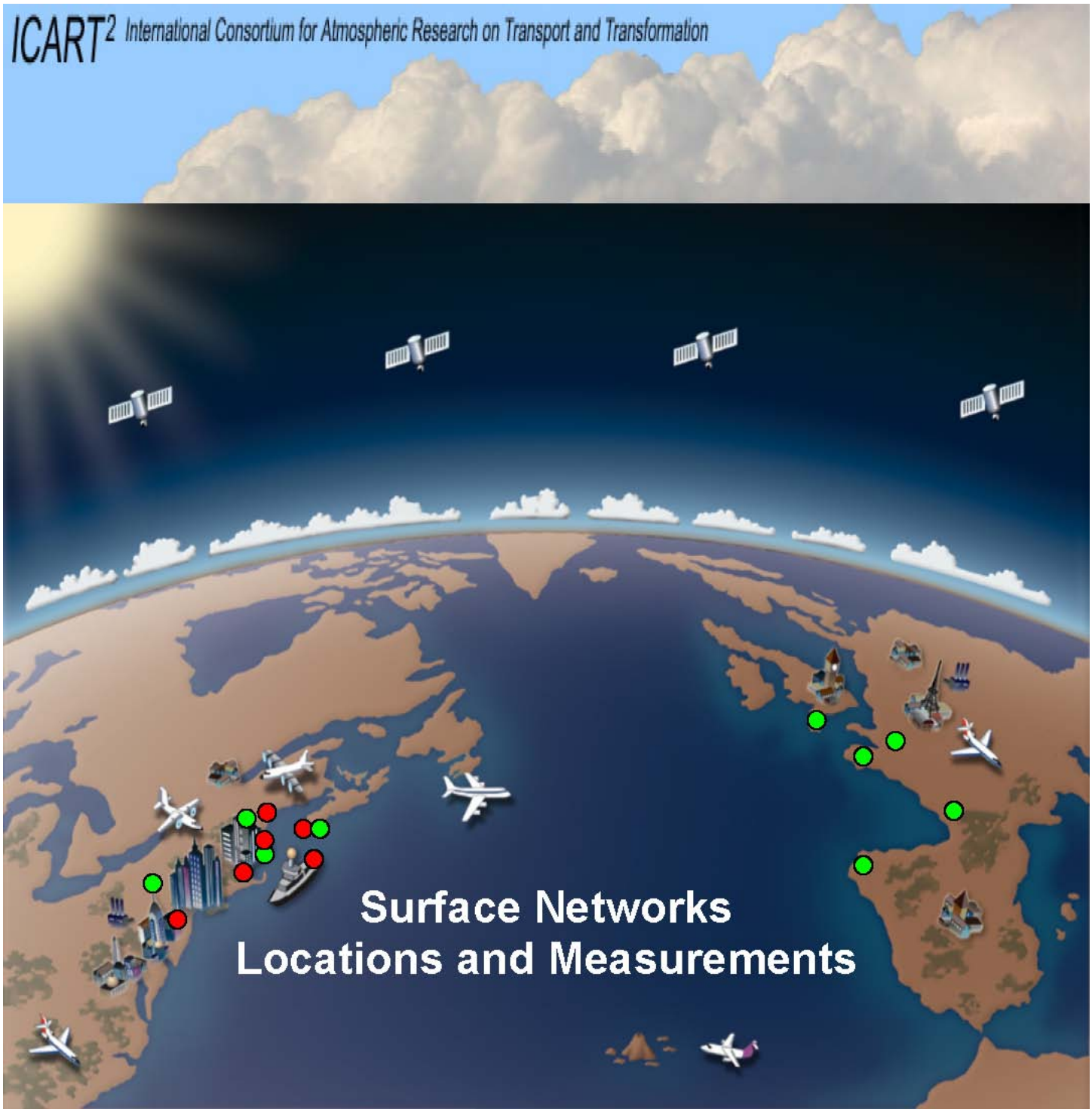

ICART2 International Consortium for Atmospheric Research on Transport and Transformation
Surface Networks
Locations and Measurements

April 2004

ICARTT Surface Networks
Locations and Measurements

The surface networks available for ICARTT will consist of permanent research and operational networks and temporary research networks that will be installed for the 2004 summer intensive. The combined measurements from these networks will provide an unprecedented characterization of key physical processes in the atmosphere over land and ocean and along the underlying surface. The networks will consist of in situ and remote sensors for measuring air chemistry and meteorology. The ICARTT Surface Networks Working Group is putting together a web site that will allow scientists to view the locations of available surface networks. We need your help by providing us with information about your surface network (please send information to allen.b.white@noaa.gov). A template is enclosed along with examples from some of the research groups that will operate surface networks during the summer intensive.

While individual web sites are listed here for access to information about surface networks and/or real-time data, we plan to have links to all of these sites from a single web site hosted by NOAA's Aeronomy Laboratory.

Template

Surface Network Name

Project name and link if available:

Network **map** and/or **table** with instrumented site locations here

Research areas:

Deployment period: (i.e., permanent or deployment period)

Measurements table with information about instruments, sampling, and PI's

Parameter	Method	Sampling Resolution (space and time)	PIs

Additional information and/or real-time data link if available

Surface Network:

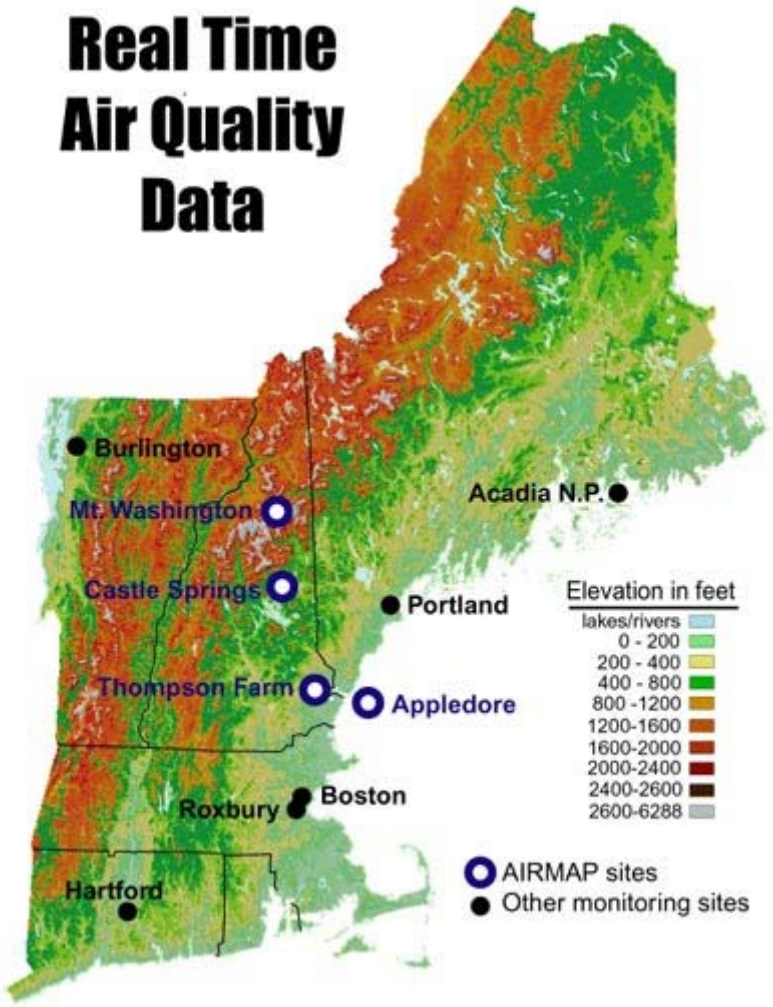
AIRMAP
MAPPING NEW ENGLAND'S CHANGING CLIMATE AND AIR QUALITY

Operated by the University of New Hampshire (R. Talbot, PI).

Web Link: http://www.airmap.unh.edu/

Real-Time Data Link: http://www.airmap.unh.edu/data/data.html?site=AIRMAPTF

Deployment period: Since spring 2001 and ongoing.



Measurements at the AIRMAP sites.

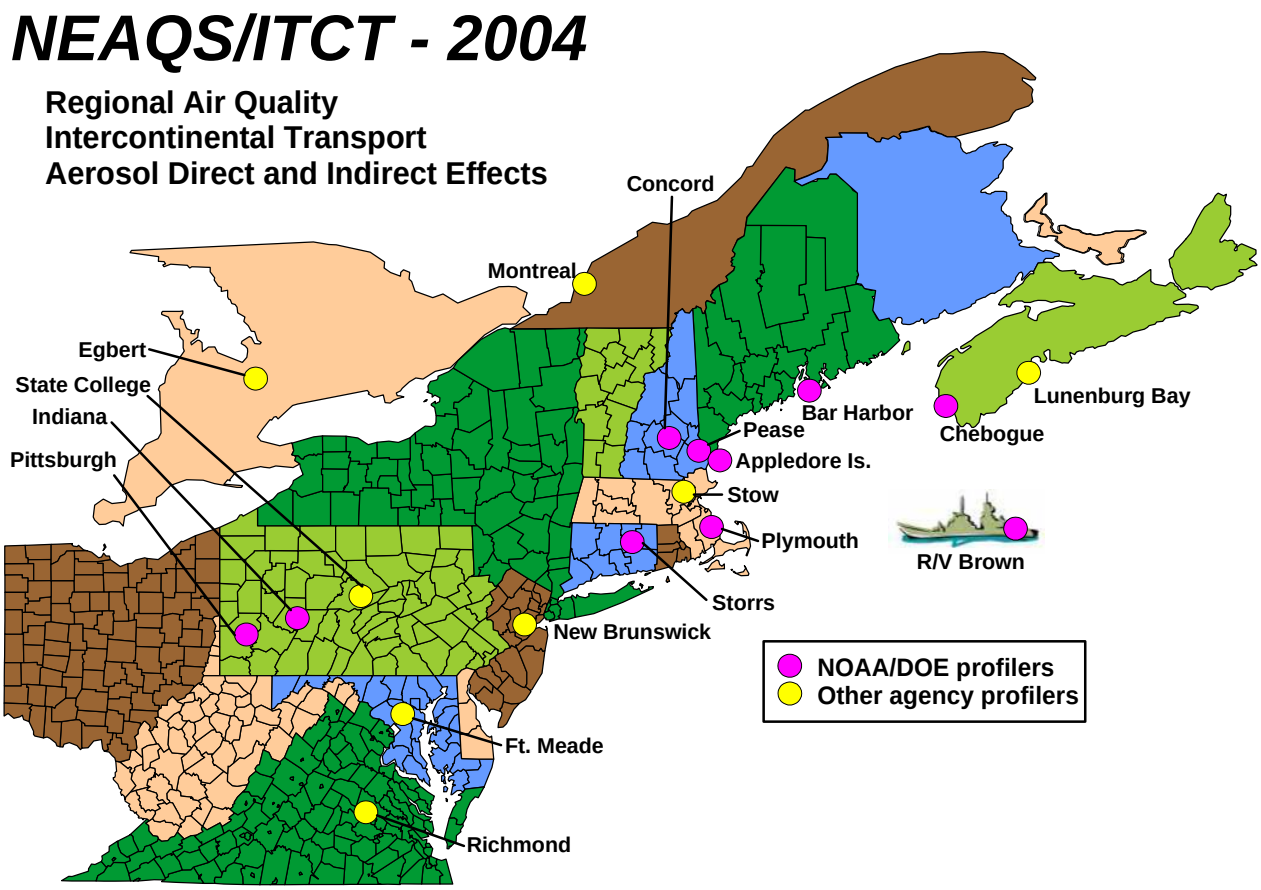
Species	Thompson Farm	Castle in the Clouds	Mount Washington
O_3	✓	✓	✓
CO	✓	✓	✓
NO	✓	✓	✓
PAN	✓		
NO_y	✓	✓	✓
SO_2	✓	✓	✓
CO_2	✓		
Hg	✓		
Hydro/Halocarbons	✓	✓	
Alkyl Nitrates	✓	✓	
JNO_2	✓	✓	✓
Bulk Aerosol Comp.	✓	✓	✓
CN	✓	✓	✓
PM2.5 Mass Conc.	✓	✓	✓
PM2.5 Scattering	✓	✓	✓
PM2.5 Absorption	✓		✓
MC/IC Aerosol Comp.	✓		

Measurement Details at the AIRMAP Sites.

Parameter	Method	Time Resolution (minutes)
Ozone (O_3)	UV Spectroscopy (254 nm)	1
Nitric Oxide (NO)	NO/O_3 Chemiluminescence	1
Nitrogen Dioxide (NO_2)	Photolysis & NO/O_3 Chemiluminescence	1
In-situ volatile organic compounds, VOCs	Proton Transfer Reaction Mass Spectrometer (PTR-MS)	10
VOCs	Real Time/Canister, GC/FID, GC-MS	1
Total Nitrogen Oxides (NO_y)	Mo Converter & NO/O_3 Chemiluminescence	1
Carbon Dioxide (CO_2)	Infrared Spectroscopy (4.26 µm)	1
Sulfur Dioxide (SO_2)	Pulsed Fluorescence	1
Carbon Monoxide (CO)	Infrared Spectroscopy (4.6 µm)	1
PAN's (PAN, PPN)	Gas Chromatography with ECD	5
Aerosol Bulk Composition	Aerosol Mass Spectrometer (AMS)	10
Condensation Nuclei Concentration (CN)	TSI 3025A Condensation Nuclei Counter	1
Mercury (Hg)	Cold Vapor Atomic Fluorescence Spectrometry (253.7 nm)	5
Sub-micron Aerosol Scattering & Backscattering (530, 550 nm)	Radiance Research & NGN Nephelometers (530 & 550 nm)	1
Sub-micron Aerosol Absorption (565 nm)	Modified Particle Soot Absorption Photometer (PSAP) (565 nm)	1
Bulk Aerosol	Ion Chromatography	1440
JNO_2 Down	Filter Radiometer	1
JNO_2 Up	Filter Radiometer	1
PM2.5	"Camms" "Pressure Drop"	60
Pressure	Capicitance	1
Temperature	Thermistor	1
Relative Humidity	Thin Film Capacitor	1
Wind Direction	Wind Vane	1
Wind Speed	Wind Cup	1

Integrated Boundary-layer Wind Profiler Observing Network

Project: NEAQS-ITCT 2004 (http://www.al.noaa.gov/2004/)



Research areas:

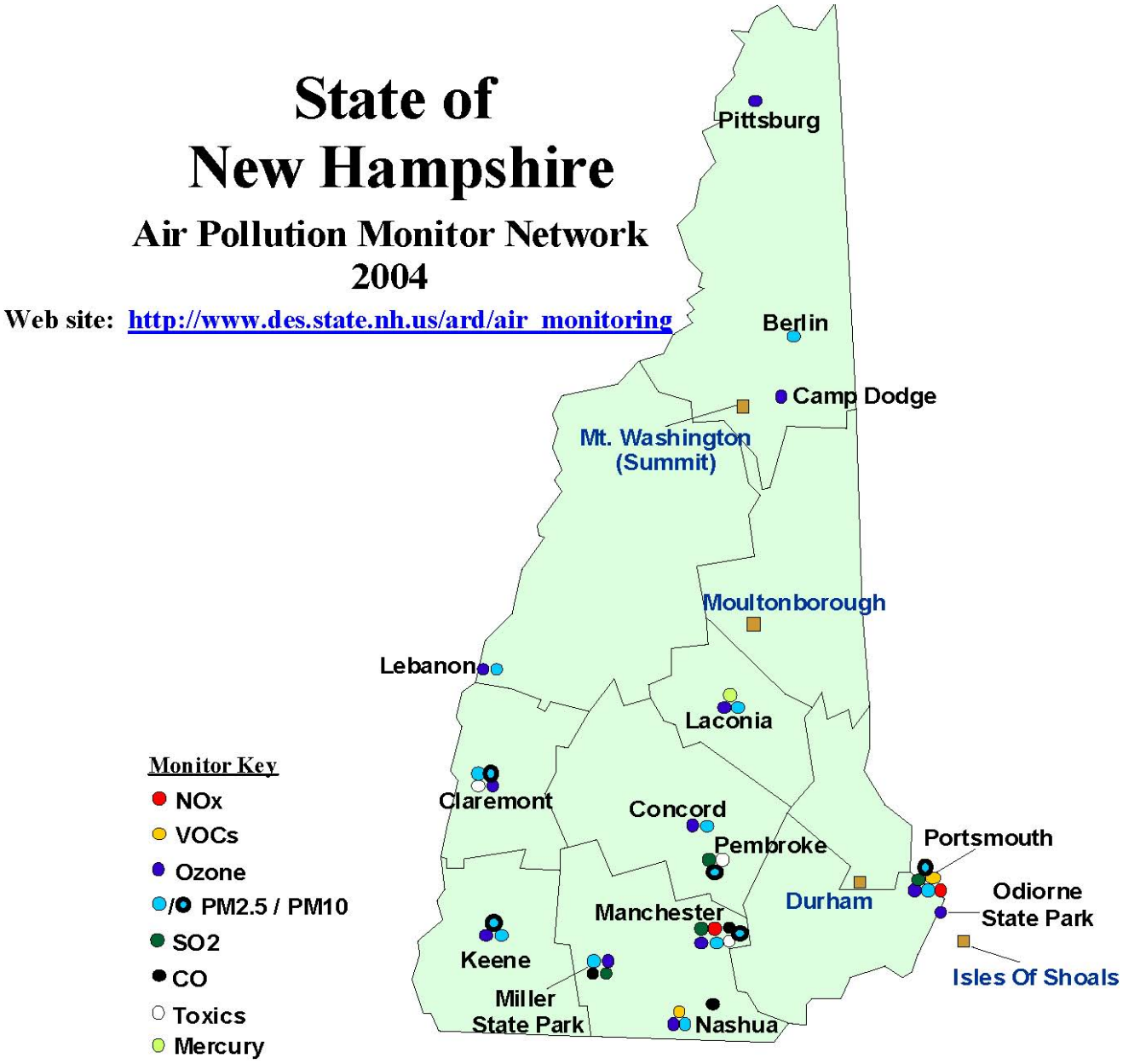
- **<u>Transport and mixing</u>**
  - *What are the main transport corridors that bring transported air pollution into the Northeastern U.S.?*
  - *How are the continental and marine boundary layers linked and how does this coupling affect the vertical distribution of pollution transported over the ocean?*
  - *Where and when is the sea-breeze/land-breeze circulation important?*
- **<u>Forecast models</u>**
  - *How well do operational and research models used for weather and air quality prediction reproduce the observed meteorology (diagnostic and operational evaluation)?*
  - *What improvements in model design and/or operation are needed to significantly improve forecast skill?*

Deployment period: July 1 – September 30, 2004

Measurements:

Parameter	Method	Sampling Resolution (space and time)	PIs
Wind profile	915-MHz Doppler wind profiler	60 or 100 m vertical resolution, hourly	NOAA (ETL, AL, FSL), DOE, Cooperative Agencies
Temperature profile	Radio Acoustic Sounding System (RASS)	100 m, hourly	ETL, AL, FSL, DOE Cooperative Agencies
Surface wind	RM Young wind monitor	@10 m, 2 min.	ETL
Pressure	Vaisala analog pressure probe	@1 m, 2 min.	ETL
Temp., r.h.	Vaisala HMP45C	@2 m, 2 min.	ETL
Solar radiation	Kipp & Zonen pyranometer	@2 m, 2 min.	ETL
Net radiation	REBS net radiometer	@2 m, 2 min.	ETL
Rainfall	Texas Electronics tipping bucket	@1 m, 2 min.	ETL

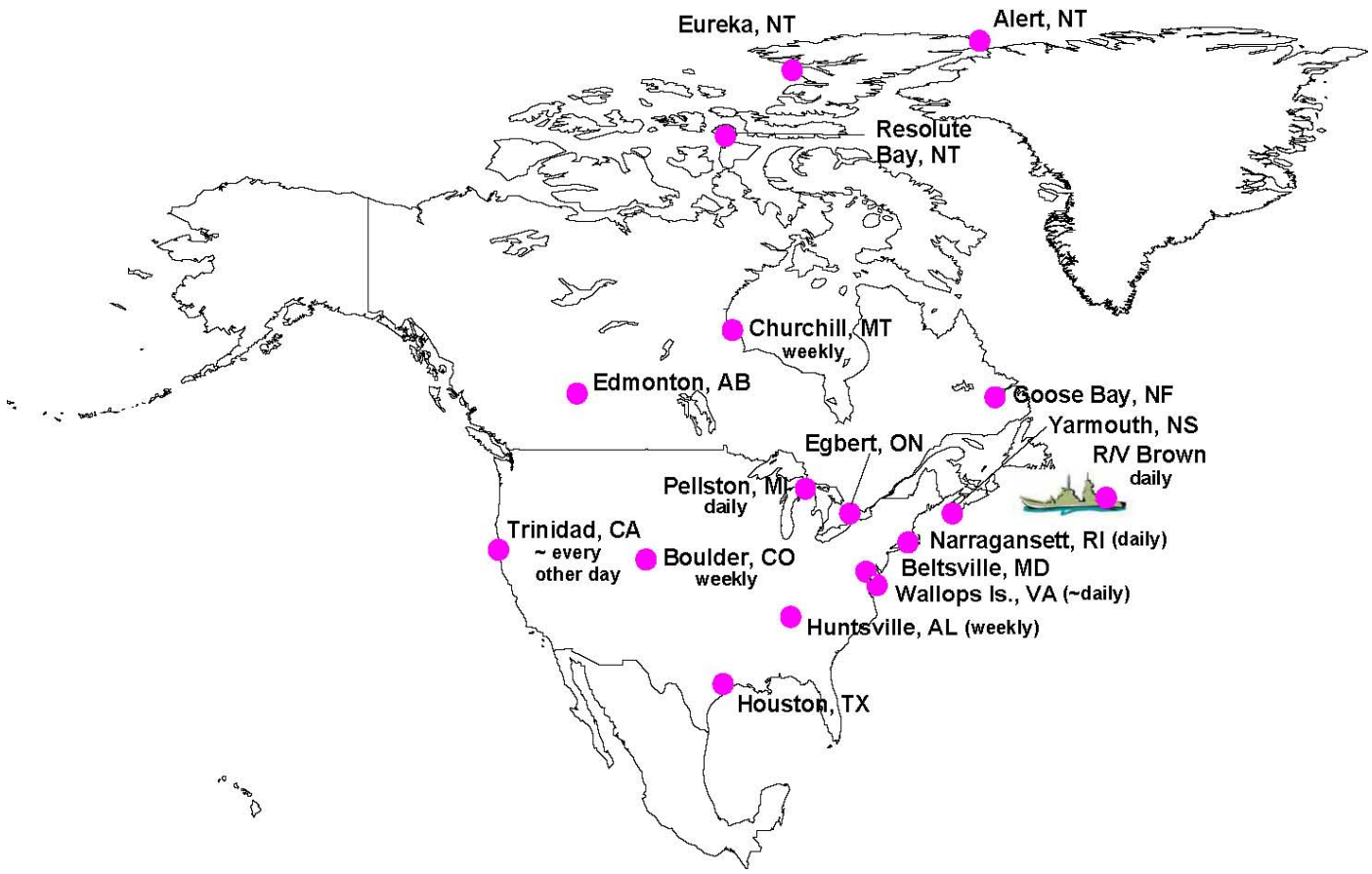
Real-time data link: http://www.etl.noaa.gov/et7/data/



Note: The monitor shown for Lebanon is proposed to be moved from the curr ent Haverhill location in 2004. The VOC's shown for Portsmouth are currently measured in Kittery, ME.

North American-North Atlantic Ozone Soundings

Project: INTEX-NA (http://cloud1.arc.nasa.gov/intex-na/)



Research Areas:

This ozonesonde network addresses the question "can ozone export be quantified from observations?" while responding to the INTEX requirement for high-quality ozone profiles. During the July-August 2004 deployment we will provide ozone sounding data to the INTEX-NA Science Team from at least nine fixed sites east of the Rockies (six US, three Canadian) and from a mobile platform, the *Research Vessel Ronald H. Brown*. The shipboard observations, part of NOAA's NEAQS-ITCT 2004, are similar to those of the Aerosols99 cruise and will take place in the Portsmouth, NH – Boston, MA – Gulf of Maine areas. Launches will be coordinated among all stations at a frequency of 3-4 times/week at some sites, daily at the remaining sites and from the ship. Turn-around of preliminary ozone profile data will be less than 24 hours, with graphical and digital posting on the web. (Data will also be available on the INTEX Project archive, as required). The approach to site configuration, website design and data distribution for the INTEX-NA ozone network follows the SHADOZ (Southern Hemisphere Additional Ozonesondes) model: <http://croc.gsfc.nasa.gov/ shadoz>. As with SHADOZ, INTEX display of ozone profiles will be enhanced with air parcel trajectories to assist in mission planning. The

data, enhanced with graphical display and forecast trajectories, will be distributed to the INTEX Science Team within 24 hours for data assimilation and flight planning purposes.

Deployment period: July 1 – August 15, 2004.

Measurements:

Parameter	Method	Sampling Resolution	PIs
Ozone profiles	ozonesonde	1-5 seconds	NASA, MSC, NOAA, Univ. Rice, Univ. Howard, Univ. Alabama-Huntsville, Univ. Rhode Is., Univ. MD-College Park, Univ. Mich.
Met. Profiles (Temperature, Pressure, Relative Humidity)	radiosonde	1-5 seconds	NASA, MSC, NOAA, Univ. Rice, Univ. Howard, Univ. Alabama-Huntsville, Univ. Rhode Is., Univ. MD-College Park, Univ. Mich.

More information and data link: (http://croc.gsfc.nasa.gov/intex)

Appledore Island Ground Site

Project: AIRMAP (http://www.airmap.unh.edu/)
NEAQS-ITCT 2004 (http://www.al.noaa.gov/2004/)

Research areas:

- Influences of halogen radicals on ozone production/destruction in polluted air along the New England east coast during summer.
- Influence of nocturnal radical chemistry, i.e. NO_3 and N_2O_5, on halogen levels.
- Role of halogens in the production and chemical evolution of aerosols over the Gulf of Maine.
- Potential implications of the outflow on the chemistry in the MBL over the Gulf of Maine.

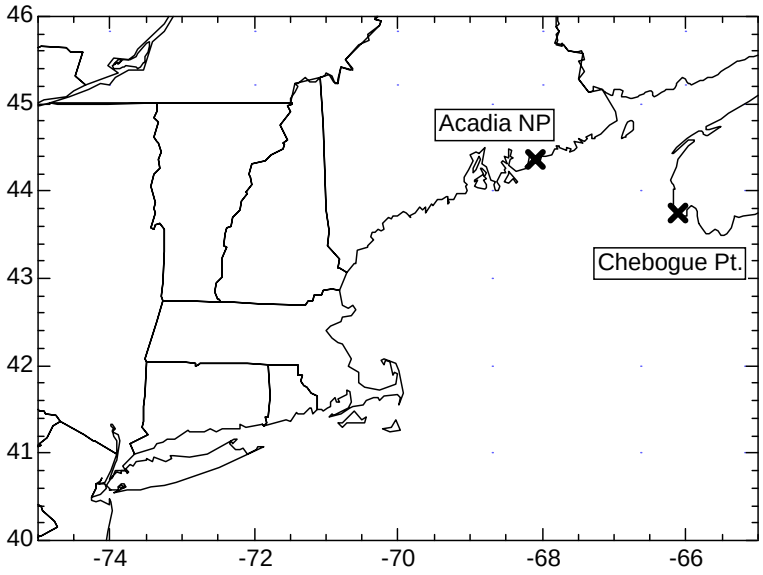
Deployment period: Equipment installation and shakedown: 28 June to 4 July.
Measurement periods 5 - 23 July and 26 July - 13 August (same as *Ron Brown* cruise legs).

Measurements:

Parameter	Method	Sampling Resolution	PIs
NO_2, HCHO, O_3, HONO, NO_3, ClO, BrO, OIO, IO	MAX-DOAS		UCLA
HCl, reactive inorganic Cl gases (Cl_2, HOCl etc.), SO_2, HNO_3, NH_3, HCOOH, CH_3COOH	Mist chambers		UVA, UNH
Total gaseous inorganic Br and I	Filter packs		UVA, UNH
C_2-C_7 hydrocarbons, halomethanes (CH_3X, CH_2X_2, CHX_3 (X = Cl, Br, I), CH_2ClI, CH_2BrI, CH_2ClBr, $CHCl_2Br$, $CHClBr_2$)	GC-FID/MS		UNH
Aerosol NO_3^-, $SO_4^=$, MSA^-, Cl^-, Br^-, $HCOO^-$, CH_3COO^-, $C_2O_4^=$, Na^+, K^+, Mg^{2+}, Ca^{2+}, NH_4^+, total Na, Cl, Br, I	Cascade impactors and bulk filters		UNH, UVA
Particle number size distributions: ~30 nm to ~800 nm, ~0.5 µm to ~20 µm, ultrafine (>3 nm)	DMA APS CN		UCSD-SIO
O_3, CO	Modified TECO		UNH
NO	B. Ridley, NCAR		UNH
Photolysis frequencies	spectroradiometer		UCLA
Wind profile	915-MHz Doppler wind profiler	60 or 100 m vertical resolution, hourly	NOAA ETL
Temperature profile	Radio Acoustic Sounding System	100 m, hourly	ETL
Surface wind	RM Young wind monitor	@10 m, 2 min.	ETL
Pressure	Vaisala analog pressure probe	@1 m, 2 min.	ETL
Temp., r.h.	Vaisala HMP45C	@2 m, 2 min.	ETL
Solar radiation	Kipp & Zonen pyranometer	@2 m, 2 min.	ETL
Net radiation	REBS net radiometer	@2 m, 2 min.	ETL
Rainfall	Texas Electronics tipping bucket	@1 m, 2 min.	ETL

Chebogue Point Ground Site 2004

Project: NEAQS-ITCT 2004 (http://www.al.noaa.gov/2004/)



Research areas:

- **Characterization of composition of aerosols and gas-phase species transported across the Gulf of Maine**
  - *How do aerosols, oxidants and their precursors evolve during transport from the emission sources on the eastern coast of the U.S.?*
  - *What are the heterogeneous and homogeneous mechanisms responsible for this evolution?*
  - *Is there evidence for a significant role played by fog in aerosol and /or gas-phase species processing?*
  - *What can we say regarding the sources of these species (anthropogenic vs. biogenic, tests on emission inventories, etc.)?*
- **Transport and mixing**
  - *Characterization of transport above the marine boundary layer. How prevalent are elevated layers of transported emissions?*
  - *How well do models capture these transport layers?*

Deployment period: July 1 – August 15

Measurements:

Parameter	Method	Sampling Resolution	PIs
VOCs	GC/FID/MS		U.C. Berkeley
OVOCs	PTR/MS		U.C. Berkeley
CO, CO_2, H_2O, O_3, met.			U.C. Berkeley

Inorganic and organic oxidized nitrogen species			U.C. Berkeley
Rn-222			U. Washington
PANs			NOAA AL
Gas phase mercury			MSC Canada
Aerosol chemical comp.	Aerosol Mass Specs.		Aerodyne
Aerosol size distribution	DMA & HTDMA		U. Mist
Speciated organic composition of aerosols	In-situ thermal desorption GC-MS		U.C. Berkeley Aerosol Dynamics
Aerosol light scattering and backscattering (450, 550, 700 nm)			NOAA CMDL
Aerosol light absorption (565 nm)			NOAA CMDL
Total aerosol number			NOAA CMDL, PMEL
Size-resolved aerosol chemistry			NOAA CMDL
Size-resolved aerosol total mass			NOAA CMDL
Aerosol optical depth (380, 440, 500, 675, 875 nm)			NOAA CMDL
Aerosol elemental comp.	Drum Sampler		U.C. Davis
Stable isotopes of sulfate and nitrate aerosols			U.C. San Diego
Wind & temperature profiles, surface meteorology	915-MHz radar wind profiler, 10-m tower		NOAA ETL
Column densities of NO_2, CH_2O and SO_2, Vertical distributions by varying the zenith angle	MAX-DOAS		University of Heidelberg
Cloud and aerosol backscatter, depolarization, and extinction, possibly water vapor	LIDAR		Dalhousie University
Direct, diffuse, and total broadband solar irradiance, total downwelling IR irradiance			NOAA CMDL
Vertical profiles of ozone, temperature, humidity	Ozonesonde, radiosonde		NASA, NOAA CMDL

Additional information and/or real-time data link: There will be a web site for posting quick-look field data, but the URL for that site has not been determined yet.

Harvard Forest Flux Tower Site

Project: Harvard Forest Environmental Measurements Site
(http://www-as.harvard.edu/chemistry/hf/index.html)

Site location: The 30-m tower is located at 42.537755 N latitude, 72.171478 W, longitude and 340m (ASL) elevation; the walkup platform is ~130m away (42.536875 N, 72.172602 W).

Research areas: At Harvard Forest, we conduct long-term eddy-covariance measurements of atmosphere-biosphere exchange. Our system of continuous monitoring provides quantitative information, defining the sources and sinks for important atmospheric gases. By constructing long, continuous time series we can understand sources of variance and determine the factors that regulate concentrations and deposition fluxes of greenhouse gases and pollutants. At the site, measurements of Net Ecosystem Exchange (NEE) for carbon, ozone, NOy, H_2O, and energy have been made continuously since 1990, along with comprehensive climatic, environmental, chemical, and ecological observations. Some specific research areas include:

- Carbon exchange
- Forest management and CO_2
- Nitrogen deposition
- Urban pollution

Deployment: Permanent, installed 1990

Measurements:

Sensor	Inlet/ instrument altitudes	Determined quantity (data rate)
ATI Sonic Anemometer	30m	Three-dimensional wind velocity, temperature, momentum & heat fluxes (30 min avg)
NO_y (catalyst-->NO)	30m	NO_y concentration and fluxes, 30-minute averages
high-speed CO_2-H_2O IR-Absorbance	30m	CO_2 and H_2O) concentration and fluxes (30-min avg)
high-speed O_3 C_2H_4 - chemiluminescence	30m	Ozone flux (30-min avg)
slow CO_2 IR absorbance	30,24,18,12,6, 3,1,0.05m	CO_2 concentration along a vertical profile (8 levels @ 2/hr)
slow O_3 UV absorbance	30,24,18,12,6, 3,1,0.05 m	O_3 concentration along a vertical profile (8 levels @ 2/hr)
slow NO_x (Photolysis, O_3-chemiluminescence)	30,24,18,12,6, 3,1,0.05m	NO, NO_2 concentration along a vertical profile (8 levels @ 2/hr)

Thermistor, thin-film capacitor		Temperature and relative humidity profile (5,60-min avg)
Thermistors	surface (6 reps), 20cm, 50cm	soil temperatures (5,60-min avg)
PAR sensors	30,12m	photosynthetically active radiation (5,60-min avg)
Net radiometer	30m	net radiative heat flux (5,60-min avg)
CO Gas-filter correlation IR absorbance	30m	CO concentrations (4,60-min avg)
PAN GC-ECD	30m	Hourly averages from 100min samples
4-Channel GC-ECD[2]	29m	Halocarbons, N_2O, CO, CH_4, SF_6

[2]Lead investigator for the 4-Channel GC is Jim Elkins, NOAA-CMDL

Data archive: http://www-as.harvard.edu/data/nigec-data.html

ASRC Field Station at Pinnacle State Park

Project name: Atmospheric Science Research Center, Albany, NY
(http://www.asrc.cestm.albany.edu)

Research areas:

- Studies of oxidant and PM formation and impact.
- Site is also used for testing and evaluation of instrumentation.

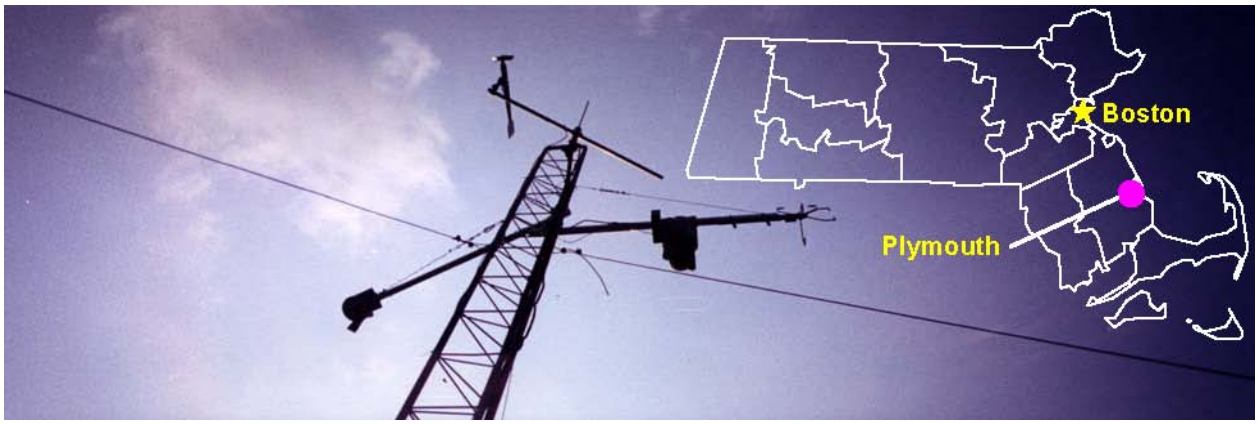
Deployment: Possible deployment of "research" instrumentation at PSP for the 2004 Summer Intensive will be discussed by Ken Demerjian if he is at the planning meeting.

Measurements:

Parameter	Method	Sampling Resolution	PIs
Ozone	UV Absorption	1 min DL average	State University of New York at Albany (SUNYA)-ASRC
NO, NO_2, NOy	Chemiluminescence	1 min DL average	SUNYA-ASRC
HNO_3	Denuder Diff/Chemi	1 min DL average	SUNYA-ASRC
SO_2	Pulsed Fluorescence	1 min DL average	SUNYA-ASRC
CO	NDIR	1 min DL average	SUNYA-ASRC
PM2.5	TEOM	10 min running average	SUNYA-ASRC
PM2.5	FDMS-TEMO	12 min switched	SUNYA-ASRC
C1-C8+HC's	AutoGC	1 hour	SUNYA-ASRC
PM2.5	Filter – FRM	24 hour	SUNYA-ASRC
PM2.5-species	Filter – STN	24 hour – every 3rd day	SUNYA-ASRC
PM2.5-species	Filter – IMPROVE	24 hour – every 3rd day	SUNYA-ASRC
PM2.5-species	Filter – ACCU	24 hour – daily	SUNYA-ASRC
Wind speed, wind direction	Cup anemometer	1 min DL average	SUNYA-ASRC
Temperature, RH	Thermistor/Humicap	1 min DL average	SUNYA-ASRC
BP	Capacitance Man	1 min DL average	SUNYA-ASRC
Rainfall	Tipping bucket	1 min DL average	SUNYA-ASRC

Boundary-layer and Surface Energy Site at Plymouth, MA

Project: New England High Resolution Temperature Program
(http://www.etl.noaa.gov/programs/2003/nehrtp/)



Site will be located at the northern edge of a uniform forested region south of the Plymouth Regional Airport in Plymouth, MA (41.91 N, 70.73 W, 46 m elev.).

Research areas:

- **Boundary Layer Processes**
  - *What are the important meteorological factors that influence transport and mixing in the coastal zone?*
  - *How large are the feedbacks of aerosols on radiation and boundary layer structure?*
- **Forecast Model Assessment**
  - *How well do operational and research models used for weather and air quality prediction reproduce the observed boundary layer structure, clouds fields, and radiation?*
  - *What improvements in model physics are needed to significantly improve model forecast skill of meteorological parameters that are crucial for air quality prediction?*

Deployment period: July 1 – September 30, 2004 (some instrumentation will remain after the 2004 Summer Intensive).

Measurements:

Parameter	Method	Sampling Resolution (space and time)	PIs
Wind profile	915-MHz Doppler wind profiler	60-100 m hourly	NOAA ETL

Temperature profile	Radio Acoustic Sounding System	100 m hourly	ETL
Temperature profile	60-GHZ radiometer	2m-200m 15 min	ETL
Wind, temp and humidity profile	GPS rawinsonde	30 m occasional	ETL
Cloud profile	S-Band radar	45 m, 5 min	ETL
Integrated water vapor and cloud liquid water	Radiometer	10 min	ETL
CBL depth	915-MHz profiler	60-100 m, hourly	
Nocturnal boundary layer structure	Bistatic backscatter sodar	15 m 5 min	ETL
Surface heat and momentum fluxes	ATI sonic anemometer	@20m 30 min	ETL
Humidity and CO fluxes	LICOR 7500	@20 m 30 min	ETL
Surface wind	RM Young wind monitor	@10 m, 20 m 2 min.	ETL
Pressure	Vaisala analog pressure probe	@1 m 2 min.	ETL
Temp., RH	Vaisala HMP45C	@2 m, 20 m 2 min.	ETL
Solar radiation	Kipp & Zonen pyranometer	@2 m 2 min.	ETL
Net radiation	REBS net radiometer	@2 m, 2 min.	ETL
Rainfall	Texas Electronics tipping bucket	@1 m, 2 min.	ETL
Aerosol optical depth	Sun photometer	@1 m hourly	ETL
4 stream radiation	Eppley	@20 m hourly	ETL
Direct/Diffuse solar	Eppley	@1m hourly	ETL
Soil temperature	CSI-107	@5, 10, 15, and 60 cm hourly	ETL
Soil moisture	CSI-660	@10 and 60 cm hourly	ETL
Ground heat flux	HFT3	@2cm, hourly	ETL