



Hazards Workshop

Environmental Air Hazards

Aerosols

Particulate Matter – fine (2.5) and coarse

Dust – fine (2.5) and coarse

Smoke, combustion, sulfates

Nitrates and Sulfates

Secondary organics

Ozone

NOX, NO₂

SO₂

Volatile Organic Compounds (VOC)

Carbon Monoxide

Toxics

CO₂

Methane and other greenhouse gases

Topics:

PM Forecasting in US

Longer-term PM issues

**International aspects of PM,
including transport**



Approach

State of Practice & What can currently do

Satellite observations

Models

Uncertainty, error estimates, etc.

Needs and directions to improve state of practice

Contributing Factors

Urbanization, Fires

Specific projects, studies, meetings, events to target



PM - Forecasting NRT in US

State of Practice

- NASA has 10 km MODIS AOD product (MISR 20 km, 7-9 day repeat)
- 5 km and 1 km products are in development
- 1 km products have been tested in case studies (China, etc.)
- Need to assess gradients in 10km product
- Accuracies have been driven by the climate community
- Particle size over land – maturity in 1-3 years expected
- Better temporal resolution may be more important than finer spatial resolution. Hourly data is desired.
- Context is current strength for forecasting community (spatial & temporal extent of an event)

AOD is an atmospheric column measurement; need better vertical stratification for PH exposure use. Would be beneficial in evaluating transport issues too.

Satellite data products may not/should not replace other ground based and more specific measurements that currently exist. Scale of health impact is a key consideration, is PH area of interest local, city, regional or larger scale?



PM - Forecasting NRT in US

Products not being produced that could be:

- CALIPSO
 - AOD on CMAQ grid
 - NRT availability of CALIPSO products
- Interest in 1 km to 500 m seasonal product for dust assessment
 - *MOD12 product: Need for seasonally-updated product*
 - *Possible linkage to Drought – NIDIS*
- Interest in a pollen product – needs more definition on specifics



PM - Forecasting NRT in US

Emission Inventories – Especially Fire Emissions

State of Practice: Some groups are doing integration of MODIS fire products into NRT forecasting (e.g., USFS & BlueSkyRAINS in Pac.NW; some in Southeast)

Needs: Location, intensity, duration are issues to characterize fire events.

Need a national integration effort

Data products: Desire for soil moisture and surface roughness for models

NRT sources of dust (esp. speciation) – this may be more a regional issue

Ideas for activities:

- Evaluate how much new emissions products improve current forecasting efforts
- Possibility to incorporate DREAM into forecasts.

Issue: Does information on biomass combustion benefit the PH community? As well as other sources of uncontrolled burning.

Between Fire Emissions and Dust, fire is the more immediate priority



PM - Forecasting NRT in US

Visualization for PM Forecasting:

3D-AQS project doing work in this area; significant work by other teams also

Much of the current use of satellite observations is for qualitative information

Some quantitative but largely for contextual information relative to forecasting

Example: CALIPSO images shown Tuesday

Project: Visualization Workshop

Gather the visualization specialists, air quality forecasters, media?, others to discuss approaches to displaying qualitative information



PM - Forecasting NRT in US

Contributing Factors – Urbanization & Land Cover

State of Practice: Currently using fixed boundary conditions rather than time-variant global boundary conditions

spatial patterns change overtime but is poorly characterized in AQ models

Dynamic LCLU forecasting data is not typically used in forecasting;

LDAS group evaluating the dynamic LCLU issue as a WRF input for weather

Future climate change scenarios to 2050 are being used in forecasting

Needs : Better characterization of urban sources & LU-LC change in Air Quality models

Project: Investigate land-cover in EPA CMAQ, WRF (AQ perspective rather than weather)

Land-use database: how would this effect biogenic emissions



PM - Forecasting - International

International (PM)

State of Practice:

Gaps in research on health effects of air pollution in developing countries
Effects of long term exposure in developing countries needs more research.

Issue: Can we provide PM mass concentrations for selected international locations?

Aerosol mix may be very different in developing countries.

Need: Estimate burden of disease due to air pollution effects globally.

- How effectively can we use US studies for risk estimations internationally
- More ground based measurements are needed.

Project: Workshop may be beneficial to address burden of disease and technological issues.



PM - Forecasting NRT

Project – Beijing Olympics:

Background: China is expected to take unprecedented efforts to clean up air quality in Beijing and the larger region. This provides a tremendous natural experiment to understand how changes in emissions affect air quality and the resulting health impacts.

Project: Create an integrated data set of satellite observations for a period *before, during, and after* the Olympics. Data may be available from NASA and NOAA satellites, as well as other satellites from ESA and other agencies.

Satellite data could be integrated with surface observations in China and in downwind countries (Korea, Japan, U.S., Canada). An agreement could be made to create an integrated archive, which may actually be distributed.

Decisions would need to be made about the appropriate domain, scope, and temporal character of the dataset. Near real time information could be useful for Chinese authorities and air quality forecasting efforts during the Olympics.

Additional Effort:

Interagency group meet with US Olympic Committee to discuss possible air quality support and assessments during the Olympic timeframe, especially for major outdoor events such as the marathons and track & field competitions.



Overall Findings – Part 1

Seemingly little collaboration between US and Europe on forecasting and analysis. US and Europe both have satellites, tools, and data.

Comparisons of satellite observations and modeling efforts is well done in the research communities (LRTAP example); however, these techniques and knowledge need to get out to the broader AQ community

Activities for GEO: Global training and capacity building on a country or regional scale would be beneficial. Could be useful to attract more scientists/researchers to the GEO user groups.

Better coordination with European and other parts of world



Overall Findings – Part 2

This needs to be just one of several more meetings between Public Health and Earth Science communities to make real progress

- Exchange of Epidemiology 101 & Earth Observation 101 courses
- Significant efforts to understand languages and build familiarity/trust
- PHASE project – part of success was a focus on specific issue enabled linkages



Overall Findings – Part 3

Communities using satellite data for air quality are small.

Satellite data very useful for model evaluation, particularly on large scales.

Needs:

Capture consensus views of best practices that include the use of satellite data for model validation and share with the air quality community.

How can evaluation tools, techniques, and data be more available to a larger community?

Project: Evaluation on state of practice on comparing satellite observations and models: Current best practices on techniques/knowledge need to be shared with the broader community

Website – pre-processed datasets targeted at building familiarity.

What ISCCP did with clouds is an approach to emulate

Need review articles on various state of the art practices for use of Earth science data in air quality forecasting.