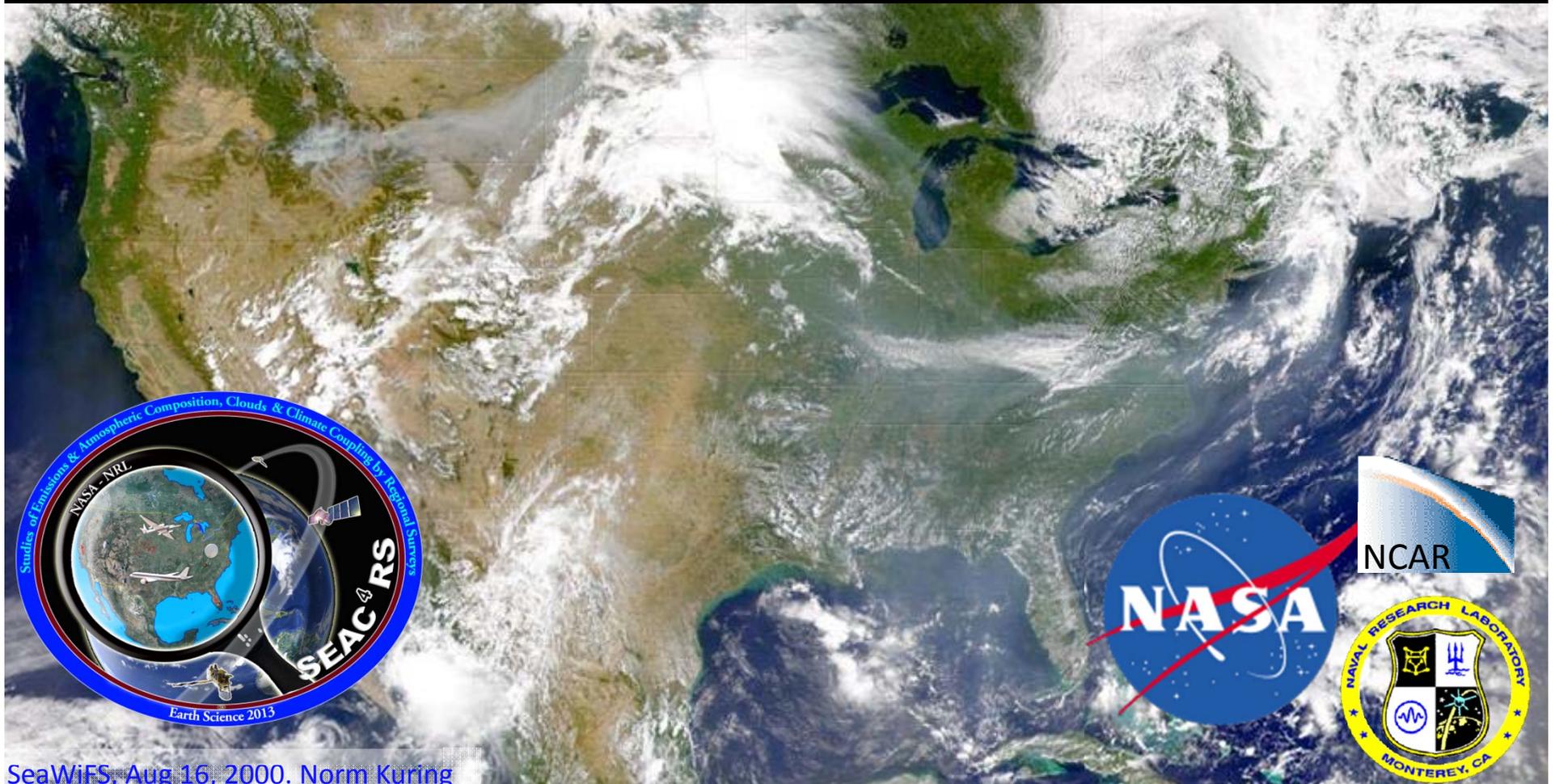


Studies of Emissions and Composition, Clouds and Climate Coupling by Regional Surveys (SEAC⁴RS) :

Surface Network Information

April 2013

<http://espo.nasa.gov/missions/seac4rs/>



SeaWiFS, Aug 16, 2000. Norm Kuring



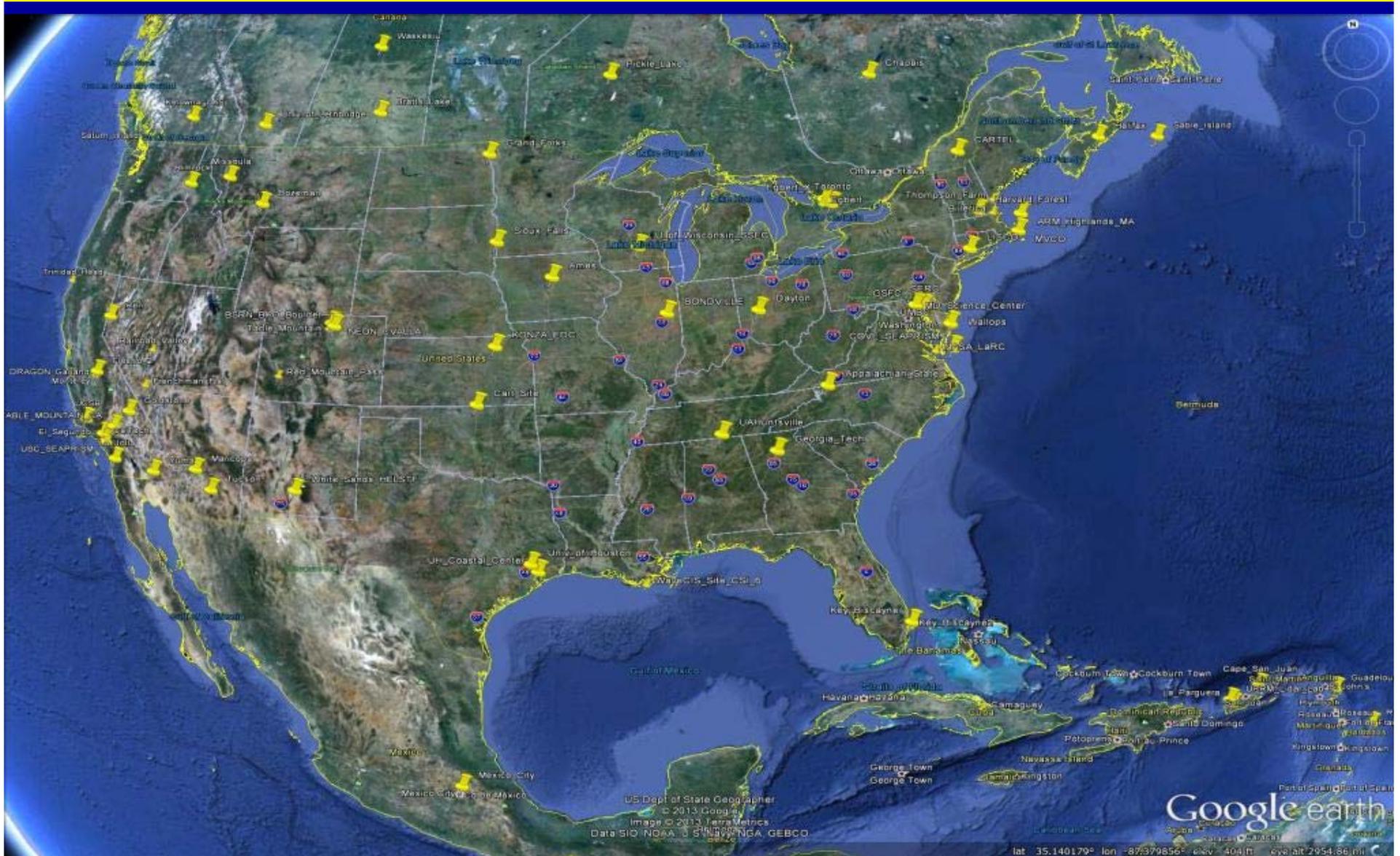
Ground Network Bottom Line Up Front



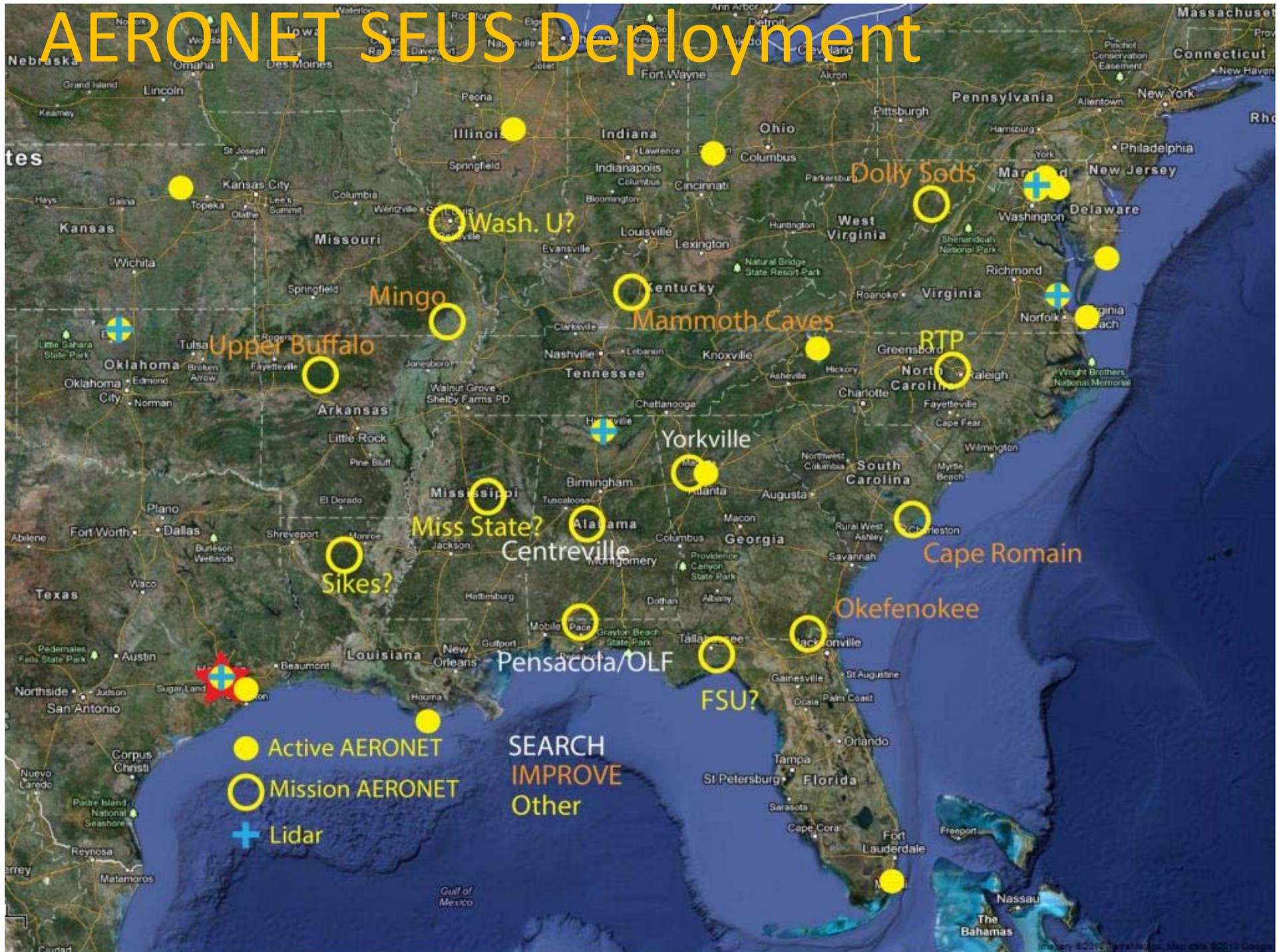
- AERONET is pretty well set up for the west, but the Southeast US is a bit sparse. Hence, a mission network is being deployed with sites generally associated with IMPROVE or SEARCH. SEARCH sites are also a focus of SOAS/SENEX. First sites are going in this week.
- LIDAR observations are rare, but DISCOVER-AQ will deploy their ozone lidar, and there is the Newchurch ozone lidar in Huntsville, AL. We may be able to get an HSRL into the SEUS.
- Whereas SE Asia had few opportunities for collateral ground data, in CONUS we are swimming in it. Keep in mind the 1 day in 3 particle chemistry calendar.
- Tag team: Anne Thompson, Gary Morris and Rennie Selkirk are coordinating regional balloon operations. SEACIONS sonde network connects to other ground sites (eg lidar) and DISCOVER-AQ in Houston. Balloon team is ready to help.



Current Operational AERONET



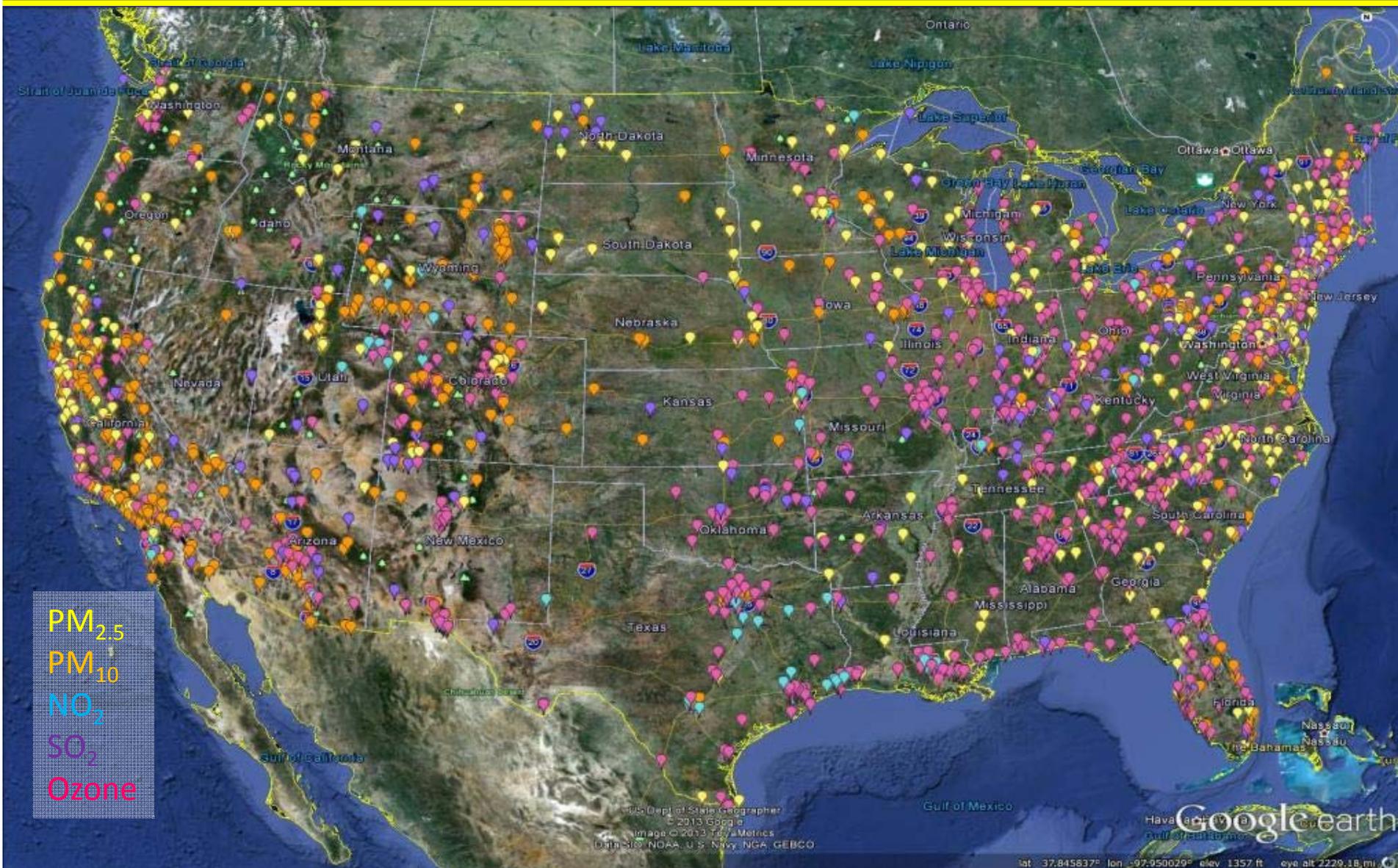
AERONET SEUS Deployment





Swimming in Surface Data

[http://www.epa.gov/airdata/ad_monitors.html](http://www.epa.gov/airdata/ad_maps.html)



- PM_{2.5}
- PM₁₀
- NO₂
- SO₂
- Ozone

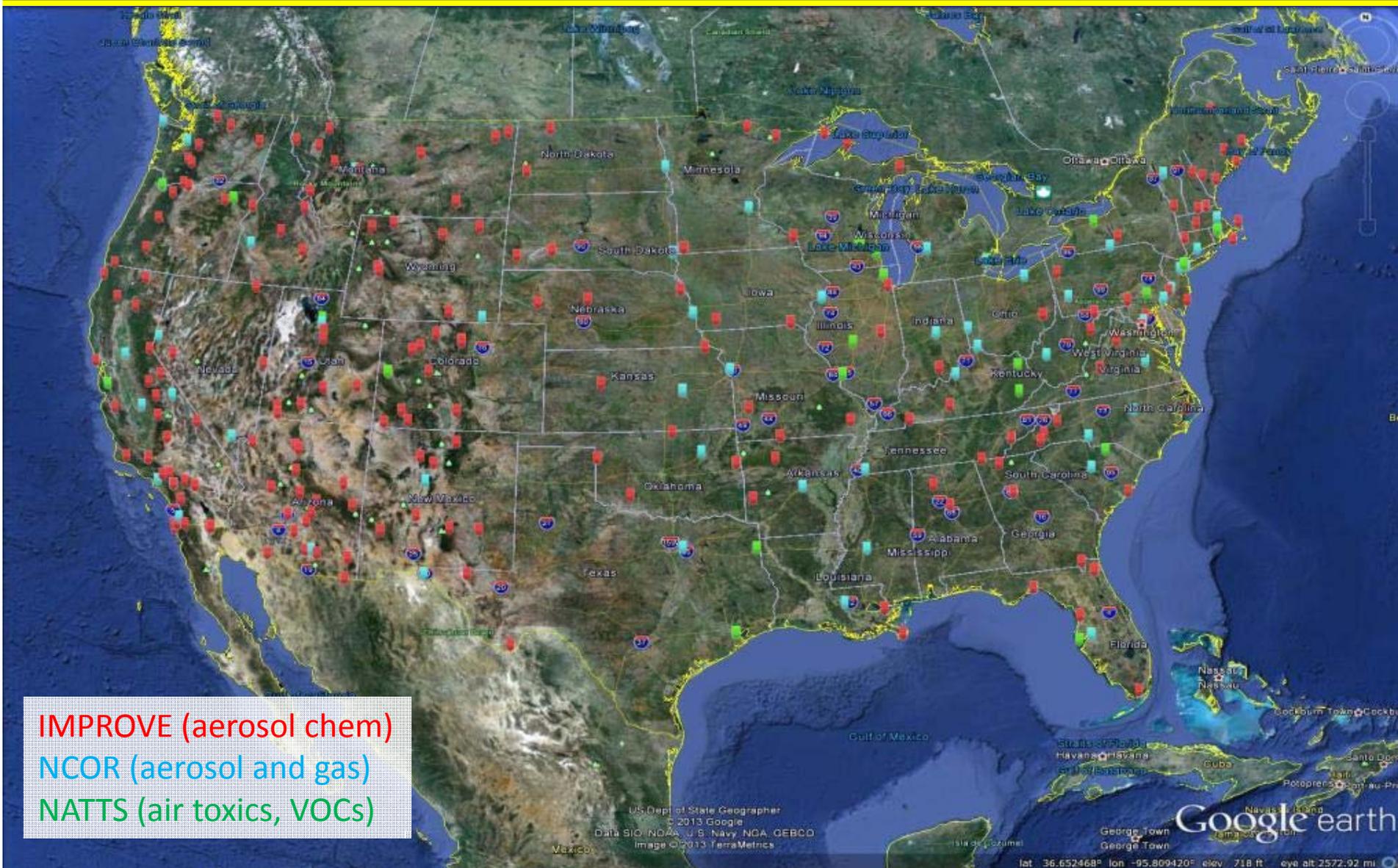
US Dept of State Geographer
© 2013 Google
Image © 2013 TerraMetrics
Data from NOAA, U.S. Navy, NGA, GEBCO

Google Earth

lat: 37.845837° lon: -97.950029° elev: 1357 ft eye alt: 2229.18 mi



National Air Chemistry Networks



IMPROVE (aerosol chem)
NCOR (aerosol and gas)
NATTS (air toxics, VOCs)

US Dept. of State Geographer
© 2013 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2013 TerraMetrics

Google earth

lat: 36.652468° lon: -95.809420° elev: 718 ft eye alt: 2572.92 mi

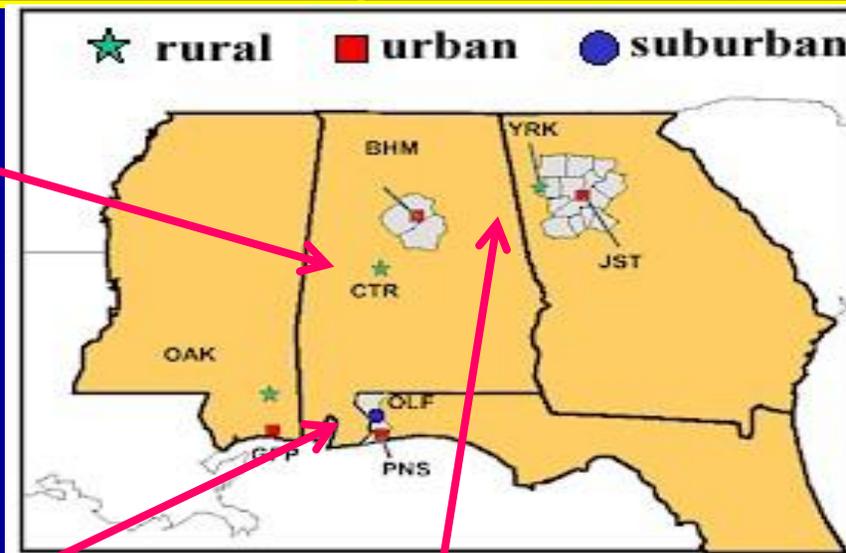


SEARCH

South Eastern Aerosol Research And Characterization Study



Centreville, AL (CTR)
6/92-Present



Pensacola, FL (OLF)
6/92-Present



Yorkville, GA (YRK)
6/92-Present



SEARCH Objectives



- ◆ Develop O₃, PM and Hg Climatologies
 - O₃ 18+ years
 - PM 12+ years
 - Hg 8+ years
- ◆ Understand Composition and its Variability
 - Year to Year, Season to Season (1999-2011)
 - Rural vs. Urban
 - Coastal vs. Inland
- ◆ Long-Term Trends
- ◆ Provide Data to Health Researchers
- ◆ Test and Improve Methods
- ◆ Collaborate with States and Others



SEARCH Measurements - All Sites



- ◆ Discrete Particles and Gases (24-hour filter/denuder)
 - $PM_{2.5}$ and PM_{coarse} Mass
 - $PM_{2.5}$ and PM_{coarse} Anions(7), Cations(5), Trace Elements (12), water-soluble Metals (15-25)
 - $PM_{2.5}$ OC/EC and thermal fractions
 - NH_3
- ◆ Continuous Particles (5-min to 1-hr)
 - $PM_{2.5}$ Mass (TEOM)
 - TC and Optical EC (Sunset)
 - BC and dry B_{abs} (Magee Sci. aeth)
 - Ammonium/Nitrate (ARA)
 - Sulfate (ARA)
 - Wet and dry B_{scat} (Optec NGN-2a, Radiance Research M903)
- ◆ Trace Gases (5-min)
 - O_3 , NO, NO_2 , NO_y , HNO_3 , SO_2 , CO, NH_3
- ◆ Meteorology
 - WS/WD (10m)
 - T (10m and 2m)
 - RH (10m and 2m)
 - BP, SR, precipitation

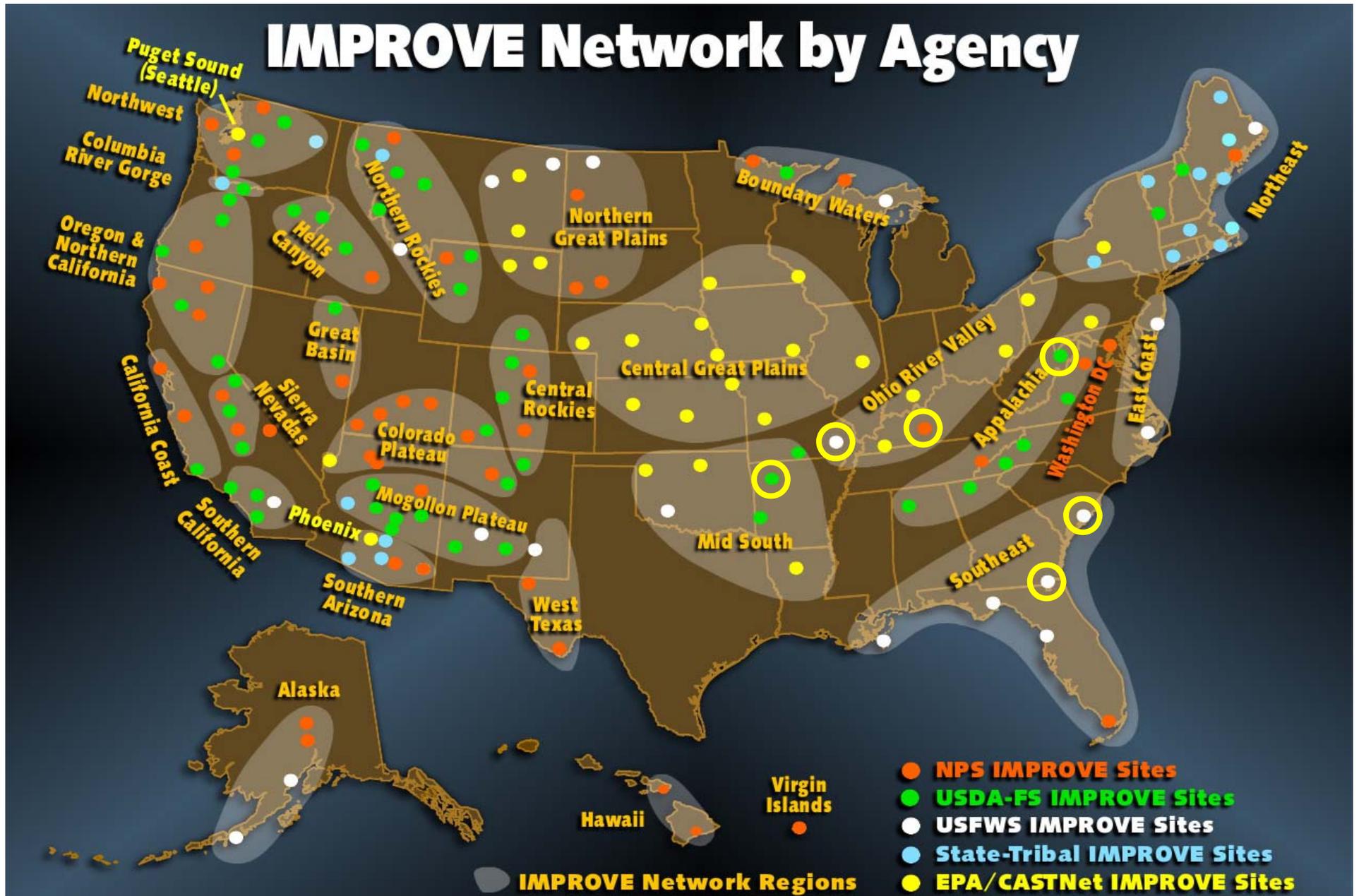


SEARCH Measurements Recent Additions



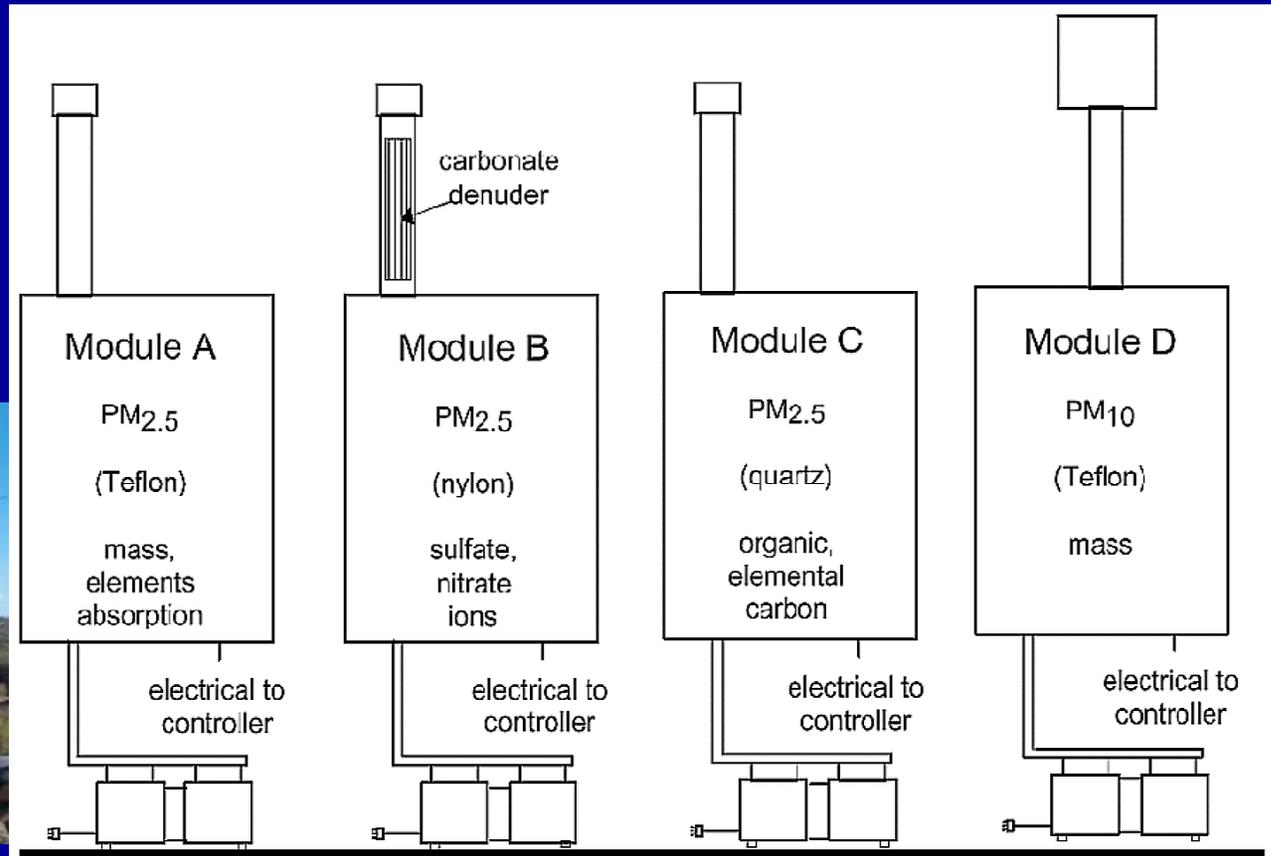
- Ceilometers at CTR and BHM (particle layers, cloud layers and boundary layer depth)
- Acid Gases at YRK (HCl, HF, etc.)
- Σ PAN/ Σ AN analyzer (CTR only)
- Wet Deposition at CTR and GA Station (NADP-NTN)

IMPROVE Network by Agency



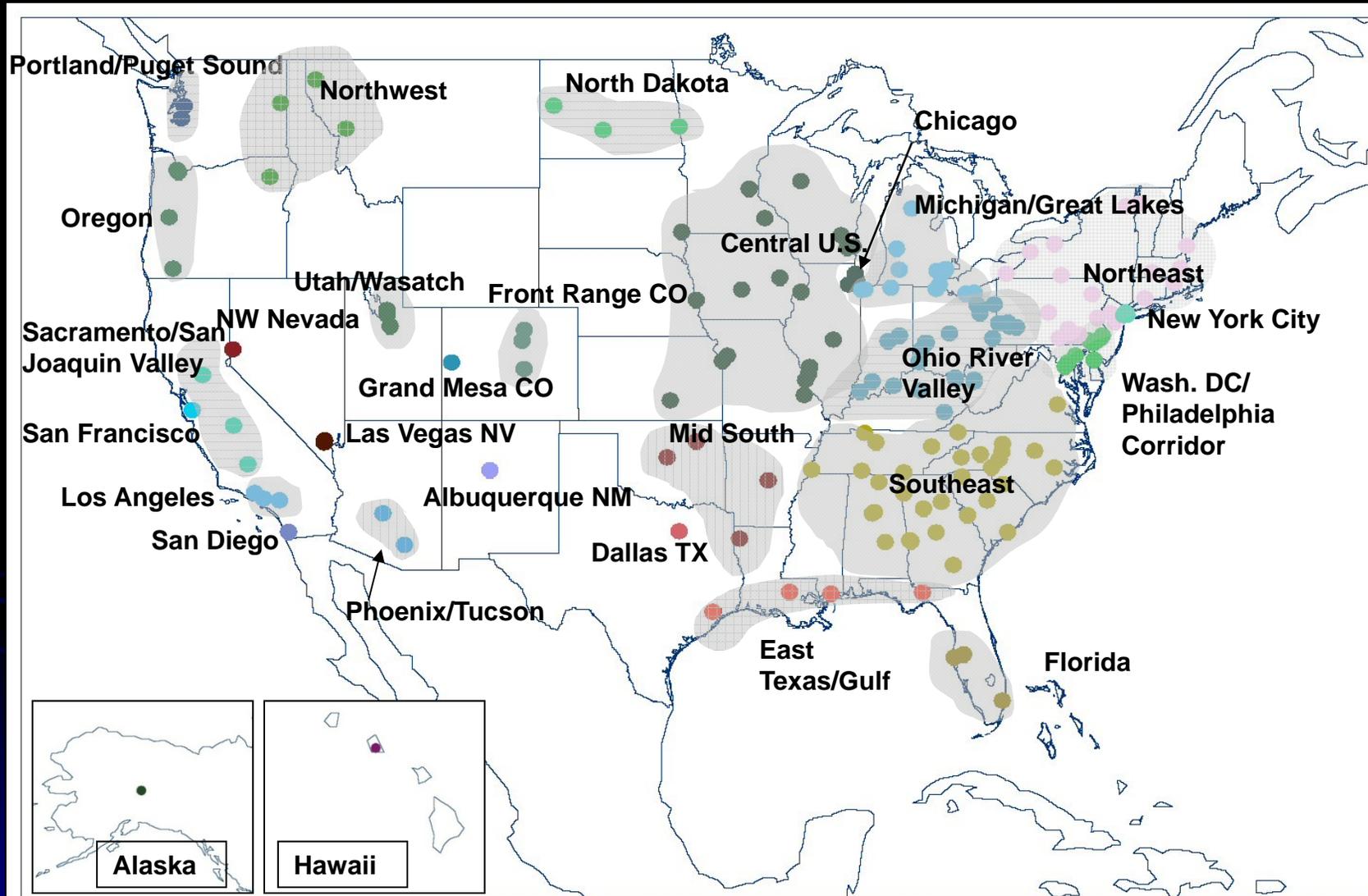
- Began operating in spring of 1988 with 20 monitoring sites
- Today has over 160 sites most with 10 or more years of data.

IMPROVE Aerosol Monitor



- A: PM_{2.5} Gravimetric mass, elements (Na-PB - XRF, H - PESA), coefficient of absorption - HIPS
- B: PM_{2.5} Ions (SO₄, NO₃, Cl ion chromatography)
- C: PM_{2.5} Carbon (organic and elemental - Thermal Optical Reflectance (TOR))
- D: PM₁₀ gravimetric mass

US EPA Speciated Trend Network



- Began operation in 2000 and approximately 200 sites are in operation today



Chemical Speciation Network (CSN) vs IMPROVE



- CSN and IMPROVE use similar sampling and analysis techniques for mass, elements, ions and organic and elemental carbon. These methods have been shown to be near equivalent except for soil elements.
- Prior to 2010, CSN used thermal optical transmission (TOT) vs thermal optical reflectance (TOR) for IMPROVE and different temperature profiles.
 - The TOT method produced smaller EC and greater OC concentrations compared to IMPROVE TOR
- The IMPROVE TOR method was phased into the CSN program starting in 2007 and completed in 2009



Data and Information Distribution Visualization and Analysis Websites

<http://vista.cira.colostate.edu/IMPROVE>



IMPROVE *Interagency Monitoring of Protected Visual Environments*

Home Search Contents Contact

Overview Data Tools Publications Studies Education/Reg Forum Activities Links

Interagency Monitoring of Protected Visual Environments

Our national Parks and Wilderness Areas possess many stunning vistas and scenery. Unfortunately, these scenes are diminished by uniform haze causing discoloration and loss of texture and visual range. Layered hazes and plume blight also detract from the scene. Recognizing the importance of visual air quality, congress included legislation in the 1977 Clean Air Act to prevent future and remedy existing visibility impairment in Class I areas. To aid the implementation of this legislation, the IMPROVE program was initiated in 1985. This program implemented an extensive long term monitoring program to establish the current visibility conditions, track changes in visibility and determine cause impairment in the National Parks and Wilderness Areas.



The purpose of this website is to provide access to the IMPROVE educational material on the science of visibility and regulations. For Overview section which summarizes the IMPROVE network and vis

IMPROVE and Visibility Overview

Data Resources Tools Publications Sp

IMPROVE Resources

Database Metadata Graphics Photos Web

Bulletins

Federal Land Manager Database (FED)

Sign In | Register

Home Summaries Data Metadata Resources



Search:

QQRV Summaries
Webcams and Photographs
Data Visualization and Exploration
Metadata and Reference
Database Query Wizard
Web Services and Tools

FED Home Page status Printer friendly view Contact us

Federal Land Manager Environmental Database (FED)

This website provides access to an extensive database of environmental data and an integrated suite of online tools and resources to help Federal Land Managers assess and analyze the air quality and visibility in Federally-protected lands such as National Parks, National Forests, and Wilderness Areas.

- AQRV Summaries**
View graphical summaries and reports of the status and trends of air-quality-related values (AQRVs) and other metrics that have been chosen by Federal Land Managers (FLMs) for assessing air quality in protected federal areas.
- Webcams and Photographs**
See live video from webcams at select rural and urban vistas, and examine sequences of photographs from selected monitoring sites that demonstrate the range of visual conditions at each site over time.
- Data Visualization and Exploration**
Use a variety of interactive tools and applications to visualize, explore, filter, and download raw and aggregated air quality data and relevant metadata from the integrated database in a variety of customizable formats.
- Metadata and Reference**
Find and explore detailed metadata about datasets, monitoring sites, parameters, sampling and analysis protocols, processing methods, data flags, and other aspects of the air quality data in the integrated database.
- Database Query Wizard**

Featured Substance

Barium

Name:	Barium
FormulaHTML:	Ba
CASNum:	7440-39-3
ACXNumber:	X1002791-5
DOTNumber:	UN 1399; UN 1400 Non-Powder/UN 1854 Powder
Comments:	Yellowish-white, slightly lustrous lumps, flammable solid.
MolecularWeight:	137.33
MeltingPoint:	725
BoilingPoint:	1640
WaterSolubility:	Insoluble (decomposes)
EPACode:	K061; P013; D005

Featured Term

Camera
Device for recording visual range on film.

Air Quality News



RTP Site



Base package

PM_{2.5} , PM₁₀
CO, NO_x, SO₂, O₃
Basic Met
Wind profiler

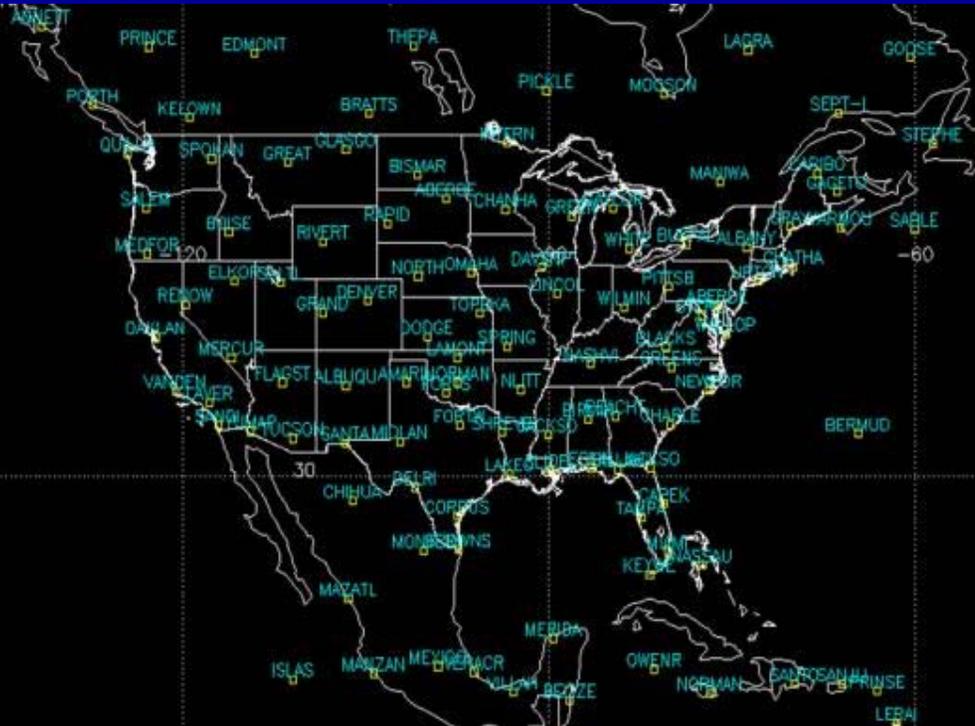
SAS package (Jun-Jul 15)

AIM, AMSs
VOCs, PAN, Aldehydes, H⁺
PM_{2.5} OC/BC, ions and C14
PASS, SMPS, SP2,
Basic Met
Wind profiler

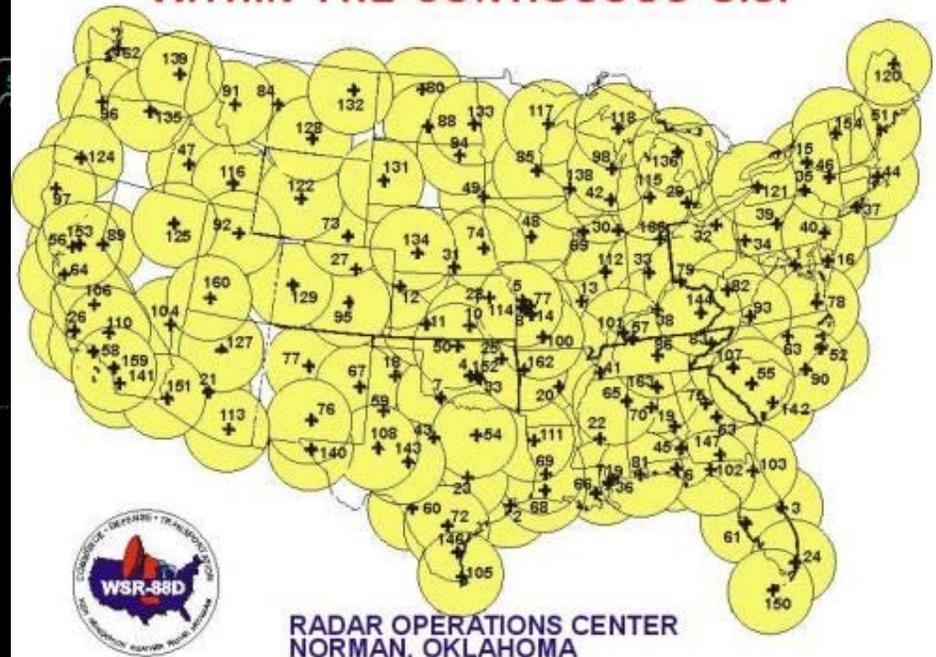




RAOBS & NEXRAD



COMPLETED WSR-88D INSTALLATIONS WITHIN THE CONTIGUOUS U.S.





Important POCs

Thanks to all of our partners!



- Traffic cop: Jeffrey Reid (jeffrey.reid@nrlmry.navy.mil)
- AERONET: Brent Holben (brent.n.holben@nasa.gov)
<http://aeronet.gsfc.nasa.gov/>
- IMPROVE: Bret Schichtel (Bret.Schichtel@colostate.edu)
<http://vista.cira.colostate.edu/IMPROVE>
- RTP Site: John Offenberg (Offenberg.John@epa.gov)
- SEARCH: Eric Edgerton (eedgerton@atmospheric-research.com) for SEARCH and SEARCH data and Brad Gingrey (bgingrey@atmospheric-research.com) for contact and logistics and <http://www.atmospheric-research.com/studies/SEARCH/>
- SEACIONS: Anne Thompson (amt16@psu.edu)
<http://croc.gsfc.nasa.gov/seacions>

SEACIONS UPDATE: Reconfiguring a Strategic Sonde Network for US Campaign

POINTS OF CONTACT:

Anne Thompson, PSU; amt16@psu.edu

G Morris, Valpo Univ; gary.morris@valpo.edu

H Selkirk, USRA @ NASA/GSFC

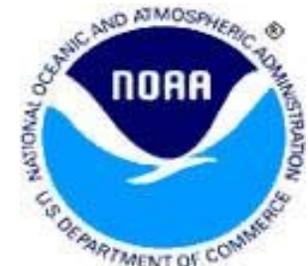
Henry.b.selkirk@nasa.gov

Partners: B Johnson, S Oltmans,
NOAA/GMD

A Panday, UVA

J Witte, SSAI @ NASA/GSFC

SEAC4RS STM, 29 April 13



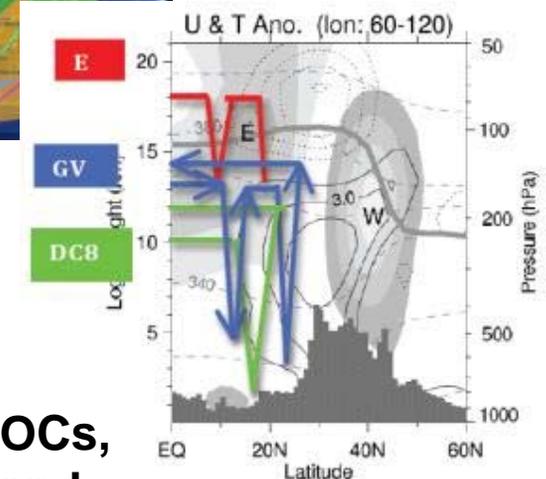
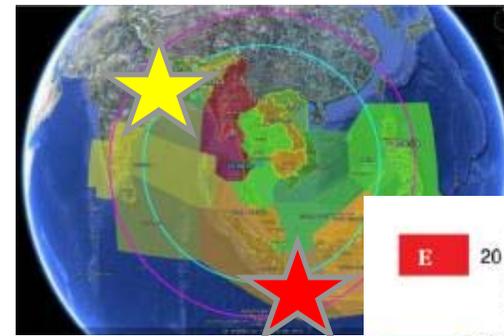
Valparaiso
University



NOTE!!! ORIGINAL SEAC4RS O₃/H₂O Questions As Valid with North American Monsoon as Asian



- (1) How does convective redistribution affect tropospheric & TTL ozone, H₂O in Asian anticyclone during Monsoon season (**upper, middle**)
- (2) How do aerosols & ozone pollution sources (CO, NO_x, VOC) from urban areas & biomass fires interact with convection during Asian Monsoon (**lower**)
- Fly 2 aircraft (NASA DC-8, ER-2) over instrumented ground sites in August-September period
- Updates at NASA-ESPO SEAC4RS Website: <http://espo.nasa.gov/missions/seac4rs>



**NO_x, VOCs,
HO_x and
aerosol**

precursors

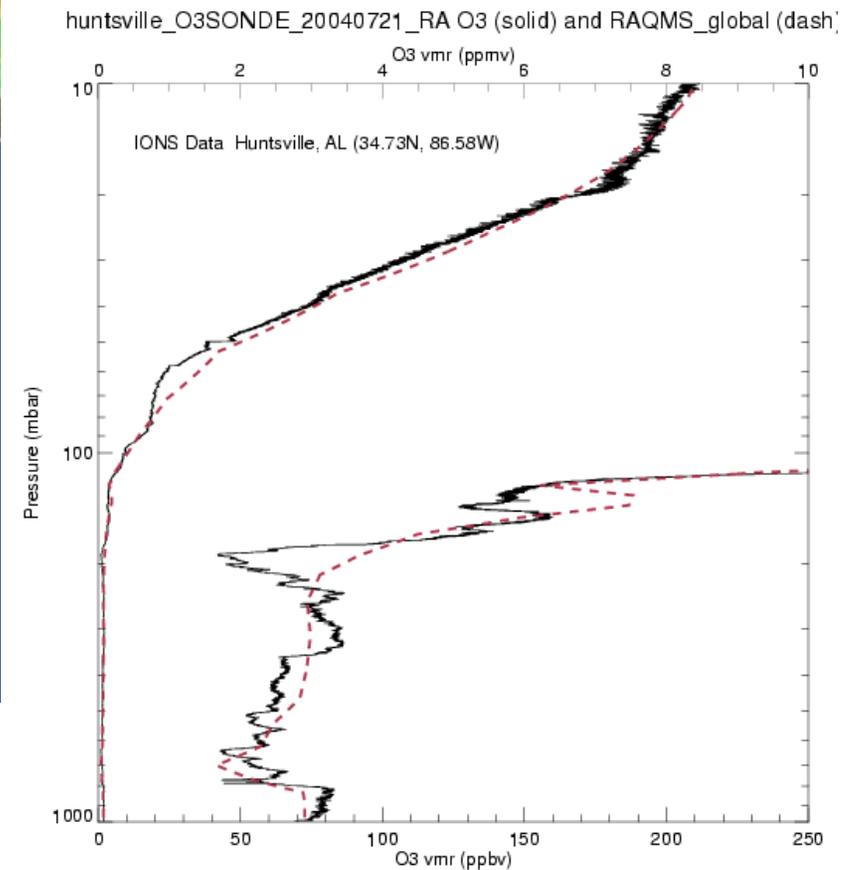
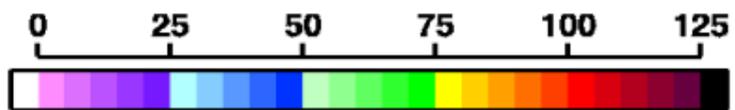
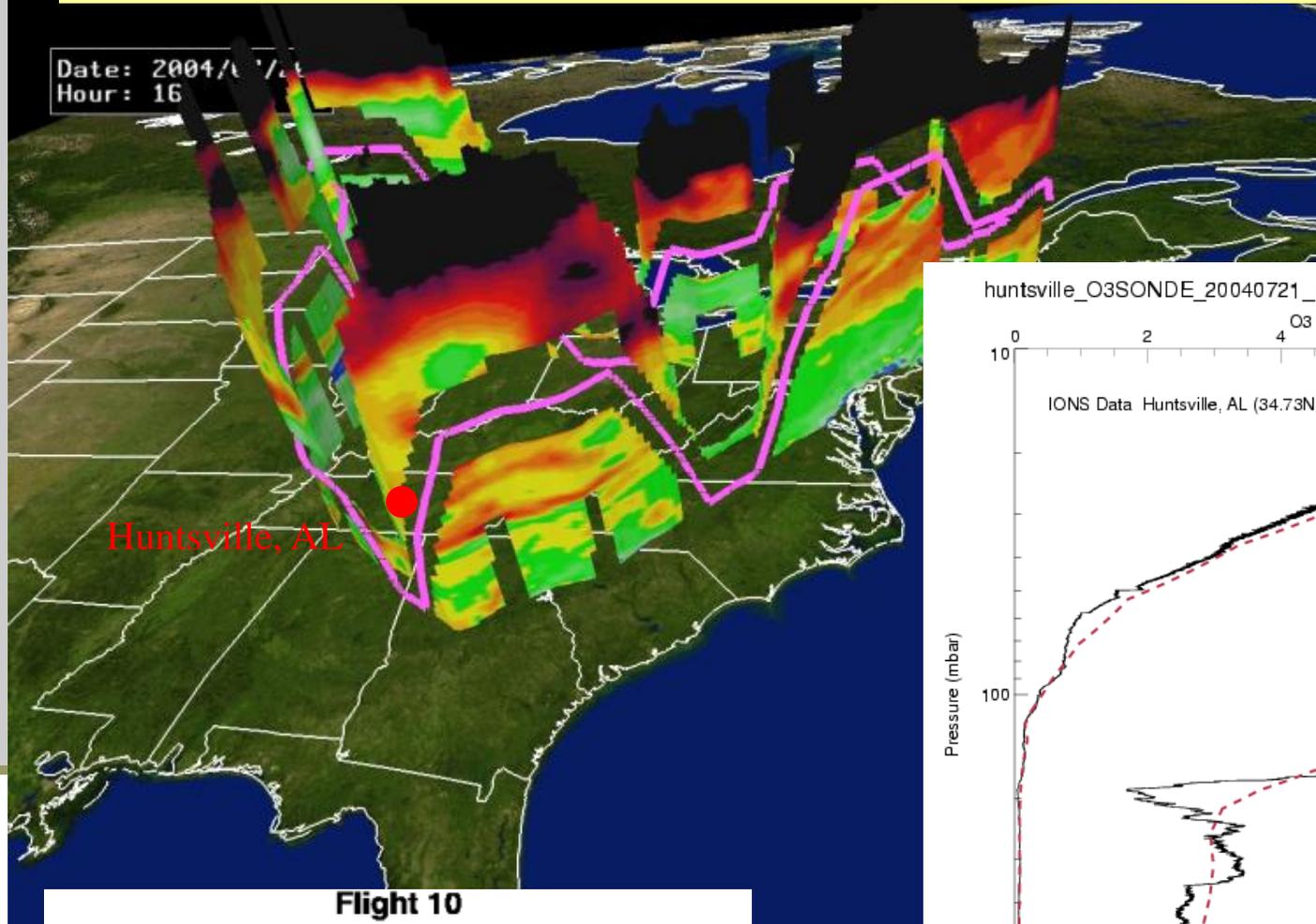


Road Map

- **Original “Asian” SEACIONS based on No American IONS/INTEX-A (2004), IONS06/INTEX-B (2006)**
 - Summer IONS-04 & IONS06 w/ TEXAQS/GOMACCS/INTEX-B are models for 2013 SEACIONS
 - SEAC4RS-relevant science from 2006 (Houston/SE)

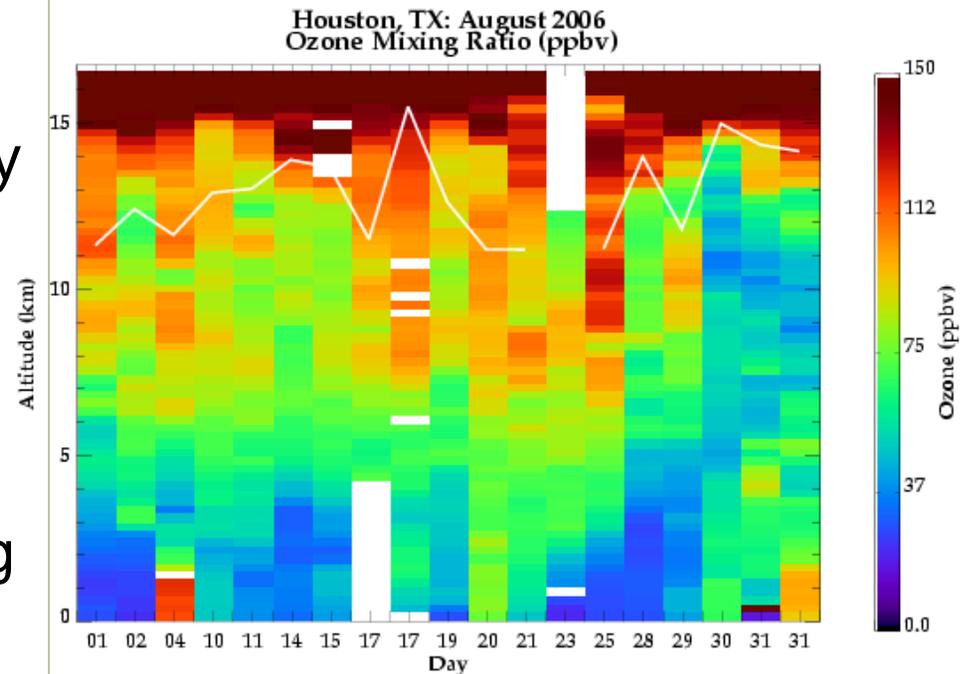
- **Re-mapping SEACIONS to US: Options**
 - Leverage existing sites, infrastructure
 - Houston – DISCOVER-AQ linkages (2-30 Sept 2013)
 - NATIVE daily sondes at Smith Point
 - Other TX soundings (G Morris)

INTEX-A: DC8 DIAL Ozone (E. Browell, LaRC) – Huntsville Sonde & RAQMS Model



Houston – August 06 – IONS-06*

- Episodic pollution in BL
- Up to 25/8, lightning & convection dominate; heavy stratospheric influence thereafter
 - Wave analysis [Thompson et al., 2008]
 - In 9-12 km layers, lightning dominant ozone source across SE US [Cooper et al., 2006; 2007]



SEACIONS Sampling Protocols

■ Original “Asian” SEACIONS

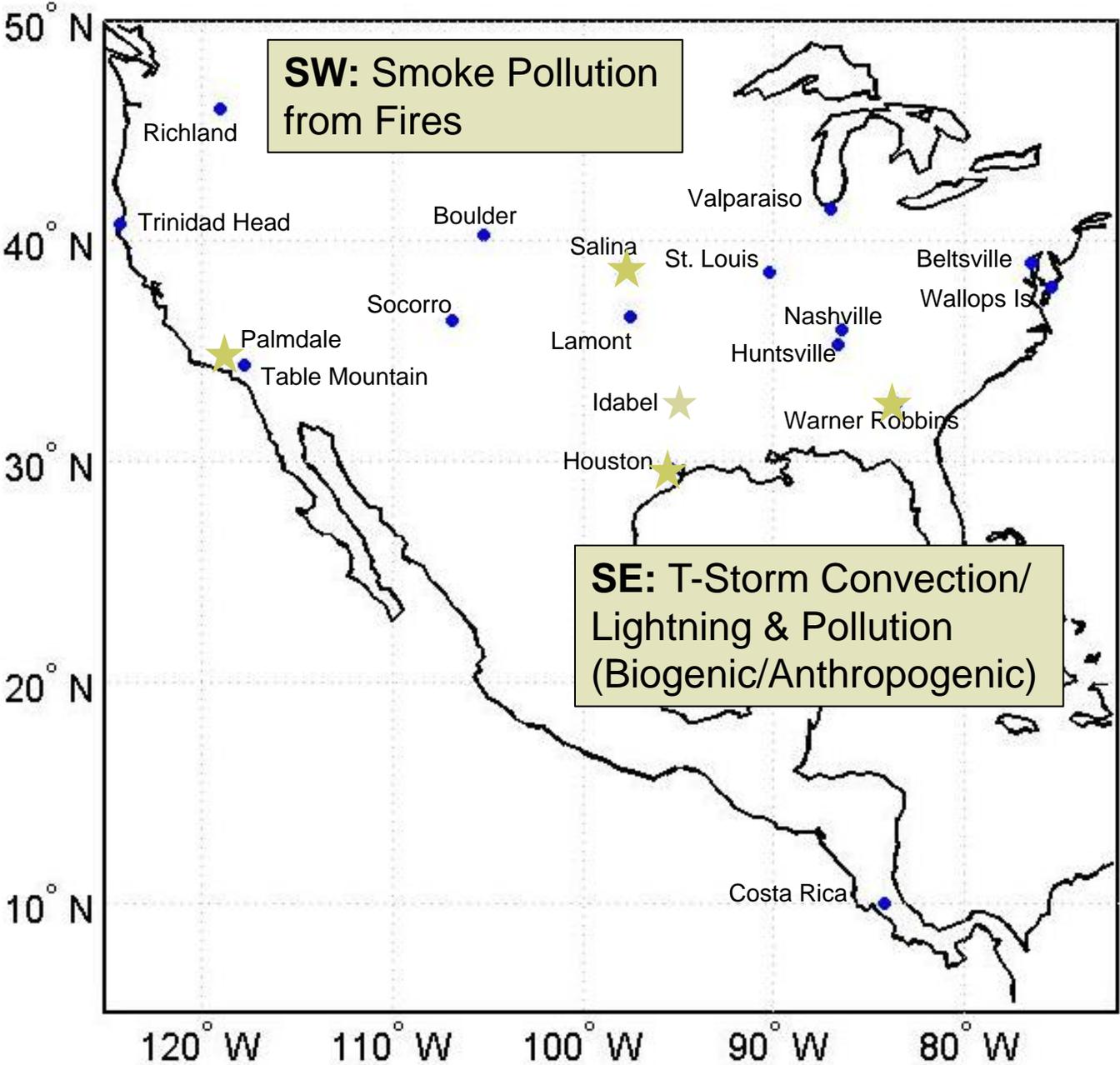
- Four sites with 40 daily ozonesonde launches
- One site with 20 sondes
- One site with 20 ozone only and 20 CFH-water-ozone combinations: at location of DC-8 & ER-2
- *In principle, 6 sites possible for SEAC4RS*

■ SEAC4RS Options Map follows. Following sites operating 5+ years:

- | | | | |
|--------------|------------|---------------|--------|
| ■ Boulder | NOAA | Beltsville | Howard |
| ■ Huntsville | UAH | Wallops Is | NASA |
| ■ Houston | UH & Valpo | Trinidad Head | NOAA |

■ Other “ready” sites: JPL/TMF, SGP/Salina, NMTech

Candidate Sites for US SEACIONS



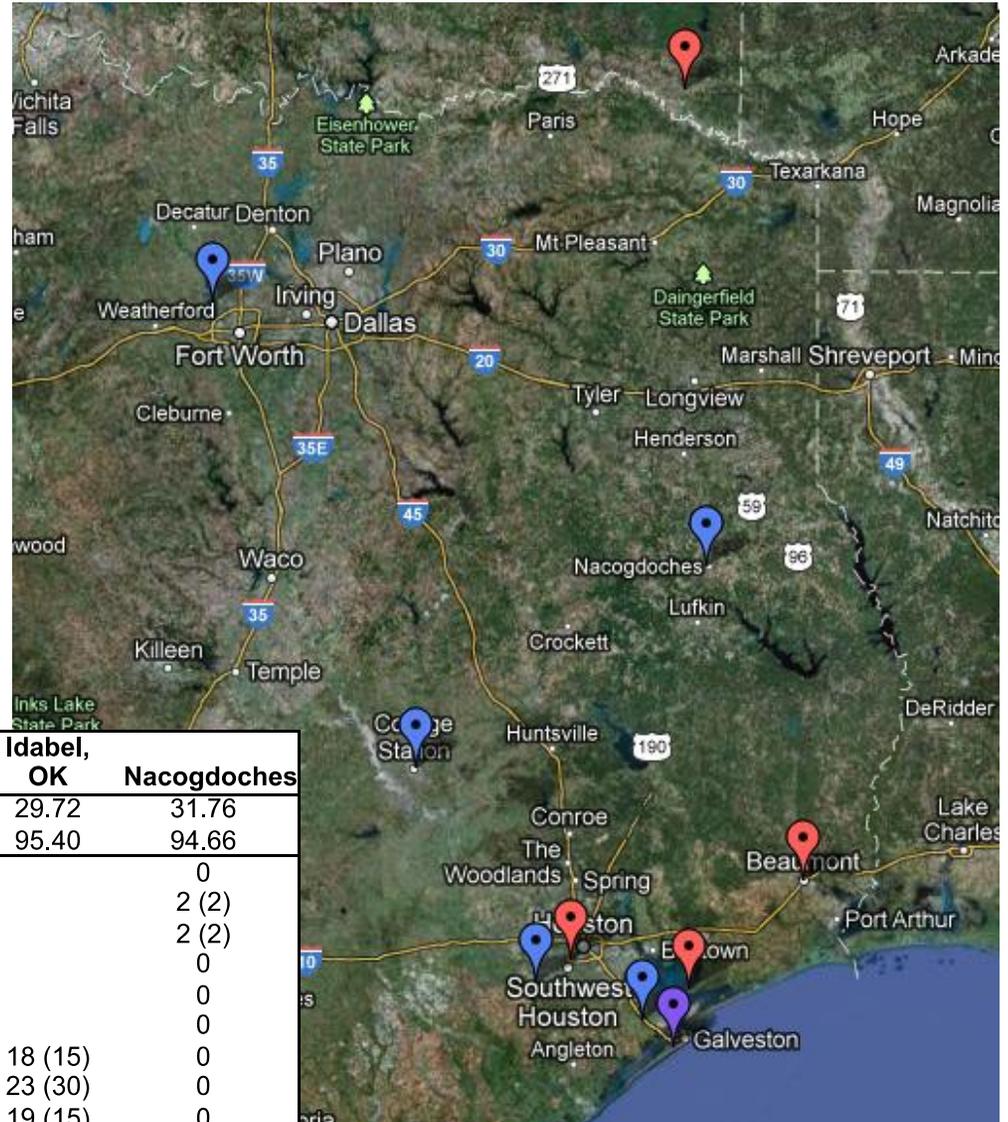
Houston Operation Linkage: DISCOVER-AQ

- Easy for PSU-USRA/NASA-VU to support CFH & sonde launches at Ellington. Also SEAC4RS, DISCOVER-AQ flight planning
- Sonde Training held in 5/12
- In September, PSU-VU supports DISCOVER-AQ daily ozonesondes at NATIVE. Can substitute for 15-20 ozone only SEAC4RS launches
- At NATIVE will have tethered balloon (Millersville), lidar (UAH)
- Contacts at UAH, NMTech, Boulder, Beltsville, St Louis available for SEACIONS!



TOPP Launch Sites

- Funded since 2004 w/ > 500 launches at Texas & Idabel sites
- **Operating during Aug/Sept. 2013**
- **Planned sites for DISCOVER**
- **Past sites**
- AQRP funding for 30 launches 2013
- TCEQ funding for ~5- launches 2013
- Project Website:
physics.valpo.edu/ozone
- PI – Gary.Morris@valpo.edu



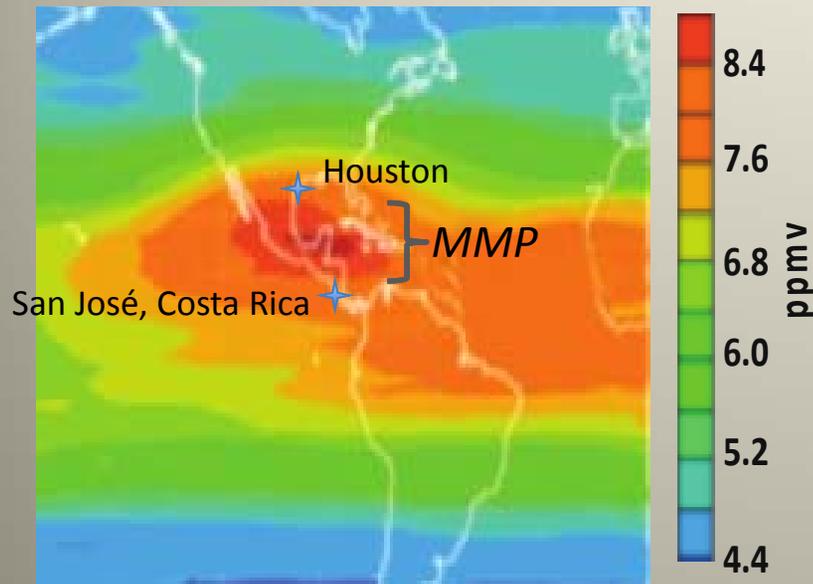
	Houston – Rice U.	Houston – UH	Beaumont	College Station	Eagle Mt.	Idabel, OK	Nacogdoches
Lat. (^o N)	29.72	29.72	30.04	30.64	29.72	29.72	31.76
Long. (^o W)	95.40	95.34	94.07	96.30	95.40	95.40	94.66
2004	36 (0)	0	0	0	0		0
2005	32 (15)	0	2 (2)	1 (1)	0		2 (2)
2006	41 (0)	42 (14)	2 (2)	2 (2)	0		2 (2)
2007	0	43 (40)	0	0	0		0
2008	1 (0)	43 (0)	0	0	0		0
2009	0	43 (53)	0	0	0		0
2010	0	23 (15)	0	0	0	18 (15)	0
2011	0	28 (30)	0	0	0	23 (30)	0
2012	0	30 (25)	10 (10)	0	0	19 (15)	0
Total	110 (15)	252 (177)	14 (14)	3 (3)	12 (0)	60 (45)	4 (4)

Water vapor profiling in SEAC⁴RS: the Mesoamerican Moist Pool

Rennie Selkirk, GESTAR/NASA GSFC

Anne Thompson, Penn State U (NASA GSFC)

*Aug-Sep MLS WV @ 121 hPa**



5-year average

Background:

- Pool of moist air in UTLS over Mesoamerica during NH summer
- Associated with upper-level anticyclone and NA Monsoon
- Significant input into WV tape recorder [Schoeberl et al., 2013]

Science Question:

What are the roles of deep convection, transport and microphysical processes in this Mesoamerican Moist Pool (MMP)?

Approach in SEAC⁴RS:

- Characterize water vapor and ozone structure and variability with CFH/ECC sondes
- Bracket the MMP with 20 launches each at San Jose (10°N) and Houston (30°N)
- Launches at Houston in concert with SEACIONS
- Opportunities for aircraft instrument inter-comparisons at Houston

* Courtesy Mark Schoeberl