizon), but the total length of the A-B line was reduced from 100 to 75 miles. Lines were flown above cloud, below cloud looking for residues, and then at constant altitude within the cloud. These legs were followed by an aerosol leg below cloud, an in-cloud run, and spirals over the ACRF Barrow site. Finally, there was still time for another above-cloud run, a porpoising run, an in-cloud run, and a residual run underneath cloud before landing again in Barrow. The crew then transited home to Fairbanks, landing around 6pm local time. Total flight time: ~10 hours. At the Barrow site, Ismail Gultepe reported morning temperatures around 5F, with light snow and ice fog in the area, with frost on the instruments. All his instruments worked fine, and during the morning Convair flights, he observed heavy precipitation including large snow flakes, and small particles.

Education and Outreach: This morning Greg McFarquhar participated in an International Polar Year (IPY) Pole-to-Pole video conference and web chat at the University of Alaska Fairbanks (UAF). This videoconference was part of the Global Learning and Observations to Benefit the Environment (GLOBE) Program, which brings together students, teachers, and scientists to talk about climate change. Greg and faculty from the University were joined by area middle and high school students, as well as students from the Alaskan native school of Innoko River. The group at UAF connected via video-con with scientists from NCAR, national snow institute center at CSU-Boulder, and teachers from Ushuaia (Argentina) and the Argentine GLOBE school, Escuela Provincial No. 38, in Esperanza, Antarctica.

Greg talked about why we need to understand clouds as part of climate change puzzle, and along with the other experts, answered student questions about changing weather and explaining the difference between weather and climate. They also talked about projects to observe climate change in their life, such as recording temperature, snowfall and permafrost levels to compare against historical records. Many of the students seemed concerned about how their snowboarding and skiing season might be impacted by climate change. However, Greg noted that near the end of the conference, one of the native Alaskan teenagers commented that climate change was affecting his entire way of life.

The GLOBE Program began on Earth Day in 1995, with the goal of encouraging students to become involved in climate change research locally and to collaborate with others globally. The Esperanza Base Station in Antarctica is heavily involved in IPY science and education activities.



The Convair stops in snowy Barrow to refuel between the first and second flights on April 8



A distinct stratus deck on April 8.



Several layers of Arctic haze were detected on April 8.



A beautiful sunrise takeoff in Fairbanks led to an excellent day of science flights around Barrow.

Wednesday, April 9, 2008

Weather Summary

N/A

Commentary

Today was a no-fly day for the team to recover and work on instruments and data after yesterday's long but productive day.

Thursday, April 10, 2008

Weather Summary

Fairbanks: Snowing, temps in the teens °F

Barrow: Ice fog in morning with visibility around 500 feet and temps around -4 °F; clearing in afternoon.

Commentary

The flight planning team decided to scrub today's mission due to dissipating clouds in the Barrow area, Low visibility due to ice fog, and suboptimal conditions during the A-train satellite overpass. Although the freezing frost caused some of the guest instruments at Barrow to stop operating in the morning, an excellent data set was obtained thanks to redundancy built into the instrument suite.

Two instruments measured ice crystals with sizes less than 35 microns. With the absence of large ice crystals and calm conditions, ice crystal number concentrations were on the order of about 10-20 per cubic centimeter. This is a perfect data set for analysis of ice crystal nucleation and ice fog formation. In fact, according to Ismail Gultepe, "this is the first time ice fog has been documented at this level, that I know of."

All photos for this entry provided by Ismail Gultepe.



Frost gathers on the all-weather sensor, which measures precipitation amounts and extinction (visibility).



The sun readies to dip below the horizon off the coast near Barrow.



Through the fog at Barrow, the ACRF site instruments are seen on the right, and the guest instrument suite from Environment Canada on the left. These instruments differ from ACRF instruments primarily in their focus on small ice crystal particles, aerosols, a broader particle range, and extinction (visibility).

Friday, April 11, 2008

Weather Summary

N/A

Commentary

Another ice-fog day in Barrow, with lots of frost on instruments but operating without problems.

Due to the unappealing conditions for landing in Barrow, today was another no-fly day, so the science team spent most of the day preparing for another science meeting. After the daily weather briefing and flight planning discussion, the team held their second science meeting of the campaign. At this meeting, eleven ISDAC instrument leads presented preliminary data and analyses from the April 8 Golden Day flight. The primary purpose of this meeting was to address: 1) how these data will help understanding of cloud/aerosol interactions; and 2) whether the flight profiles are adequate for instruments and for meeting the science goals of ISDAC. The team will use discussions from this meeting as a basis for starting their investigations of the cloud/aerosol interactions occurring on this day. Several NOAA and NASA colleagues attended the meeting.

Saturday, April 12, 2008

Weather Summary

Fairbanks: sunny, daytime temps in the 30s °F

Barrow: cloudy

Commentary

Today is the 4th day in row with ice fog in Barrow.

With a forecast for tomorrow looking like ideal conditions for a long flight day, the team was given the day off until the daily weather briefing. However, Greg McFarquhar, Lynne Roeder, and Debbie Ronfeld spent the day at “Science Potpourri.” This annual science fair for the general public is held at the University of Alaska at Fairbanks, and features hands on experiments and demonstrations of various earth sciences. The event was sponsored by EPSCoR, AAAS Arctic Division, Sigma Xi Alaska Chapter, American Chemical Society Alaska Section, and the Alaska Statewide High School Science Symposium.

Greg, assisted by Debbie, conducted two experiments throughout the day – “measuring a raindrop” and “cloud in a cup” – which intrigued both kids and adults. He related the history of droplet measurement techniques from yesterday versus today’s advanced probes and sensors. Meanwhile, Lynne talked with parents and teachers who were enthusiastic to discover ACRF’s “Climate Change: Science and Traditional Knowledge” DVD, as well as the educational resources available at education.arm.gov. Traffic was steady throughout the day, with several hundred kids and adults passing through.

WEEK 3: April 13, 2008 - April 19, 2008

Sunday, April 13, 2008

Weather Summary

N/A

Commentary

N/A

Monday, April 14, 2008

Weather Summary

Fairbanks: snowy, temps in the 30s °F

Barrow: cloudy

Commentary

Two research flights were completed today in somewhat similar conditions as yesterday – both much different than the “golden case” on April 8. Once the Convair reached the Barrow area, it spiraled down from transit altitude and completed six 50-mile horizontal legs at three different altitudes (12, 14, 16 kft) above the ACRF site. Alexei Korolev noted that the clouds were optically thin, but the ice water content seemed pretty high. After landing in Barrow to refuel, the aircraft spiraled back up into the clouds and resumed horizontal sampling, but reduced the length of the legs to 25 miles each. Aerosol layers were sampled on the transit back to Fairbanks. Through today, a total of 51.3 research hours have been flown.

While the Convair crew was in the air, several ISDAC team members on the ground took part in a joint media day with NASA and NOAA. Local and regional news outlets attended, as well as aides for Alaska Senator Ted Stevens and Congressman Don Young. Greg McFarquhar joined other key speakers at the University of Alaska at Fairbanks to provide overviews of the various campaigns and answer questions. After the panel briefings, the media and guests came down to the hangar to tour the aircraft and conduct additional interviews.

Tuesday, April 15, 2008

Weather Summary

Fairbanks: Partly sunny, daytime temps in the 20s °F

Barrow: temps around -5 °F

Commentary

Today's flight was cancelled due to insufficient clouds and no strong aerosol signature. The team spent the day working with their instruments on the aircraft and reviewing data from the past few research flights.

Wednesday, April 16, 2008

Weather Summary

N/A

Commentary

Today was a down day, as the aerosol layer expected to the northeast of Fairbanks did not materialize, so the team spent the day working in the hangar on aircraft instrumentation and checking data.

The afternoon weather briefing indicated an extremely thick haze arriving early Friday morning and persisting for several days, so the team is looking forward to upcoming science flights in deep clouds and aerosols.

Thursday, April 17, 2008

Weather Summary

N/A

Commentary

Another no-fly day due to suboptimal conditions allowed the team to prepare for an anticipated long flight day tomorrow and possibly Saturday as well.

Friday, April 18, 2008

Weather Summary

N/A

Commentary

Three research flights completed today, with another classic ISDAC case measured on the first flight. A mixed layer-cloud was sampled between 3 to 4 km, representing an outstanding example of low-level stratocumulus clouds with freezing precipitation. Dirty layers were also sampled around 4 km and near the surface. The aircraft heavily worked this system before landing in Barrow to refuel for the second flight.

While on the ground at Barrow, the cloud system drifted to the east. After take-off, the Convair worked legs below, above, and within the cloud which had by this time begun to thin and break up. Survey flights both inland and over the ice did not locate precipitating clouds of interest before landing again in Barrow to refuel again.

After takeoff from Barrow for the third flight, the Convair completed spiral ascents and descents measuring vertical profiles over the ARM site. On transit to Fairbanks, cirrus clouds were encountered and sampled with particle imagers. Initial examination of ice crystal images appeared to show a bi-modal distribution with a large number of very small crystals as well as a population of larger agglomerations.

Saturday, April 19, 2008

Weather Summary

N/A

Commentary

Today was another successful fly day, with the Convair taking off from Fairbanks around noon and completing a coordinated flight with the NASA B200. They sampled very distinct aerosol layers at four different altitudes along the Calipso satellite path around 2:25pm local time, then landed in Barrow around 3:30pm to refuel.

The second flight of the day was an hour-long aerosol and cloud intercomparison with the NOAA P-3. Finally, the Convair team flew above, below and within a liquid layer with very high concentrations (up to 500 per cc) for a droplet closure study. The crew landed in Barrow around 8:30pm.

The weather at Barrow changed drastically throughout the day, according to Ismail Gultepe on the ground there. He observed a very distinct polluted haze layer north of Deadhorse-Barrow in the morning, with clouds becoming thinner over Barrow. About 2 pm, clouds became much thicker over the ocean and west of Barrow. Then, at about 6:30pm, the skies cleared amid strong winds, followed about an hour later with prevalent clouds becoming thicker as the evening wore on, with sustained winds.

From these observations, Ismail noted distinct differences in local weather between coastal Barrow and inland Fairbanks, with diurnal effects and open water playing an important role in cloud formation.

WEEK 4: April 20, 2008 - April 26, 2008

Sunday, April 20, 2008

Weather Summary

N/A

Commentary

After two long and successful days of research flights, today was a hard down day, meaning no aircraft access. The only required activity was a weather briefing in the afternoon for the flight planning team; attendance by others was optional.

Monday, April 21, 2008

Weather Summary

N/A

Commentary

Today's planned flight was scrubbed due to the eroding cloud deck over Barrow and warm air moving into the lower levels of the atmosphere in the afternoon. These conditions are not optimum for meeting ISDAC science objectives.

At Barrow, Ismael Gultepe observed persistent clouds over both open water and land, and the sun was rarely visible. He said the clouds were not as thick as indicated by the radar, and that the lidar images were likely more representative of the real conditions. He observed two layers;

one very close to the surface and other one above it and much thicker. He also noted strong surface winds (~8-10 m s⁻¹) with blowing snow, and while driving to the site he saw many particles being airlifted.

Tuesday, April 22, 2008

Weather Summary

N/A

Commentary

The flight planning team called a no-fly day due to complex cloud patterns over the Barrow area that were not conducive to ISDAC science questions.

At Barrow, Ismail Gultepe reported that blowing snow caused road closures, and increasing winds necessitated the early departure of the ground team from the site instrument shelters after archiving their data. Lidar and radar cross-sections showed a very low, high reflectivity layer from the blowing snow.

Visibility was less than 1 km in places, with 85% relative humidity. Ice crystals from the surface lifted up at least 100 m, and to the untrained eye could look like ice fog, but was indeed airlifted ice crystals.

Wednesday, April 23, 2008

Weather Summary

Fairbanks – daytime temps in the 50s °F

Barrow – daytime temps in the upper teens °F

Commentary

From the ground at Barrow, Ismail Gultepe reported a dark, thick cloud layer over the ocean and slightly improved visibility in the morning. Toward the afternoon the winds calmed and the sun came out. He also noted low-level saturation over the ocean and clearing skies above Barrow. Today's planned flight was scrubbed due to these clearing conditions.

Mengistu Wolde provided an update on research flight hours completed by the NRC-Convair thus far: 70.4.

Thursday, April 24, 2008

Weather Summary

N/A

Commentary

Today's conditions resulted in three good flights, with the NRC-Convair taking off at 9:15am and landing around 10pm – still some daylight in Fairbanks! The aircraft arrived in Barrow around 11am and worked a north-south line parallel to the ambient wind to look at aerosols/residuals above/below cloud and cloud properties within. Cloud tops were about 12 kft, and during the residual runs, total ice and water contents were between .1 and .15 g/m³.

After taking off from Barrow for the second flight, the NRC-Convair climbed to 15 kft, where an expansive cloud was visible to the east. The aircraft completed a residual run below base, an aerosol run below base, then a run through a liquid layer, then an aerosol run above the layer, a residual between layer, and finally a spiral up through the center and one set of porpoises through the cloud. Total water contents in the ice regions reached up to .2 or .3 g/m³.

For the third and last flight of the day, the aircraft climbed to 22 kft and they could see more aerosol and a large dry layer not visible before. Runs were completed at 21, 17, and 11 kft, with precipitation dominating the final two lower legs. Alla Zelenuk reported that her SPLAT instrument identified aerosols as mostly from biomass burning with less sulfates.

Over Barrow, Ismail Gultepe observed a thick cloud system with significant amounts of liquid water. The lidar signal also suggested these conditions. He noted clouds over the ocean seemed much thicker than over land, with ice clouds above this layer.

In the early evening, the skies cleared, but visibility went down again to about 2 km toward dusk.



Thick clouds in the Barrow area extend out over the ocean.

Friday, April 25, 2008

Weather Summary

N/A

Commentary

Given tomorrow's forecast for deep precipitating cloud systems over Deadhorse and broken cloud conditions with a nice stratus deck and liquid layers (tops at -15 C) over Barrow tomorrow, the flight planning team decided to scrub today's flight. There were also a few minor instrument issues that required attention today.

At Barrow, it was very calm in the morning with no fog and no wind, and visibility about 3-5 km. Ismail Gulpepe observed clouds all over the Barrow area, with a cloud deck over the ACRF site. He noted another deck over the ocean, but had difficulty seeing a sharp cloud base.

Saturday, April 26, 2008

Weather Summary

N/A

Commentary

Two more golden cases today!

The NRC-Convair took off at 10:50am to work a stratus deck between Deadhorse and Barrow. Cleaner conditions were noted during takeoff from Fairbanks. On the way to Deadhorse, observations were made in cirrus and in a layer with slightly elevated aerosol counts. Although clear sky conditions were present over Deadhorse, there was a building layer of thicker clouds on the way to Barrow with a low pillar sun and glory evident, suggesting the clouds were mixed-phase. A series of aerosol runs above and below cloud, a residual leg below cloud, and porpoising and level legs were executed in cloud before landing at Barrow around 2:50pm. The cloud was noted to have some, but not substantial, precipitating ice beneath.

After takeoff at 3:40pm, the NRC-Convair returned to an area nearby with bright radar images indicating the presence of significant amounts of precipitating ice and visually uniform cloud tops. Based on strong echoes to the north, the Convair shifted the legs a little for the next set of legs and worked an east-west leg parallel to the wind direction. Measurements were completed for aerosols above and below cloud, residuals below cloud, and straight-line legs and porpoising maneuvers through the cloud. In general, these flights could be described as additional "golden" case studies in a cleaner environment than seen on previous days.

The third flight of the day was a transit back to Fairbanks, landing around 10pm.

According Ismail Gulpepe, the weather over Barrow changed quickly today. At about 9 am, the sun was out most of the time with some clouds and fog over the ocean. At 12am, the sky was

almost completely clear except for thin layers over the ocean and east of Barrow. At 4:30pm, the sky above Barrow was cloud covered, possibly a diurnal effect of cloud formation, and thick clouds were over the ocean and east of the Barrow Airport.

WEEK 5: April 27, 2008 - April 30, 2008

Sunday, April 27, 2008

Weather Summary

N/A

Commentary

After yesterday's long day, today was a short day to review data and work on instruments.

At Barrow, Ismail Gultepe reported a new weather event affecting the area; cloudy, with a mix of blowing snow and precipitation, primarily small ice crystals (columns and some dendrites). Visibility was less than 2 km, as indicated on the Lidar and radar, and particle sizes at the surface were less than 1000 micron. The small ice particles and northeasterly flow (clean air) over the area presented an interesting case, as satellite images showed a low pressure system just east of Barrow and moving slowly in a northwesterly direction.

Monday, April 28, 2008

Weather Summary

Weather conditions in Barrow today were much like yesterday, with similar clouds over the ocean. Over land, clouds were thin, with no precipitation.

Commentary

At Barrow, Ismail Gultepe reported an accumulation of 2.5 inch snow during the night, and continued small snow/ice particles at the site, primarily dendrites with some small columns, at a precipitation rate <0.5 mm per hour. Most of the precipitation sensors missed the ice crystals.

The NRC-Convair took off at 11:30am through a precipitating stratocumulus layer. Once in the Barrow area, the aircraft descended below cloud to 3000 ft, and did some porpoising through cloud in a north-south oriented line in an attempt to identify the optimum cloud layer and location to fly during the CloudSat overpass. On the original planned line for the overpass coordination, radar returns showed low reflectivity with some ice particles, but it was predominantly a liquid cloud. During the last climb through cloud, the team observed three interesting layers, with a top layer having median volume diameters (MVD) of 10 microns and a second layer with 15 microns MVD.

Because the cloud at the southern edge of the planned line was dissipating, they focused instead on the cloud well north of Barrow, porpoising up and down to measure the characteristics of the precipitating cloud layer. During the CloudSat overpass, the down-looking W-band radar image was dominated by water but there were enough ice particles to create a reflectivity return, presenting an interesting case to evaluate the performance of CloudSat retrieval algorithms. In the remaining flight time, the team did another porpoise to the north after measuring the structure of the cloud deck and precipitation. During the spiral descent from 15,000 ft into Barrow, the team saw a high condensation nuclei layer with almost no counts on the PCASP, indicating fresh emissions. This flight was a golden case from the perspective of the CloudSat validation. The probes picked up a little ice, but not much compared to some other missions.

After takeoff for the second research flight, the team scanned the view above the stratus deck, noting variable cloud tops and low cloud bases. Air traffic control problems and the low cloud bases prevented the completion of the original plan, which was to fly racetracks around the Barrow site in and below cloud, with a low-level leg over the ocean to measure aerosols over the open water. After one attempt at the racetrack pattern, some echoes were noted at 10,000 ft, but ascending to that altitude, only sparse clouds were found. A spiral was then conducted over the Barrow site for ground-based remote sensing validation, and at that time the clouds over Barrow started to thicken. The cloud base was below the minimum flight altitude of 1600 ft, with liquid water contents of about 0.2 g/m³ with maximums near 0.4 g/m³ at the top of the cloud. Three more spirals around Barrow showed ice water contents of up to 0.15 g/m³ falling into the liquid layer from the ice cloud above.

Reluctantly leaving the area due to time constraints, the aircraft spiraled up to transit altitude. The team noted clouds over Barrow topping at around 12,000 ft, with variations in brightness in different parts of the spiral. On the way back to Fairbanks, a haze layer began at about 23,000 feet. The plane landed in Fairbanks around 8:30pm.

Tuesday, April 29, 2008

Weather Summary

Barrow: -2°F

Commentary

Tomorrow looks like a higher probability for a deep ice cloud, so the flight planning team decided to scrub today's planned flight.

From Barrow, Ismail Gultepe reported a cold high pressure system with cold temperatures and clean airmass (aerosol number concentration <30 cubic centimeters, compared to <50-70 cubic centimeters) over the Barrow area. Other than some patchy clouds, the sun was out most of the day. Relative humidity was about 85 percent, with northwesterly winds at 4 meters per second. He also noted very visible diamond dust reflected in the sky at about noon. It resulted

in 0.02 millimeters per hour precipitation and sizes less than 200-300 microns with ice crystal number concentration $<0.2-0.5$ cubic centimeters.

Wednesday, April 30, 2008

Weather Summary

Barrow temps around 12°F.

Commentary

At Barrow, the day started with low-level stratiform clouds with ice fog and small snowflakes in dendrites and hexagonal shapes. Relative humidity was around 80%, and visibility between 7-10 km. At 10:30am, ice crystal number concentration was measured at 3 cubic centimeters, and aerosol number concentration at 70 cubic centimeters.

The NRC-Convair took off around 9:30am for a local flight, targeting an area about 10 nautical miles to the northwest of Nenana. Total flight time was a little less than 2.5 hours, using the last of the allotted research flight hours for the campaign. Shortly after landing back in Fairbanks, the aircraft began its journey home to Ottawa, Canada.

Mission complete!



From left to right, Mike Earle, Andy Glen, Cathy Burgdorf, Sarah Brooks, Alexei Korolev, and Debbie Ronfeld watch as the NRC-Convair heads for home. Photo credit: Jason Tomlinson.