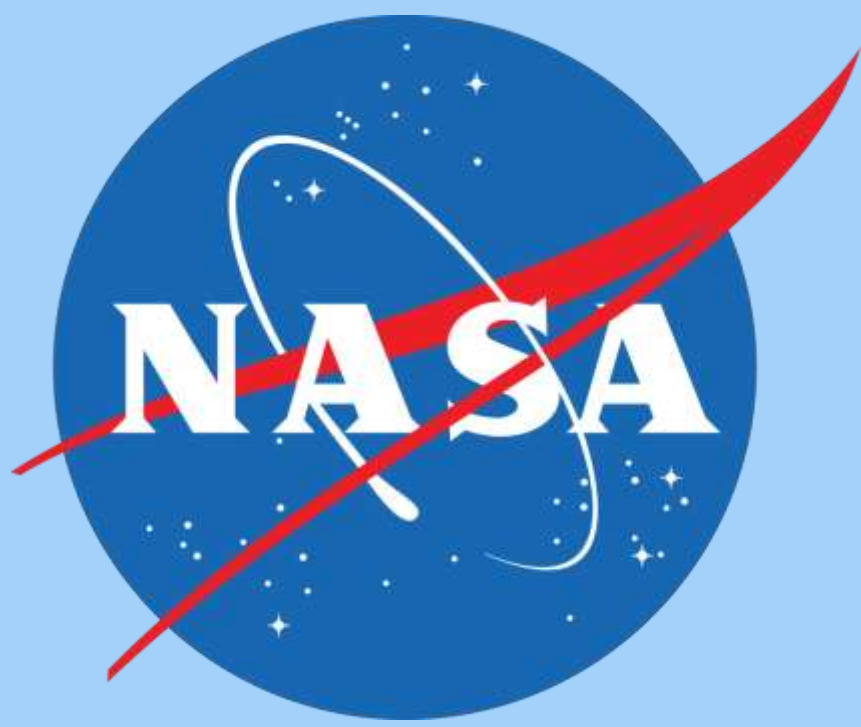


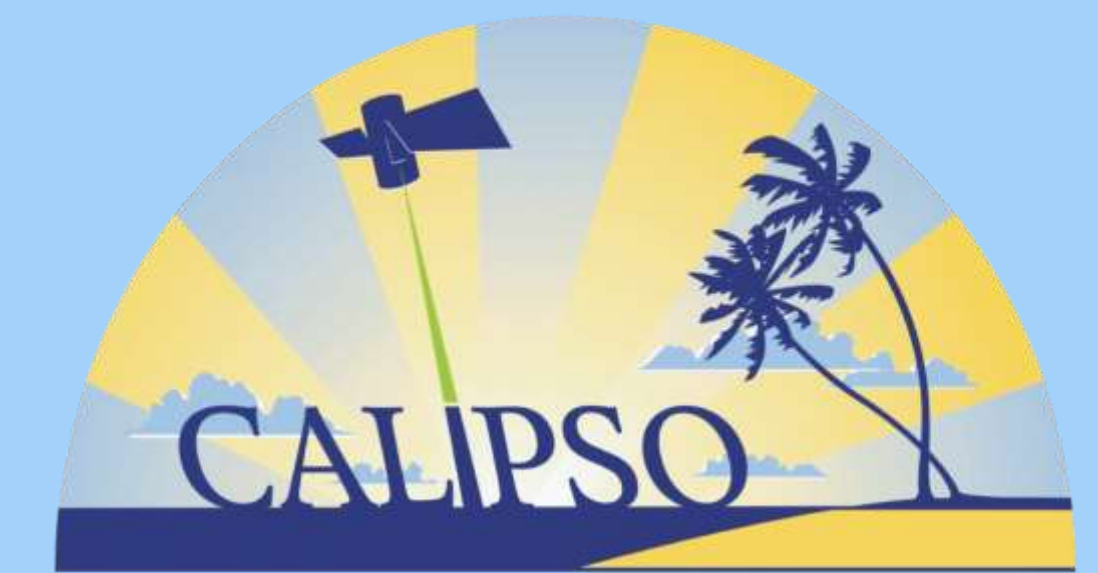


Engaging Students in Scientific Practices through GLOBE Atmosphere Investigations Program

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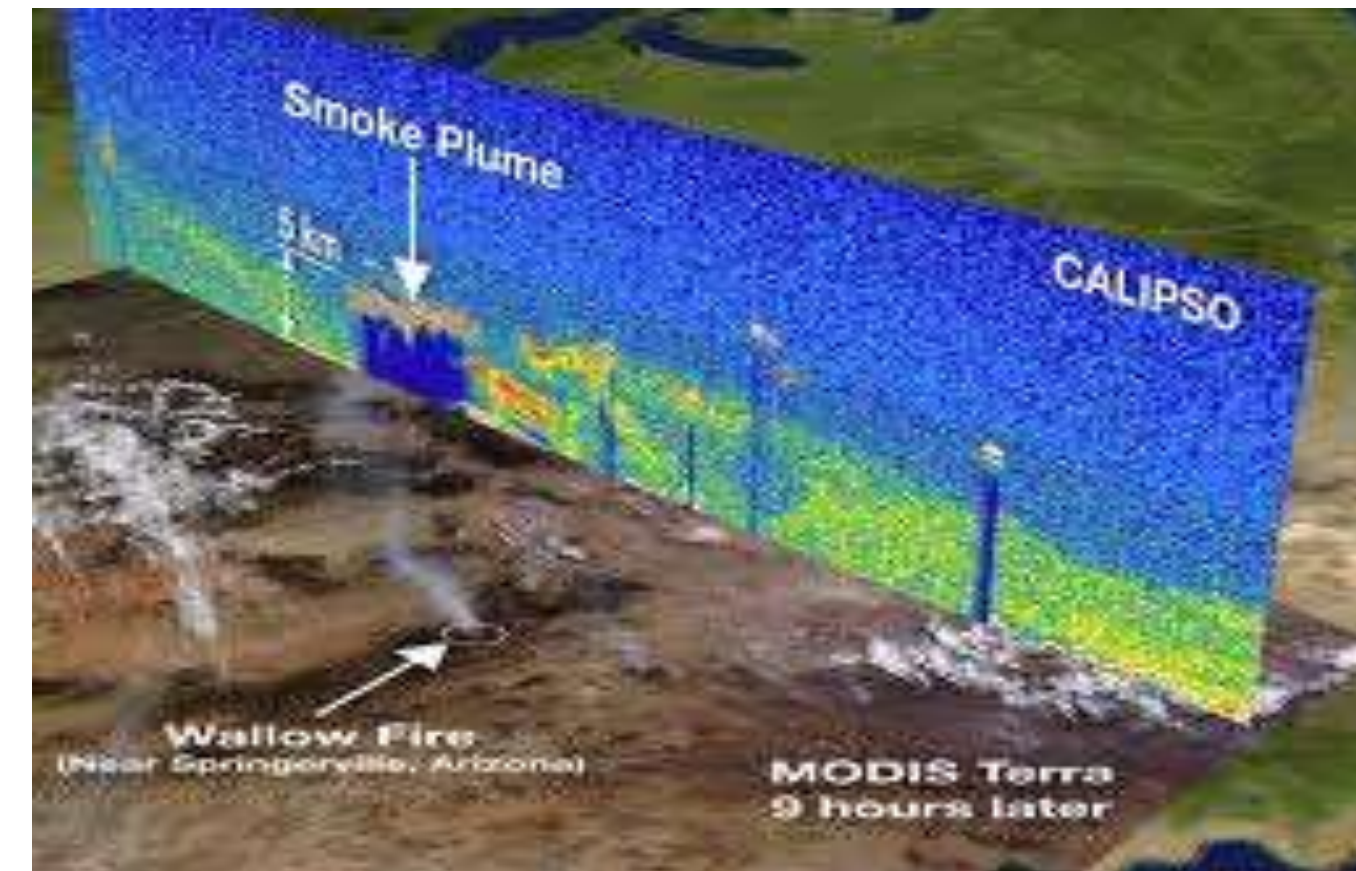


BACKGROUND

CALIPSO Satellite

The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) satellite provides insight into the role that clouds and atmospheric aerosols (airborne particles) play in regulating Earth's weather, climate, and air quality.

CALIPSO combines an active lidar instrument with passive infrared and visible imagers to probe the vertical structure and properties of thin clouds and aerosols over the globe. CALIPSO was launched on April 28, 2006 with the cloud profiling radar system on the CloudSat satellite.



CALIPSO E/PO Activities

SUPPORTING STUDENT SCIENTISTS
Encouraging students to engage in scientific investigations and discoveries, especially in the area of Earth and atmospheric sciences.

CALIPSO supports a strong educational and public outreach effort aimed at providing opportunities for teachers, K-12, undergraduate, and graduate students, as well as the general public. CALIPSO's outreach activities support students as scientists through educator professional development, student-scientist mentoring, curriculum resource development, and public outreach through collaborative mission efforts.

Mission-based Education and Public Outreach (E/PO)

Mission E/PO plans may include:

- Formal Education (K-12, Higher Education)
- Informal Education (Learning in out of school programs, museums, science centers, etc)
- Public Outreach (Raising awareness and interest of the general public)

The GLOBE Program



GLOBE (Global Learning and Observations to Benefit the Environment) is a worldwide hands-on, primary and secondary school-based science and education program that promotes collaboration among students, teachers and scientists to conduct inquiry-based investigations about our environment. The GLOBE program involves students in conducting local scientific research investigations on the environment, focused on atmosphere, hydrology, soil, and land cover. NASA's Langley Research Center has been a GLOBE Partner since 2003.

GLOBE Atmosphere Investigations Program

The CALIPSO Team is collaborating with the GLOBE Partnership at NASA Langley to develop The GLOBE Atmosphere Investigations Program (AIP). The program encourages students to engage in real science through investigations of our atmosphere. This year-long program supports both teachers and students through direct involvement with NASA research, activities, and programs.

The program provides middle and high school teachers:

- one-week summer professional development
- long-term teacher support through classroom visits (virtual and in-person)
- teacher access to GLOBE instrumentation via NASA's Educator Resource Center equipment checkout
- research investigation and presentation opportunities for students

Program Details

Teachers were selected to participate in the GLOBE AIP program via an application process. The program recruited teachers from local school divisions. Teachers were provided a minimal travel stipend for participation in the summer one-week workshop at NASA Langley.

GLOBE Teacher Workshop Survey

This information collection meets the requirements of 44 U.S.C. § 3505, as amended by section 2 of the Paperwork Reduction Act of 1995. You do not need to answer these questions unless we display a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 2700-0153 and expires 06/30/2014. We estimate that it will take 5 minutes to read the instructions, gather the facts, and answer the questions. Send only comments relating to our form online after you finish it. info@nasa.gov

Please indicate your status:
☐ K-4 Classroom Teacher ☐ 5-8 Classroom Teacher ☐ 9-12 Classroom Teacher
☐ Informal Educator ☐ Educator from Institution of Higher Education ☐ Other: _____

Please circle the rating to indicate whether you agree or disagree with the following statements:

	Disagree	Agree
The workshop improved my ability to engage students in scientific investigations.	1 2 3 4 5 N/A	
The workshop improved my ability to integrate GLOBE into educational settings.	1 2 3 4 5 N/A	
I needed more or different information from what was presented or handed out. (If agree, please elaborate in comments below.)	1 2 3 4 5 N/A	
The presenters demonstrated a useful range of expertise.	1 2 3 4 5 N/A	
The workshop was a valuable experience.	1 2 3 4 5 N/A	
Overall, I am satisfied with the quality of the workshop.	1 2 3 4 5 N/A	

What aspect of the workshop was most valuable to you? _____

What is one thing that can be done differently to improve the workshop? _____

Identify which GLOBE resources you will use with students:
☐ Learning Activities ☐ Measurement Protocols ☐ Data (from other schools)
☐ Other: _____ ☐ None, I do not plan to use GLOBE resources

Identify which of the following obstacles present the greatest challenge to implementing GLOBE:
☐ Content knowledge ☐ Knowledge on student scientific investigations ☐ Funds for equipment
☐ Time in the classroom ☐ Planning time ☐ Other: _____

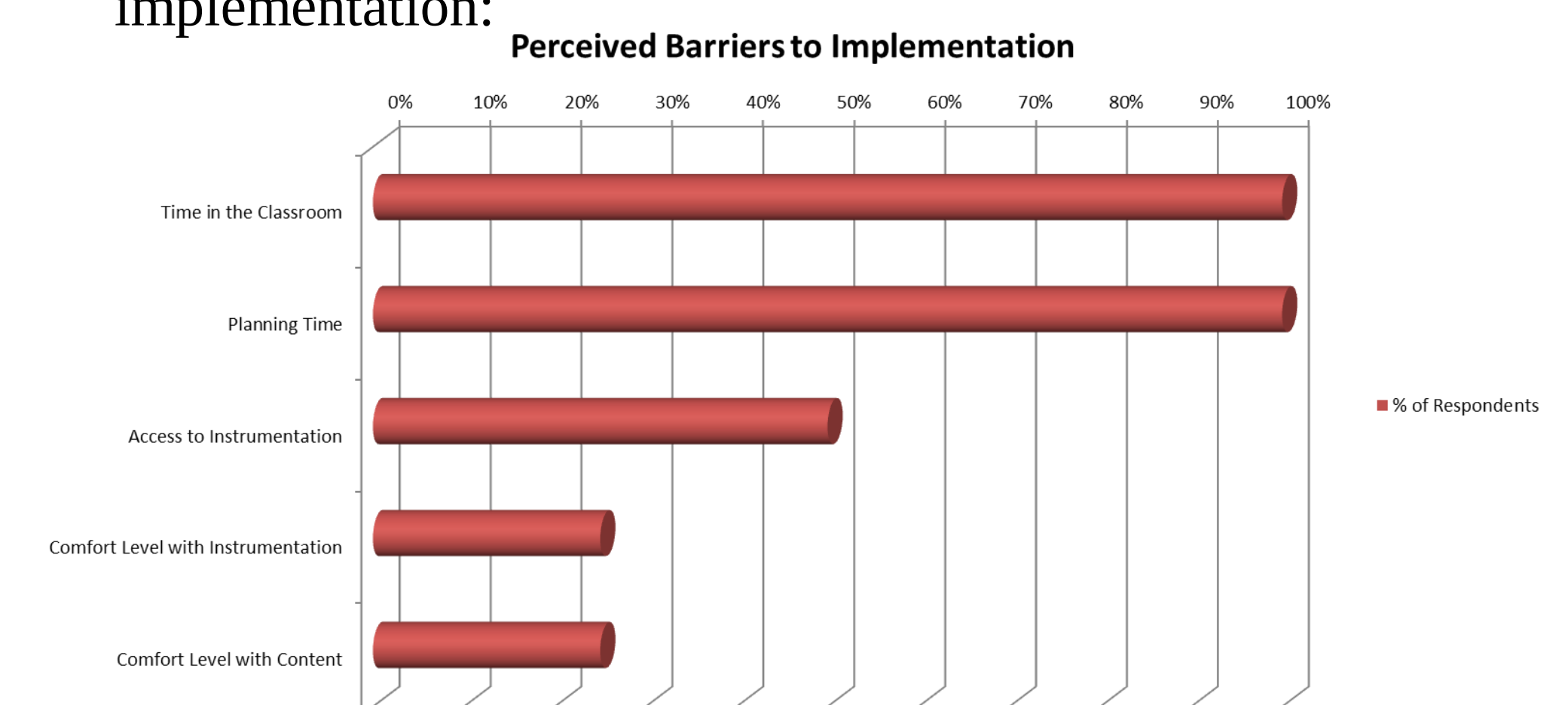
Identify the GLOBE content areas in which you would like to receive additional training:
☐ Clouds ☐ Air Temperature ☐ Surface Temperature ☐ Soil Temperature ☐ Soil Moisture
☐ Relative Humidity ☐ Precipitation ☐ Barometric Pressure ☐ Ozone ☐ Aerosols
☐ Phenology ☐ Land Cover ☐ Hydrology ☐ Soil ☐ Carbon Cycle ☐ Watershed Dynamics

Comments or suggestions (please use back of sheet, if necessary): _____

Please return completed survey to registration table.

Evaluation

Based on survey results from Summer 2012 Cohort, teachers perceived the following as barriers to implementation:



Surveys (OMB control number 2700-0153) are distributed to GLOBE workshop participants following each workshop. Submission of survey for OMB approval began early December 2011.

1-Week Professional Development

Focus: Integrating Atmosphere Investigations into the Classroom

Goals – Teachers will:

- Learn how GLOBE is a resource for teaching toolbox
 - Become familiar with *Protocols*, Instruments, and respective data
 - Clouds, Contrails, Temperature, Relative Humidity, Precipitation, Surface Temperature, Barometric Pressure, Ozone, and Aerosols
 - Become familiar with *Learning Activities*
- Become familiar with current research in inquiry
- Create an Implementation Plan focused on integrating atmospheric science investigations/research/practice into classroom activities

Daily Agenda

- Morning summary and Essential Question
- Guest Speaker – Content area expert (lecture and Q&A)
- Protocol Presentations (by teacher groups and GLOBE trainer)
- Measurement & Observation Practice Outside
- Discuss Data Collection
- Hands-on Activities
- Discuss Inquiry article
- Reflection Journal
- * Discussions of classroom implementation throughout the day

What Worked

- Teacher groups presenting protocol procedures and science background
- Teacher presentations on implementation plans
- Incorporating discussions of student-led inquiry

Anticipated Changes

- Read inquiry articles as homework instead of during day
- Have cross-cutting themes each day focused on science process skills
- Revise contrail activity, focus on temperature and relative humidity
- Conduct instrument calibration with teachers
- Revise application process to be focused on school or division as opposed to individual teachers, to attract teacher teams



2012 Summer Cohort, Group Photo



2012 Summer Cohort, Cloud Observations

PD Materials

Access a LiveBinder with workshop materials, including:

- Inquiry Articles
- GLOBE materials –
 - Protocols & Activities
 - Additional Hands-on Activities -
 - Investigating Microclimates
 - Heating Things Up
 - Clouds and Earth's Energy Budget



SCAN ME