

Sustaining Arctic Observing Networks SAON

Atmosphere Breakout Group

Stockholm, Sweden

November 12 – 14, 2007

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- **What role does the atmosphere play in the reduction of sea ice?**
 - **Causes**
 - Changes in wind
 - Arctic / North Atlantic Oscillation
 - Feedbacks (e.g., ice albedo, heat transfer through the ice) act to maintain the current state of the ice
 - Low stratus warming
 - A lot we don't know
 - **Recommendations**
 - **Develop a comprehensive cross-disciplinary science plan (e.g., ISAC), including human & social dimensions, that includes the following:**
 - Boundary Layer Studies
 - Assess radiation balance
 - Cloud climatologies (satellites, radar/lidar pairs)
 - SHEBA II – to validate long-term measurements such as satellite measurements
 - Reanalysis projects – with an emphasis on polar regions
 - Deploy more buoys on Russian side of the Arctic Ocean (anomalous winds advect buoys away)
 - Maintain and expand current land-based radiosonde network
 - Support Unmanned Aircraft Systems (UAS) dropsondes
 - Investigate and develop instrumentation that can be deployed on UAS
 - Initiate routine radiosonde launches from ice breakers, ice camps
 - Identify a process whereby new, short-term measurements should become established long-term measurements
 - **Perform Observing System Simulation Experiments (OSSE) for network design, to test the value of potential observations**
 - **Ensure intensive sites have uniform measurements that are long-term, well-maintained, with easily accessible data (funding commitments)**
 - Establish inland intensive site, preferably in Russia, flat terrain (capture continental influence)


Our Charge...

With regard to atmospheric observations...

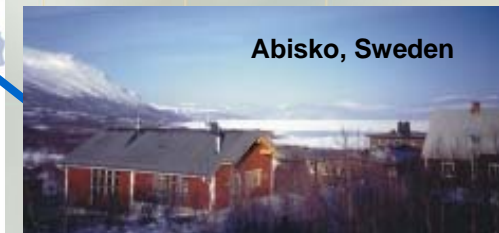
- **Are current Arctic observing and data and information management activities sufficient to meet users' needs?**
- **What Arctic observing sites, systems, and networks (activities) currently exist?**
- **What spatial, temporal and disciplinary gaps exist?**
- **Contribute to written report**

Users' Needs – the Broad Perspective

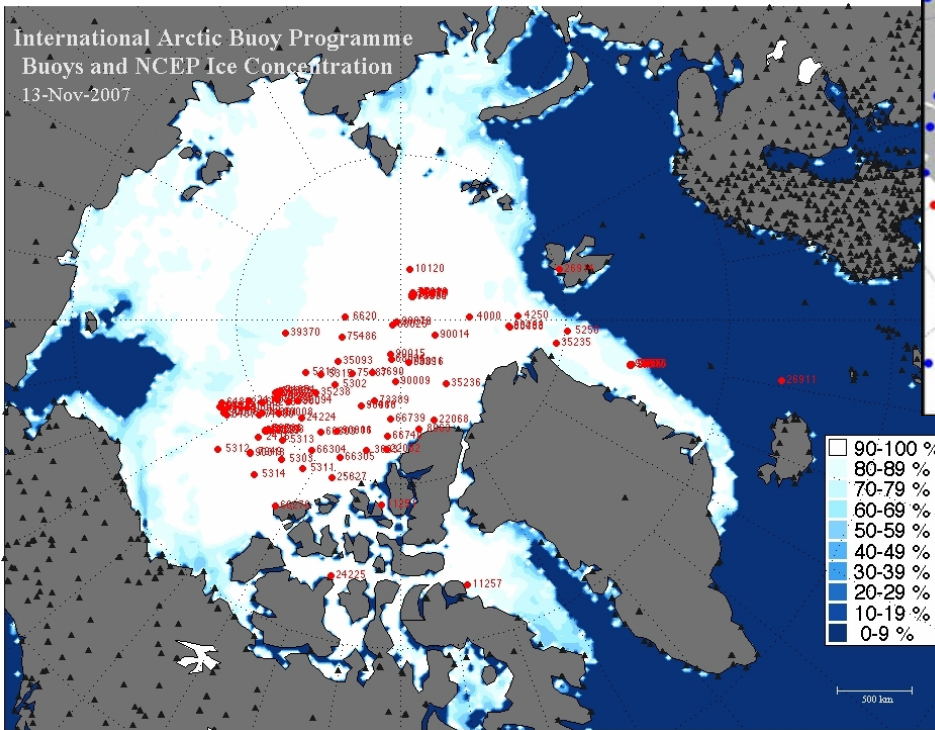
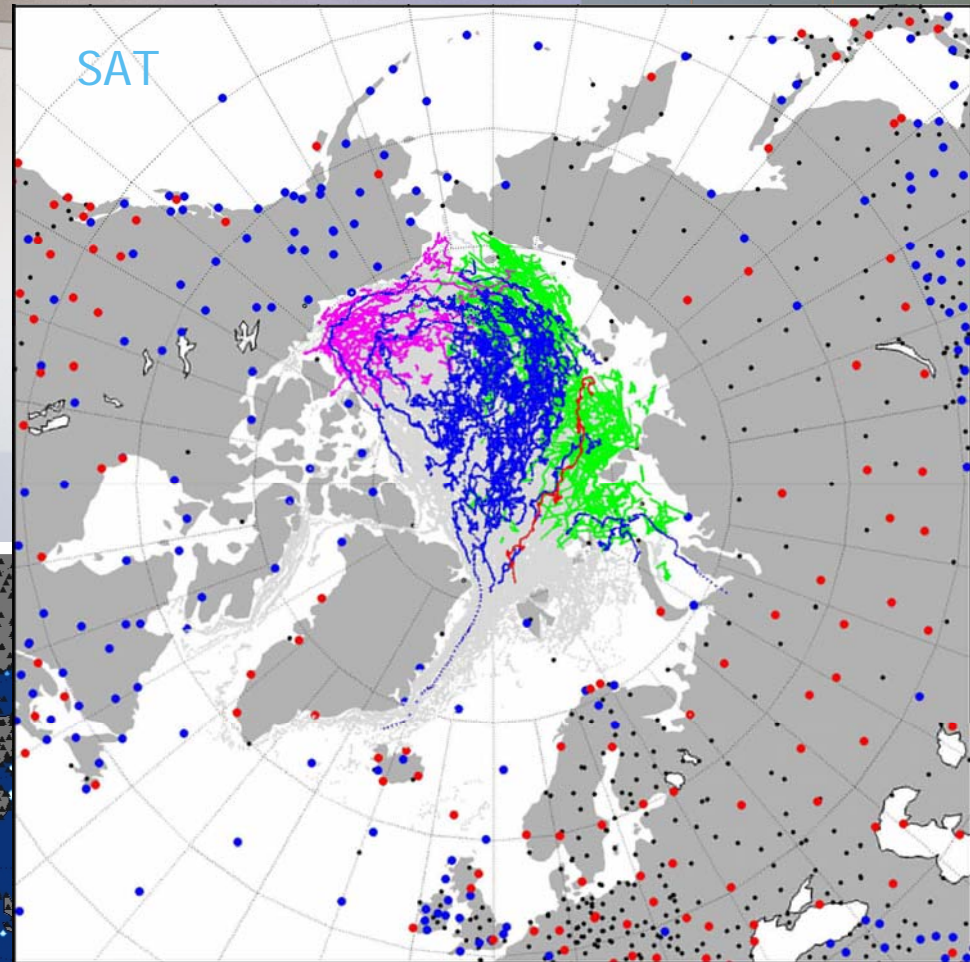
- Answer is user-dependant (wx forecasters, researchers (process studies & modelers), local communities)
- Enhance circumpolar, sophisticated intensive sites
 - Ensure intensive sites are long-term, well-maintained
 - Ensure current intensive sites have uniform measurements
 - Add one more intensive site in Russia
 - Data from intensive sites should be easily available; consolidate for each site
- Use radiosondes and meteorological stations to spatially supplement intensive sites; Can we access industry data for supplementation?
- Address spatial gaps: Arctic Ocean, Russia
 - Integrate and validate satellite data; UAS dropsondes; sonde launches in central Arctic (ice breaker and ice camps; FedEx dropsondes?)
- Identify when newer, short-term measurements should be converted to long-term measurements

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- **Sea Ice**
 - **Carbon**
 - **Food**
 - Pollutant transport
 - Changes in growing season
 - Whaling practices change due to wind changes

Atmospheric Arctic Observing Sites



Atmospheric Arctic Observing Sites



Atmospheric Arctic Measurements Table – What we might consider...

- **Which items in red are critical gaps in Arctic atmospheric measurements?**
- **Are there items that absolutely should exist at all 8 stations?**
- **Are there critical measurements or instruments missing from this chart?**
- **Are there other stations with year-round permanent atmospheric measurements?**
- **What about satellites, Unmanned Aircraft Systems (UAS), and ice breakers?**
- **Please, I invite you to find my mistakes on this chart and inform me!
(lisa.darby@noaa.gov)**

Atmospheric Arctic Measurements Table

Measurement or instrument	Abisko, Sweden	Alert, Canada	Barrow, U.S.A.	Eureka, Canada	Ny-Ålesund, Norway	Pallas/Sodankylä (plus others), Finland	Summit, Greenland	Tiksi, Russia
Meteorology – surface (T, Td, P, Ws, Wd)	Y	Y	Y	Y	Y	Y	Y	Y
Meteorology - upper air		Y	Y	Y	Y	Y		Y
Precipitation	Y	Y	Y	Y	Y	Y	Y	Y
Snow depth	Y				Y	Y		Y
Accumulation							Y	
Micrometeorology tower				Y		Y		
Surface energy balance		Y		Y?	Y			
Aerosol – surface		Y	Y		Y	Y	Y	
Aerosol – upper air					Y	Y		

Atmospheric Arctic Measurements Table

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Radiation	Y	Y	Y	Y	Y	Y		Y
Radar wind profiler			Y					
Cloud radar			Y	Y				
Cloud lidar			Y	Y	Y			
Sky camera		Y	Y			Y		
Ceilometer			Y					
Ozone lidar				Y				
Ozone – surface		Y	Y		Y	Y	Y	Y
Ozone – upper air		Y		Y	Y	Y		

Atmospheric Arctic Measurements Table

Measurement or instrument	Abisko, Sweden	Alert, Canada	Barrow, U.S.A.	Eureka, Canada	Ny-Ålesund, Norway	Pallas/Sodankylä (plus others), Finland	Summit, Greenland	Tiksi, Russia
Total ozone		Y	Y	Y	Y	Y		
Greenhouse gases	Y	Y	Y		Y	Y	Y	
Radio nuclides		Y	Y		Y	Y	Y	
Reactive gases		Y	Y		Y	Y	Y	
Precipitation chemistry					Y	Y		
Snow chemistry							Y	
BSRN member		Y	Y		Y		Y?	
GAW member		Y	Y		Y	Y		
Evaporation	Y							
POP		Y			Y			

The IASOA mission and legacy

- The main mission of the International Arctic Systems for Observing the Atmosphere (IASOA) is coordination of atmospheric data collection at existing and newly established intensive Arctic atmospheric observatories. This effort supports the International Polar Year (www.ipy.org) but is intended to establish a continuing network consortium into the foreseeable future. Data of interest to the IASOA consortium include measurements of standard meteorology, greenhouse gases, atmospheric radiation, clouds, pollutants, chemistry, aerosols, and surface energy balances.
- These measurements support studies of Arctic climate change attribution (why things are changing), not just trends (how things are changing). IASOA is responsive to growing evidence that the earth system may be approaching environmentally critical thresholds within decadal time scales. The information from IASOA will not only enhance scientific understanding but will also support decisions by the global community regarding climate change mitigation and adaptation strategies.

Initiate a process to identify which Arctic observing sites, systems and networks currently exist

Initiate a process to identify spatial, temporal and disciplinary gaps

Identify opportunities for new observing networks to integrate into existing networks

Discuss opportunities for better coordination in order to make use of synergies and to avoid overlaps

Comment on the potential for long term funding by better meeting user needs

WEB SITES

- Unmanned Aircraft Systems
uas.noaa.gov
- IASOA
www.iasoa.org

Previous reports: Arctic Atmospheric Measurements

- <ftp://ftp.etl.noaa.gov/user/tuttal>
- Taneil has kindly posted excerpts from several documents on her ftp site for our use. Some of them resulted from breakout groups such as this one. She extracted the pages that refer to atmospheric measurements.
- We do not want to reinvent the wheel!
- Cost-effective to build on established networks

Key Points from SEARCH Implementation Plan

- **Maintenance & enhancement of standardized, calibrated, uninterrupted, and long-term monitoring networks**
- **Increased atm. meas. over Arctic Ocean from ships, ice camps, and buoys**
- **Strategically located, long-term land-based atm. meas. with sophisticated, co-located instruments**
- **Regularly scheduled unmanned aerial vehicles (UAV)**
- **Coordinated surface-satellite activities**
- **International coordination on standards for measuring practices, technologies, and data archiving**
- **Transition to long-term operational programs**

"Observatories-at-a-Glance" from www.iasoa.org

IASOA - Observatories-At-A-Glance - Mozilla Firefox

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http://iasoa.org/iasoa/index.php?option=com_content&task=view&id=85&Itemid=123

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Observatories-At-A-Glance

Welcome to the Observatories-at-a-Glance page. This page has been designed to give you a quick look at what measurements & specialized instruments are available at the IASOA observatories. For more detailed information regarding instrumentation at the individual observatories, click on the observatory's name (not all station pages are complete yet).




See web site www.iasoa.org for complete chart

"Y" means that the station does have the measurement or instrument listed in the left-hand column, to the best of our knowledge.

We welcome your comments - if you have any additions or corrections that apply to this page, please forward them to lisa.darby@noaa.gov.

Measurement or instrument	Abisko, Sweden	Alert, Canada	Barrow, U.S.A.	Cherskii, Russia	Eureka, Canada	Ny-Alesund, Norway	Pallas/Sodankylä (plus others), Finland	Summit, Greenland	Tiksi, Russia
Meteorology - surface (T, Td, P, Ws, Wd)	Y	Y	Y		Y	Y	Y	Y	Y
Meteorology - upper air		Y	Y		Y	Y	Y		
Precipitation	Y	Y	Y		Y	Y	Y	Y	Y
Snow depth	Y					Y	Y		Y
Accumulation								Y	
Micrometeorology tower					Y		Y		
Surface energy balance		Y			Y?	Y			
Aerosol - surface		Y	Y			Y	Y	Y	
Aerosol - upper air						Y	Y		



Done

start

Inbox for lisa.darby...

IASOA - Observatori...

ny-alesund managers...

Microsoft PowerPoint ...

1:39 PM

Atmospheric Arctic Measurements Table

- **"Y"** means that the station does have the measurement or instrument listed in the left-hand column, to the best of our knowledge.
- **"Y?"** means there is evidence the station may have this type of measurement or instrumentation, but have not yet confirmed
- **Red text** – fewer than 4 of 8 stations have this type of measurement or instrumentation
- **Cherskii** - long-term measurements have not yet been confirmed

Networks – from AON report

- **Arctic Monitoring and Assessment Program (AMAP)**
 - POPs, heavy metals, radioactivity, Arctic haze, petroleum hydrocarbon pollution, climate change and environmental consequences, strat. ozone depletion, effects of pollution on humans living in the Arctic
- **Danish Meteorological Institute (DMI)**
 - Denmark, Faroe Islands, Greenland – std met, global radiation and sunshine
- **EMPE**
 - sfc ozone, POPs, heavy metals, particulate matter
- **Global Climate Observing System (GCOS)**
 - Atmospheric measurements (surface and upper air)
- **Global Atmosphere Watch (GAW)**
 - Chemical parameters of the atmosphere
- **Baseline Surface Radiation Network (BSRN)**
 - Radiation, Syn. Met., Upper Air