NASA’s Applied Remote Sensing Training Program (ARSET)

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NASA Health and Air Quality Applications Program Review
September 20th, 2012
Applied Remote Sensing Training (ARSET)
DEVELOP
Gulf of Mexico Initiative
SERVIR
GOAL:
Increase utilization of NASA observational and model data for decision-support

Objectives:
• Provide end-user communities and institutions with professional hands-on technical workshops
• Build long term partnerships with end-user communities and institutions in the public and private sectors

ARSET disseminates the usage of existing NASA data, web tools, Decision Support Systems and applied research, in addition to collaborating with other capacity building programs within NASA
ARSET Team Members

Project Lead
Ana Prados (GSFC/UMBC)

Air Quality
• Pawan Gupta (GSFC/GESTAR)
• Richard Kleidman (GSFC/SSAI)
• Yang Liu (Emory University)
• Jacquie Witte (GSFC/SSAI)

Water & Disasters
• Chris Mattmann (JPL/Caltech)
• Amita Mehta (GSFC/UMBC)
• Tom Painter (JPL/Caltech)
• Cindy Schmidt (AMES/Baeri)

Other Support
• Marines Martins (GSFC/SSAI)
• Annelise Carleton-Hug (Trillium A./Evaluation)

Students
• Maria Stenborg (UMCP)
• Alison Hoy (UMCP)
Health (Air Quality) (AQ)
http://airquality.gsfc.nasa.gov/
- 2008 – present
- 26 Trainings
- +500 end-users

Water Resources and Disasters
http://water.gsfc.nasa.gov/
- April 2011 – present
- 2 Trainings

Ecological Forecasting
- Est. 2013

Other Health and Disasters Application Areas
- Est. 2014
Trainings have also been conducted in Costa Rica, Colombia, Canada, Italy, Australia, Singapore, and Vietnam.
Trainings have also been conducted in Costa Rica, Colombia, Canada, Italy, Australia, Singapore, Vietnam and at the World Bank (Washington D.C).
ARSET Trainings by Societal Benefit Area

2009 – March 2013

Number of Trainings

Health/Air Quality: 32
Water Resources: 8
Disasters: 1

- Health/Air Quality
- Water Resources
- Disasters
Workshop Goals
Train end-users on how to apply NASA Earth Science Data in their professional area

Workshop Objectives
• Teach access to NASA data and utilization web-tools
• Improve access to NASA policy-relevant research
• Provide applications Case Studies
• Teach appropriate use of NASA remote sensing data
• Provide a forum for end-user feedback to help identify Earth Science information needs and to inform future trainings
Who is ARSET Training?

- **Public Sector:** U.S EPA, USDA, BLM, NOAA, regional, state, county agencies, Tribal Nations, water resources managers, watershed and reservoir managers
- **Private Sector:** Industry, agricultural sector, NGOs
- **Attendees at Professional Conferences**
- **Participants of NASA Campaigns**

**End-User Feedback:**

- Positive reviews from ‘Training customer satisfaction surveys’.
- **Continued requests for follow-up trainings:** California Air Resources Board, LADCO
- Increase in number of end-users trained per year since 2008
- Students Becoming Teachers as trainers!

Seeking to better engage the NGO community, industry and Tribal Nations in 2012+
Basic in person course
• For individuals and institutions new to remote sensing
• Trainings at professional conferences

Online courses
• Provide background material in preparation for in person trainings
• Advanced online courses on special topics

Advanced in person course
• Focused on a specific application/problem: for example impact of snow melt in California on stream flow
• Requires basic online or in person course.
Sample NASA training slide as viewed by end-users taking the online course. The interface provides both visual and audio connectivity, and the capability for attendees to provide feedback via chat (upper left) or by asking questions in turn. This slide shows an example of two NASA aerosol products that can be used to detect smoke plumes.
Case Studies and Hands-On Activities
Exercises with Step-by-Step Instructions

1) Access to NASA imagery
2) Access to other data: model, in-situ, etc.
3) Utilization of image analysis tools

4) Assessment: Precipitation propagation and its geographical impacts.
ARSET Training for Lake Michigan Air Directors Consortium (LADCO) – March 2012

- A three day in-person air quality training that reached 20 attendees from federal agencies in the U.S and Canada and 6 state agencies in the mid western and central US.

- **Co-sponsored Lake Michigan Air Directors Consortium (LADCO)**

- Attendees learned how to apply NASA satellite data, imagery and web tools to air quality management problems in their region.

- Air Quality Applied Sciences Team (AQAST) presentations during the training enabled interactions between LADCO member states AQAST PIs.

- Participants prepared and presented air quality case studies of their choosing and provided feedback to NASA instructors on the utility of NASA resources.

  NASA training in progress at the University of Wisconsin Madison facility. The course had 20 attendees from the Lake Michigan Air Directors Consortium (LADCO), Minnesota Pollution Control Agency, Michigan Department of Environmental Quality (DEQ), Wisconsin Department of Natural Resources, Idaho DEQ, Oklahoma DEQ, Indiana Department of Environmental Management, US Environmental Protection Agency (EPA) Region 5, Michigan Tech Research Institute and Environment Canada. End-user feedback from a NASA air quality online course held in February 2012 was used to tailor this training event to mid-western environmental management issues and to refine the agenda to focus on 1) less NASA products in greater detail and 2) inter-comparisons between NASA data and air quality model output.
New Training Module: From Satellite to PM$_{2.5}$ to Air Quality Index

Training Exercise developed by Pawan Gupta. Course attendees compute satellite derived Air Quality Index (AQI) for the LADCO region with instructor provided IDL code and export it to excel. The last two columns show a comparison of satellite and ground based AQI. Satellite and surface measurements generally agree in predicting these categories.
Course preceded by a mandatory five week webinar (May 9-June 1)

4 day (June 11-14) in-person course: aerosol and trace gas products from seven different NASA sensors and numerous NASA websites.

“For me, the greatest value in attending these events was to learn about all the possible applications of remote sensing in the different fields of air quality…. Last but not least, I am looking forward to attending the ‘advanced’ webinar series!!!

“ – Nevada Division of Environmental Protection

Over 60 participants in the live webinar series. The in person course averaged 27 per day.

100% of in person course participants rated the course as very good (50%) to excellent (50%).
Training Activities Coming up: Air Quality

http://airquality.gsfc.nasa.gov

• Four additional trainings through Spring 2013

• Advanced online course: Colorado/Utah Fires August 2012, Wednesdays 3-4 PM EST, **Completed!**

• Training for Environmental Canada (online and hands-on). **Online course full within one week (+60 registrations)**, ARSET AQ team is **VERY popular!!!**

• Reaching other parts of the US: Texas, Colorado, and Utah.
http://water.gsfc.nasa.gov

- Flooding/Drought - TRMM, MERRA, NLDAS: Latin America (Colombia/GEO, November 2011); South Central U.S. (U. of Oklahoma, June 2012); **online course November 2012**
- Coming up - **Courses on MODIS snow products**: local and state agencies in California and Colorado River Basin (Fall 2012/Spring 2013).
- Coming Up: online course on evapotranspiration and other land products, drought applications; western US end-users (Spring 2013).
Publicly available Modules

Case Studies

Upcoming trainings

http://airquality.gsfc.nasa.gov/

Applied Remote Sensing Education & Training
Air Quality

ARSET: Air Quality

The goal of the NASA Applied Remote Sensing Education and Training (ARSET) air quality project is to increase the utility of NASA earth science and model data for policy makers, regulatory agencies, and other applied science professionals in the area of air quality applications. The two main activities of this project are:

- Provide in-person and on-line courses, workshops and other capacity building activities throughout the year.
- Disseminate via this web page course materials and other information to enable training in applied air quality remote sensing.

Project courses are a combination of lectures and computer hands-on activities that teach professionals how to access, interpret, and apply NASA aerosol and trace gas data at regional and global scales with an emphasis on case studies. Course topics include:

- Case Studies in air quality analysis tailored to end-user needs, such as urban air pollution, dust, and fires.
- Satellite aerosol and trace gas products, their application and relationship to in-situ monitor data.

Scheduled Trainings

NASA Training for LADCO (Lake Michigan Air Directors Consortium)
University of Wisconsin at Madison
March 12 - 15, 2012

Please contact us if you are interested in applying for a NASA Remote Sensing Workshop
Quote from Idaho End User

“Yes, I’ve been using what I’ve learned to try to track and identify aerosols and to provide support to the analysts who predict AQI in our regional offices. Our seasonal smoke coordinators sometimes need help as well with ozone prediction for field burning permits, so I’ve been doing what I can there, too. Many of our air quality analysts are pretty excited about some of the tools and websites I’ve shared with them from the course”.

What do other end-users and ARSET trainees think?

What are the changes in data utilization for decision support?
ARSET Program Evaluation

20 Interviews (in progress) and +500 online surveys to be sent out by early 2013 to former ARSET course attendees.

Conducted by a professional evaluator.

1) ARSET project assessment to help inform future program directions.

2) Identify end-user needs and barriers to utilization of NASA resources (in conjunction with parallel NASA AQAST project- Bryan Duncan/Ana Prados).

3) Type of environmental management activities where NASA resources are being integrated.
Where do YOU come in?

ARSET works directly with NASA funded PIs.

We can help disseminate YOUR applied research & decision support tools

Please contact your favorite ARSET-AQ Team member!

My personal opinion: develop training modules in infectious and vectorborne diseases area with the help of PIs
NASA Applied Remote Sensing Training Websites
http://arset.gsfc.nasa.gov/
http://water.gsfc.nasa.gov/ (Water/Disasters)
http://airquality.gsfc.nasa.gov/ (Air Quality)

Updates and notification of upcoming workshops
Water Resources/Disasters
https://lists.nasa.gov/mailman/listinfo/nasa-water-training

Air Quality
https://lists.nasa.gov/mailman/listinfo/arset
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Back up slides
ARSET: Workshop 12-month cycle

Identify Host Institution
12-11 months
End-user Needs Assessment

Plan Training / add to workplan
Advertise 10 months

End-user Telecons Finalize Agenda
5-3 months

Develop modules and Case Studies
1-3 months

Conduct Training:
Online Presentations
Hands-on activities
Case Studies

Other Activities
• Advertise via list-serv and Webpage
• Collaborate with NASA Applied Science PIs
• Collaborate with NASA Data Centers
• Work with Advisory Group
• Attend professional conferences

Project Evaluation: Surveys and Feedback
ARSET Best Practices

✓ 1. Trainers first: Skill building for NASA Scientists
✓ 2. Leveraging of multiple NASA resources
   - Applied Sciences Program PIs and applied research
   - NASA Data Centers
   - Other Capacity Building Programs
✓ 3. Gradual learning approach
   - ABCs of NASA Data: What and what for?
   - Access and analysis
   - Application to decision-support
✓ 4. Heavily focused hands-on learning
✓ 5. Continued/ongoing interaction with end-users
✓ 6. Workshop Surveys
✓ 7. Ongoing Project Evaluation Plan
### Training Schedule 2012-2013

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<tr>
<th>Event</th>
<th>2012</th>
<th>2013</th>
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<tr>
<td></td>
<td>Feb</td>
<td>Mar</td>
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<tr>
<td>1 Monthly AQ Forum</td>
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<td>2 LADCO Basic AQ Webinar</td>
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<td>3 LADCO Basic AQ hands-on</td>
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<td>4 DRI Basic AQ Webinar</td>
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<td>5 DRI Basic AQ hands-on</td>
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<td>6 Oklahoma Basic Water hands-on</td>
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<tr>
<td>7 Advanced AQ Webinar (Colorado Fires)</td>
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<td>8 CMAS Basic AQ hands-on</td>
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<td>9 California/CO Basic Snow Webinar</td>
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<td>10 World Bank Basic Water hands-on</td>
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<td>11 Env. Canada Basic AQ Webinar</td>
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<tr>
<td>12 Env. Canada Basic AQ hands-on</td>
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<tr>
<td>13 Colorado Basic Snow hands-on</td>
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<td>14 California Land/ET Basic Webinar</td>
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<tr>
<td>15 Basic Atmospheric Water webinar</td>
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<tr>
<td>16 Texas Basic AQ hands-on (tentative)</td>
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<tr>
<td>17 California Basic Snow hands-on</td>
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- **Water**
- **Air Quality**
- **Other**