WELCOME AND AQAST OVERVIEW

Daniel J. Jacob, Harvard University
AQAST Leader
Air Quality Applied Sciences Team (AQAST)

**EARTH SCIENCE SERVING AIR QUALITY MANAGEMENT NEEDS**

**Earth science resources**
- Satellites
- Suborbital platforms
- Models

**Air Quality Management Needs**
- Pollution monitoring
- Exposure assessment
- AQ forecasting
- Source attribution of events
- Quantifying emissions
- Natural & foreign influences
- AQ processes
- Climate-AQ interactions
AQAST members

• Daniel Jacob (leader), Loretta Mickley (Harvard)
• Greg Carmichael (U. Iowa)
• Dan Cohan (Rice U.)
• Russ Dickerson (U. Maryland)
• Bryan Duncan, Yasuko Yoshida, Melanie Follette-Cook (NASA/GSFC); Jennifer Olson (NASA/LaRC)
• David Edwards (NCAR)
• Arlene Fiore (NOAA/GFDL); Meiyun Lin (Princeton)
• Jack Fishman, Ben de Foy (Saint Louis U.)
• Daven Henze, Jana Milford (U. Colorado)
• Tracey Holloway, Steve Ackerman (U. Wisconsin); Bart Sponseller (Wisconsin DRC)
• Edward Hyer, Jeff Reid, Doug Westphal, Kim Richardson (NRL)
• Pius Lee, Tianfeng Chai (NOAA/NESDIS)
• Yang Liu, Matthew Strickland (Emory U.), Bin Yu (UC Berkeley)
• Richard McNider, Arastoo Biazar (U. Alabama – Huntsville)
• Brad Pierce (NOAA/NESDIS)
• Ted Russell, Yongtao Hu, Talat Odman (Georgia Tech); Lorraine Remer (NASA/GSFC)
• David Streets (Argonne)
• Jim Szykman (EPA/ORD/NERL)
• Anne Thompson, William Ryan, Suellen Haupt (Penn State U.)
AQAST organization

• AQAST supports two types of projects:
   Investigator Projects (IPs) - core funding to individual members
   Tiger Team Projects (TTPs) – collaborations between AQAST members with supplementary funding to address urgent air quality management needs.

• All AQAST projects bridge Earth Science and air quality management:
   Use Earth Science resources with clear air quality management outcomes

• AQAST has flexibility in how it allocates its resources
   Members can adjust their IPs to meet evolving air quality needs
   TTPs are recompeted yearly to address the most pressing needs
   The team is self-organizing and can respond quickly to demands
Scope of current AQAST projects (IPs and TTPs)

Partner agency
- Local: RAQC, BAAQD
- State: TCEQ, MDE, Wisconsin DNR, CARB, Iowa DNR, GAEPD, GFC
- Regional: LADCO, EPA Region 8
- National: EPA, NOAA, NPS

Theme
- Earth Science resource
- Satellites: MODIS, MISR, MOPITT, AIRS, OMI, TES, GOES
- Suborbital: ARCTAS, DISCOVER-AQ, ozonesondes, PANDORA
- Models: MOZART, CAM AM-3, GEOS-Chem, RAQMS, STEM, GISS, IPCC
AQAST Year 1 Highlight:
Background ozone estimates for EPA Integrated Science Assessment

4TH highest annual value of North American background ozone from GEOS-Chem model [Zhang et al., AE 2011]

Annual maximum stratospheric influence from GFDL AM-3 model [Lin et al., 2012b]

Correlation between Asian ozone influence over western US and AIRS satellite observations of CO over Pacific [Lin et al., 2012a]

AQAST PIs: A.M. Fiore, D.J. Jacob
AQAST Year 1 Highlight: using satellite observations to monitor NO\textsubscript{x} emission growth in China and India

2007/2005 ratio of OMI NO\textsubscript{2} tropospheric columns: Circles are new power plants [Streets et al., 2012]

1996-2010 trend of OMI NO\textsubscript{2} tropospheric columns over Indian power plants regions: 70% increase is consistent with bottom-up emission inventory [Lu and Streets, 2012]

AQAST PI: D.G. Streets
AQAST Year 1 Highlight: using satellite observations to monitor growth in emissions from Canadian oil sands

Oil sand recovery
In Alberta

OMI NO₂ columns, 2004-2010

NO₂ increase of 10.4  3.5% per year

McLinden et al. [GRL 2012]
AQAST PI: R.R. Dickerson
AQAST Year 1 Highlight: spatial variability of radiative forcing efficiency from anthropogenic emissions

Aerosol radiative forcing efficiency calculated with GEOS-Chem adjoint from BC emissions

from ammonia emissions

Ozone forcing efficiency from NO\textsubscript{x} emissions

Radiative forcing efficiency from a given agent can vary spatially by a factor 4 across the US

Henze et al.[2012], Bowman and Henze[2012]

AQAST PI: D.K.Henze
AQAST Year 1 Highlight:
quantifying the effect of climate change on PM$_{2.5}$ air quality

Detrended 1999-2010 interannual variability of PM$_{2.5}$ in Midwest
Is correlated with cyclone period

Examine 2000-2050 trends
In cyclone periods
In 15 IPCC AR4 GCMs

Assessment of effects
of 2000-2050 climate change
on US PM$_{2.5}$ air quality

Tai et al. [2012 ab]
AQAST PI: L.J. Mickley
**AQAST Year 1 Highlight:** forecast support for DISCOVER-AQ

**NASA P-3 aircraft**

**Statistical ozone forecasts provided to Maryland Department of Environment (MDE) during DISCOVER-AQ**

Garner et al., in prep.

**AQAST PI:** A.M. Thompson
AQAST Year 1 Highlight: The Saint Louis Ozone Garden

An education and public outreach AQAST activity

Ozone garden at the Missouri Botanical Gardens

Planting the garden

One of four explanatory signs

Educating the public on ozone pollution effects on plants

AQAST PI: J.G. Fishman
AQAST Year 1 Highlight: Air quality workshops

• Physical Atmosphere Advisory Group Spring 2012 Meeting (Atlanta, Apr 2012)
  AQAST PI R.T. McNider
  • Examine the difficulties of AQ models to represent the physical atmosphere
  • Assess value of satellite data for addressing these difficulties

• Using remote sensing data for air quality applications (U. Wisconsin, March 2012)
  ARSET/LADCO with AQAST PIs T. Holloway, B. Pierce, G. Carmichael
  AQAST members Tracey Holloway and Brad Pierce provided talks on their AQAST projects
  at an NASA ARSET hands-on workshop for air quality agencies in the mid-western U.S.
  The workshop was held at the University of Madison, WI on March 12-15, 2012. This workshop
  was funded and organized by the NASA/ARSET Program (within the NASA Applied Sciences
  Program) and the Lake Michigan Air Directors Consortium (LADCO). The University of Wisconsin
  Madison (AQAST members Tracey Holloway and Brad Pierce) kindly provided a free computer
  room for workshop attendees.
COMMUNICATION TOOLS

• Website: http://acmg.seas.harvard.edu/aqast

AIR QUALITY APPLIED SCIENCES TEAM (AQAST)

EARTH SCIENCE SERVING AIR QUALITY MANAGEMENT NEEDS

AQAST is a NASA team of atmospheric scientists working in partnership with US air quality managers to exploit the power of Earth Science tools to address air quality issues. We conduct a wide range of projects using satellite data, suborbital data, and models, and work with air quality agencies from the local to the national level. Please browse through this website to see what AQAST is all about!

• Newsletter: subscribe through website

AQAST newsletter January 2012

Welcome to the January 2012 newsletter of the NASA Air Quality Applied Sciences Team (AQAST). This bimonthly newsletter keeps you up to date on AQAST publications, activities, and events. Catch up by reading previous newsletters. Visit regularly the AQAST website for more detailed information on ongoing projects. Subscribe/unsubscribe to this newsletter by email to Bob Yantosca.

• Ning site (intrateam)

Welcome to NASA AQAST, Daniel. J. Jacob!
Here are a few things you can do right now...
Meeting schedule

DAY 1:
• Reports on AQAST Investigator Projects
• Reports on other AQ activities of the NASA Applied Sciences Program
• Poster session (evening)

DAY 2:
• Morning: Air Quality Managers’ Session
  • What are the critical issues facing AQ managers and how can AQAST help?
• Afternoon: Progress reports from Year 1 Tiger Teams and break-outs

DAY 3 (morning): AQAST Executive Session
• Education and Public Outreach
• Review of AQAST Year 1
• Overview of Year 2 activities, response to AQ management needs