



NASA's Applied Remote Sensing Training Program (ARSET)

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NASA Health and Air Quality Applications Program Review

September 20th, 2012

NASA Applied Sciences: Capacity Building Programs



Applied Remote Sensing Training (ARSET)

DEVELOP

Gulf of Mexico Initiative

SERVIR

Applied Remote Sensing Training (ARSET)

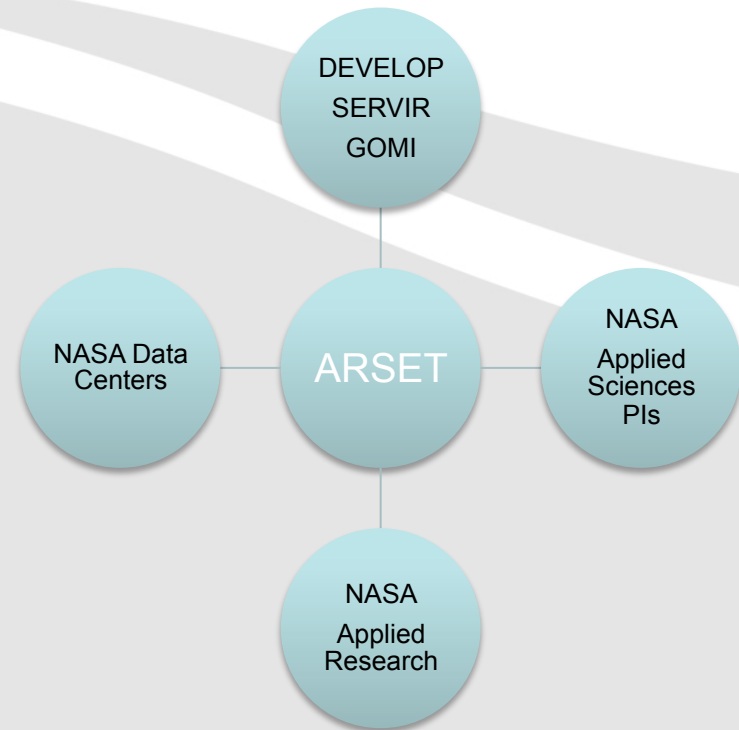


GOAL:

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)

ARSET: Application Areas Supported



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

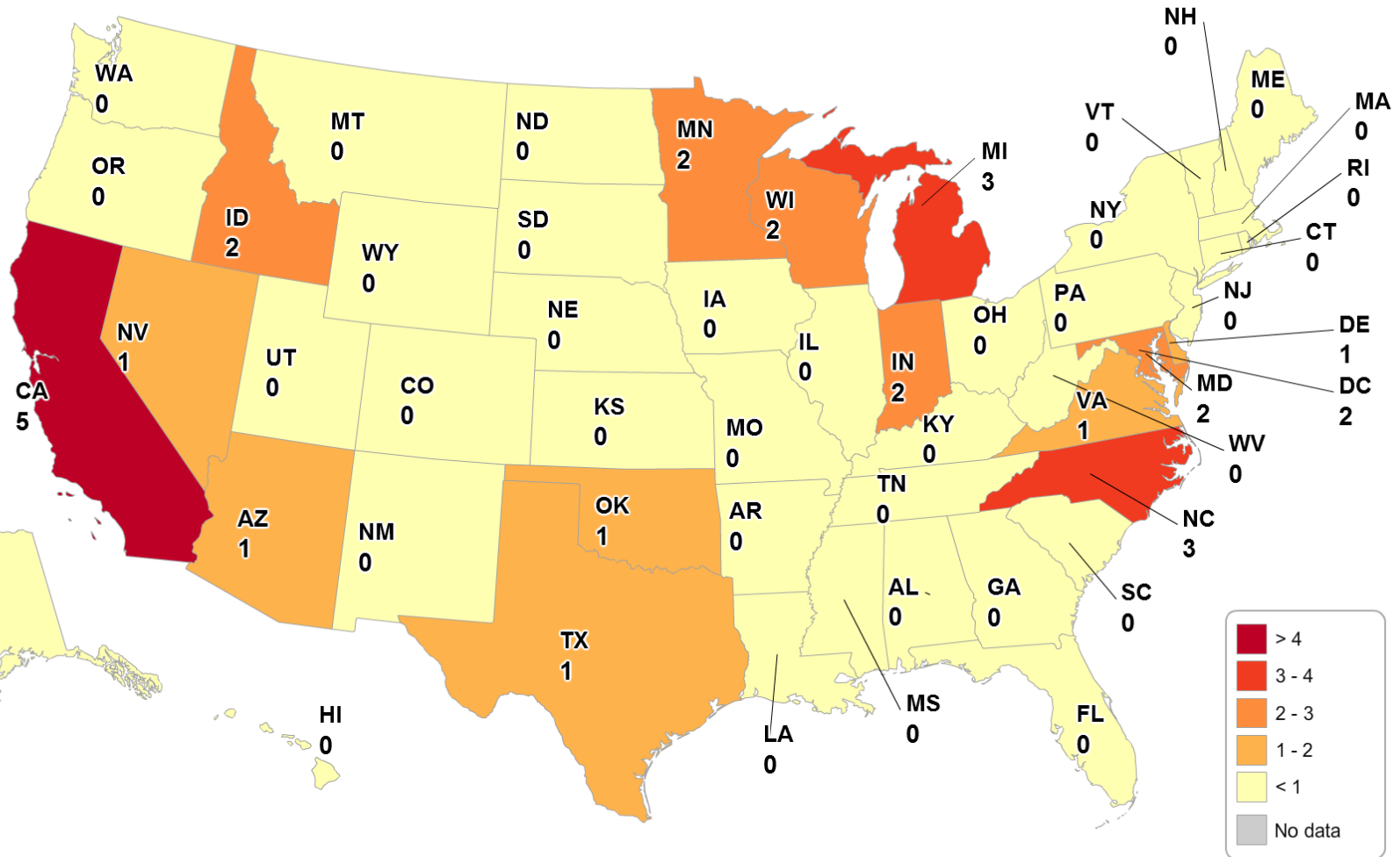
Other Health and Disasters Application Areas

- Est. 2014

ARSET Trainings at a Glance

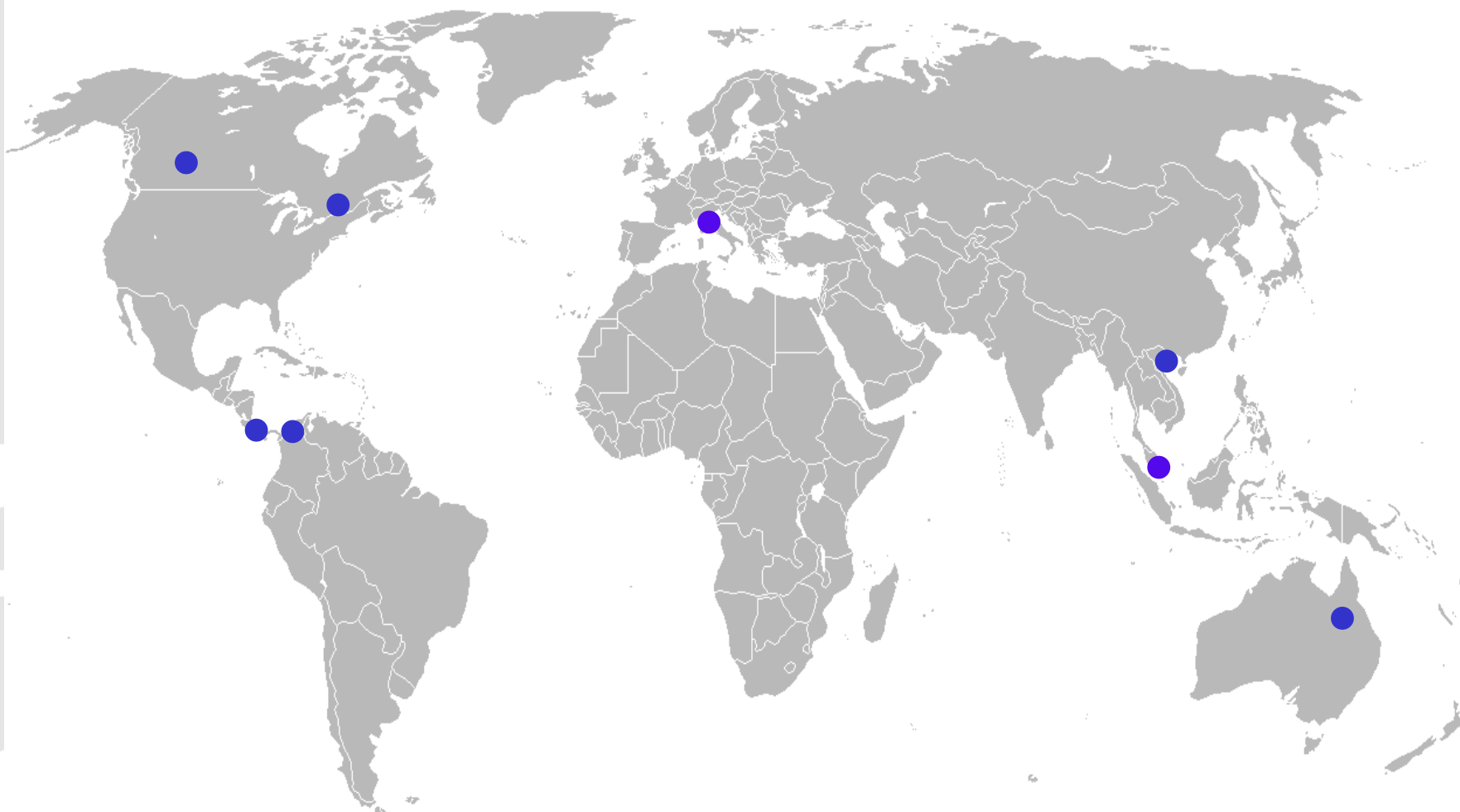


Number of NASA online or hands-on trainings per state.



Trainings have also been conducted in Costa Rica, Colombia, Canada, Italy, Australia, Singapore, and Vietnam

ARSET Trainings at a Glance: International

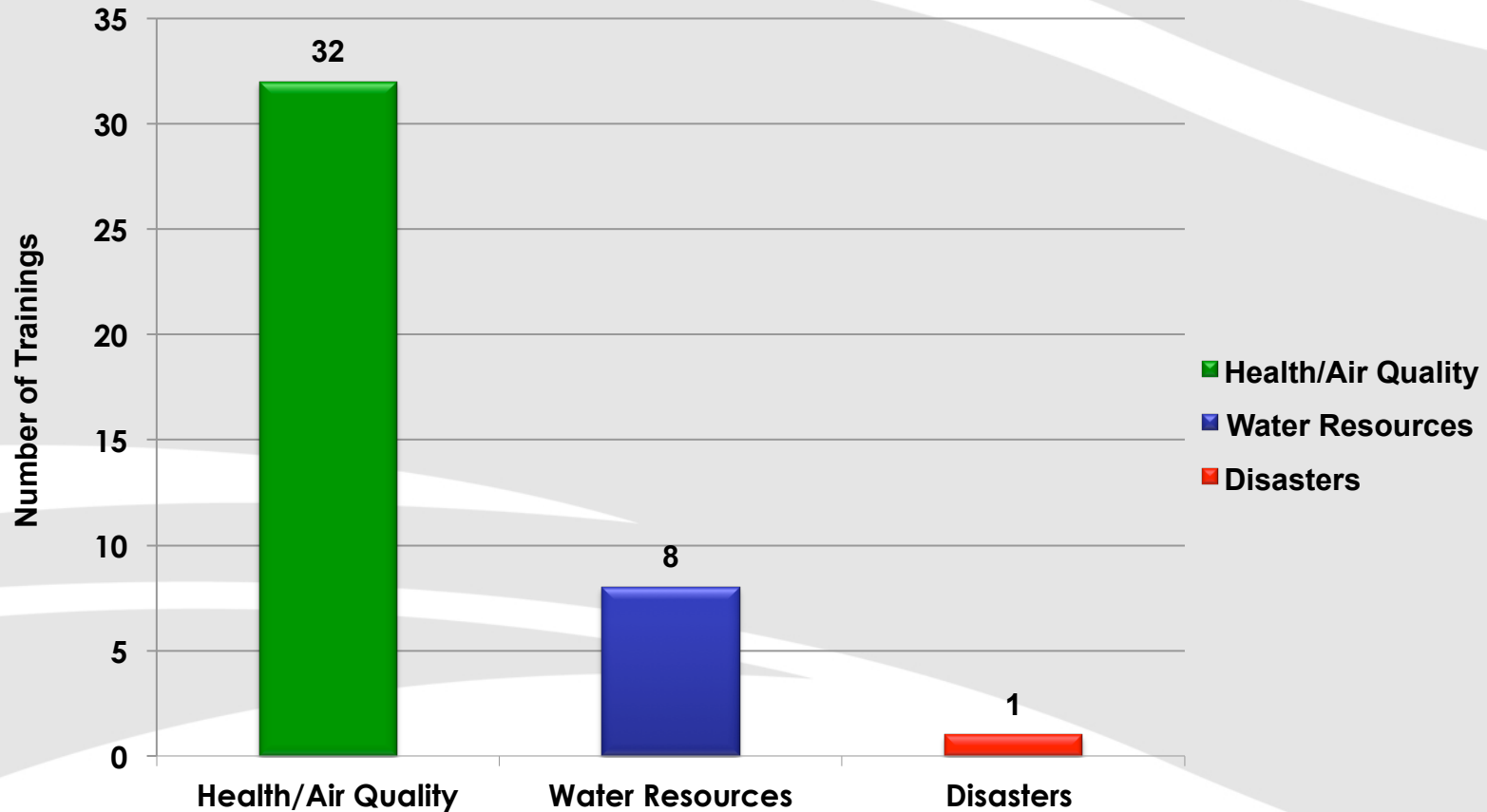


Trainings have also been conducted in Costa Rica, Colombia, Canada, Italy, Australia, Singapore, Vietnam and at the World Bank (Washington D.C)

ARSET Trainings by Societal Benefit Area



2009 – March 2013



ARSET Remote Sensing Workshops



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 !



NASA Training for California Air Resources Board, Sacramento, CA
December 2011

***Seeking to better engage the
NGO community, industry and
Tribal Nations in 2012+***

Gradual Learning Approach



Basic in person course

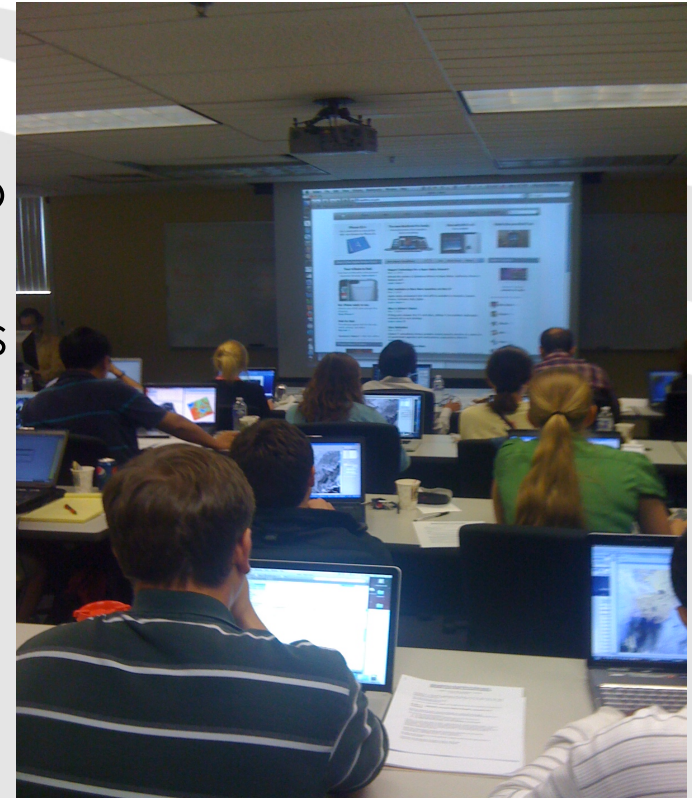
- For individuals and institutions new to remote sensing
- Trainings at professional conferences

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.





The Increasingly Popular ARSET Online Courses

The screenshot displays a Blackboard Collaborate session window. On the left, a chat window shows messages from participants like Jessica McCarty and Rich Kleidman. Below the chat is a participants list including Pawan Gupta, Rich Kleidman, and Abby Jaye. The main content area shows a slide titled "Radiance -to- Aerosol Products" with a large red arrow pointing right. The slide content includes a satellite image of "ODIS-Terra, May 2, 2007" and a corresponding aerosol retrieval map. The map shows a color-coded aerosol plume over the Indian subcontinent, with a "High" concentration area in red and a "Low" concentration area in blue. A "No Retrievals" area is also indicated.

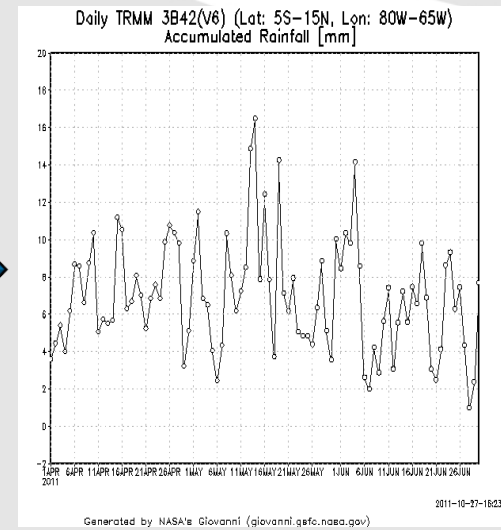
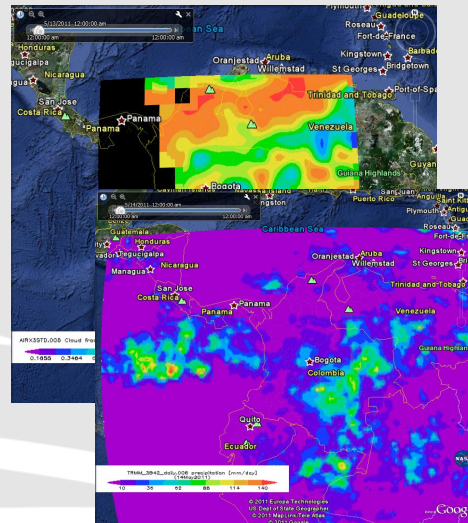
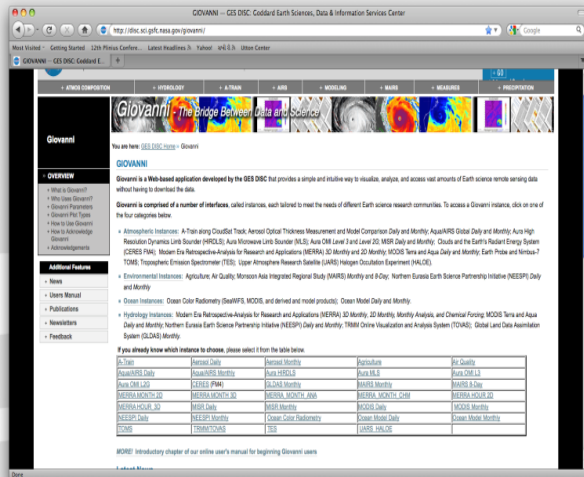
Sample NASA training slide as viewed by end-users taking the online course. The interface provides both visual and audio connectivity, and the capability for attendees to provide feedback via chat (upper left) or by asking questions in turn. This slide shows an example of two NASA aerosol products that 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.

ARSET Training for Lake Michigan Air Directors Consortium (LADCO) – March 2012



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.

	A	B	C	D	E	F	G
7	0.28	12	20.2	Good	Moderate		
8	0.16	9	14.6	Good	Good		
9	0.03	15	8.5	Good	Good		
10	0.05	8	9.5	Good	Good		
11	0.05	7	9.5	Good	Good		
12	0.04	10	9.0	Good	Good		
13	0.03	6	8.5	Good	Good		
14	0.04	8	9.0	Good	Good		
15	0.19	4	16.0	Good	Moderate		
16	0.13	8	13.2	Good	Good		
17	0.16	11	14.6	Good	Good		
18	0.02	3	8.1	Good	Good		
19	0.3	17	21.2	Moderate	Moderate		
20	0.01	7	7.6	Good	Good		
21	0.01	14	7.6	Good	Good		
22	0.17	14	15.1	Good	Good		
23	0.16	16	14.6	Moderate	Good		
24	0.04	5	9.0	Good	Good		
25	0.08	5	10.9	Good	Good		
26	0.11	18	12.3	Moderate	Good		
27	0.02	12	8.1	Good	Good		
28	0.52	32	31.4	Moderate	Moderate		
29	0.56	32	33.3	Moderate	Moderate		
30	0.46	21	28.6	Moderate	Moderate		
31	0.43	25	27.2	Moderate	Moderate		
32	0.32	12	22.1	Good	Moderate		
33	0.48	18	29.6	Moderate	Moderate		
34	0.11	7	12.3	Good	Good		
35	0.11	7	12.3	Good	Good		
36	0.56	26	33.3	Moderate	Moderate		
37	0.84	41	46.4	Unhealth for S	Unhealthy for Sensitive Group		

Building capacity for tracking aerosols in the southwestern U.S.: NASA courses in Nevada



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!!!

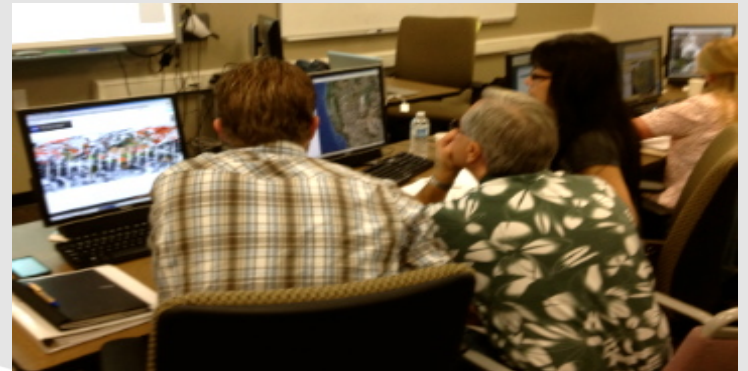
“ – Nevada Division of Environmental Protection

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%).



NASA hands-on computer exercise in progress, Reno, NV



Participants work in small groups to analyze an air quality event of their choice using tools and data presented at the webinar series and at the DRI in-person training. Agencies in attendance: Clark Co. Department of Environmental Quality, Washoe Co. Health District - air quality division, Pyramid Lake Paiute Tribe, Nevada Division of Environmental Protection, and DRI.

Training Activities Coming up: Air Quality



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

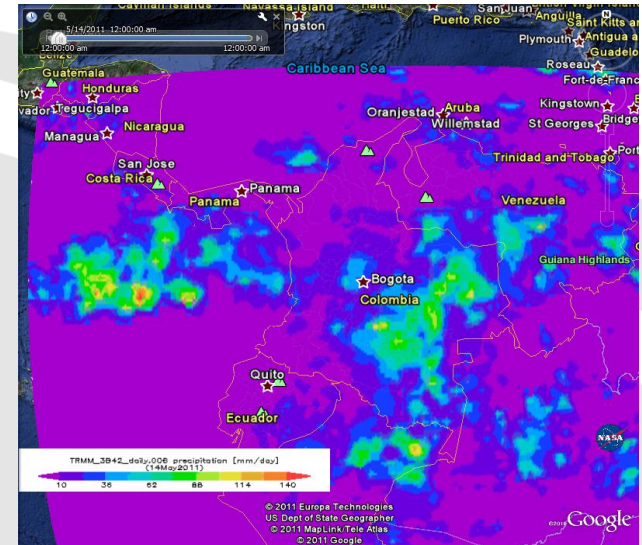
- Four additional trainings through Spring 2013
- Advanced online course: Colorado/Utah Fires August 2012, Wednesdays 3-4 PM EST, **Completed !**
- Training for Environmental Canada (online and hands-on). **Online course full within one week (+60 registrations), ARSET AQ team is VERY popular !!!**
- Reaching other parts of the US: Texas, Colorado, and Utah.

Water Resources and Disaster Management



<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

NASA National Aeronautics & Space Administration
Goddard Space Flight Center

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Applied Remote Sensing Education & Training Air Quality

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- Publications
- ▶ Personnel

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.

ARSET Email Alerts

If you would like to be informed of new materials and upcoming workshops please sign up for our list serv.

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



Assessing program outcomes

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

ARSET Web Sites and Updates



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>

Program Contact Information



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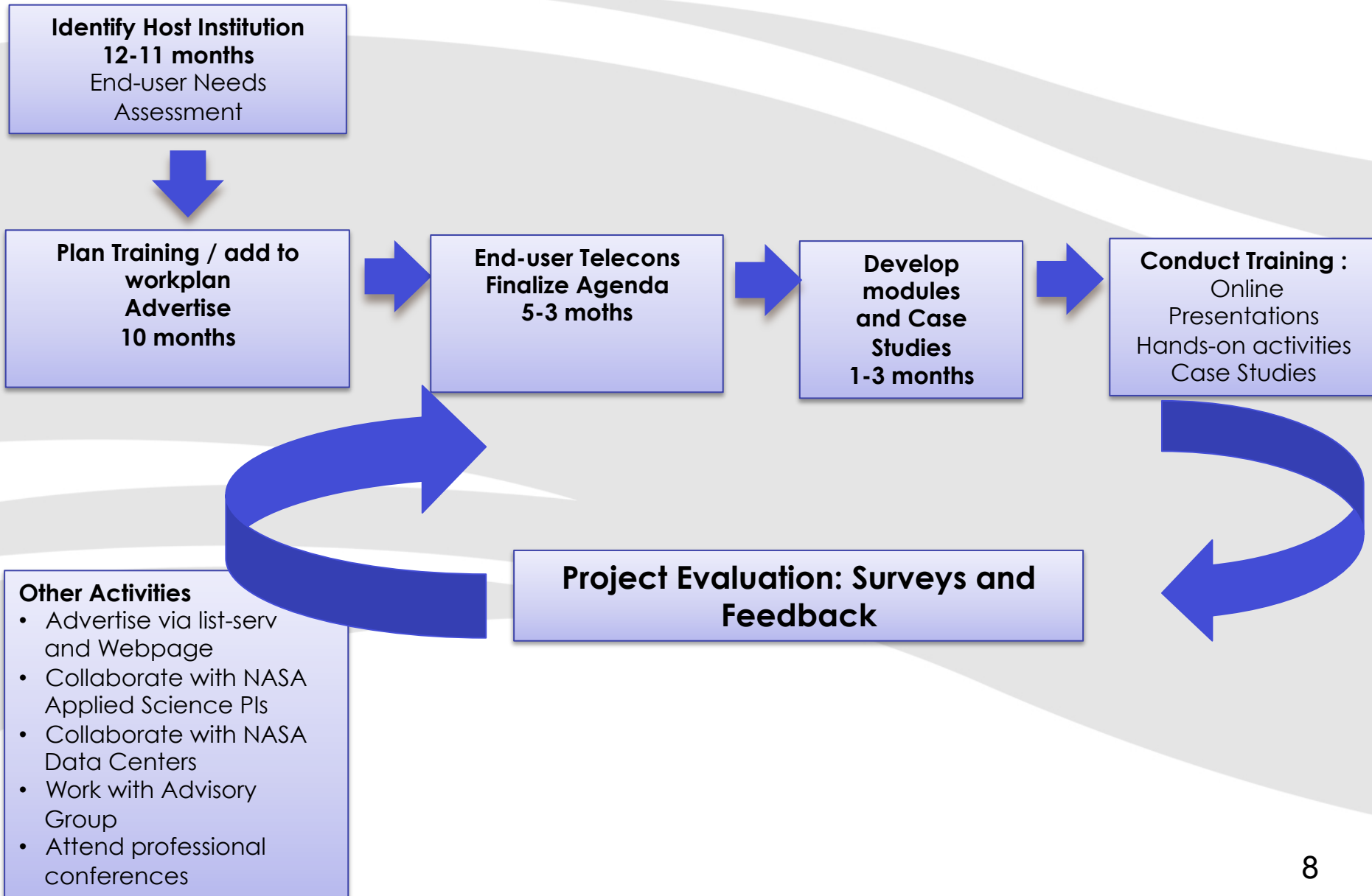
Pawan Gupta (aerosols/modeling)
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Jaquie Witte (trace gases)
jacquelyn.c.witte@nasa.gov

Back up slides



ARSET: Workshop 12-month cycle



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

Training Schedule 2012-2013	2012											2013			
	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1 Monthly AQ Forum					Other	Other	Other	Other	Other	Other	Other	Other	Other	Other	Other
2 LADCO Basic AQ Webinar	Air Quality														
3 LADCO Basic AQ hands-on		Air Quality													
4 DRI Basic AQ Webinar				Air Quality											
5 DRI Basic AQ hands-on					Air Quality										
6 Oklahoma Basic Water hands-on					Water										
7 Advanced AQ Webinar (Colorado Fires)						Air Quality	Air Quality								
8 CMAS Basic AQ hands-on										Air Quality					
9 California/CO Basic Snow Webinar										Water					
10 World Bank Basic Water hands-on											Water				
11 Env. Canada Basic AQ Webinar											Air Quality				
12 Env. Canada Basic AQ hands-on												Air Quality			
13 Colorado Basic Snow hands-on												Water			
14 California Land/ET Basic Webinar													Water		
15 Basic Atmospheric Water webinar														Water	
16 Texas Basic AQ hands-on (tentative)														Air Quality	
17 California Basic Snow hands-on															Water

 Water

 Air Quality

 Other