Engaging Citizen Scientists to Enhance Cloud Information from Satellite Remote Sensing
Science Communications and Education

Education Team
Lin Chambers, Lead, Detailed to Headquarters
Jessica Taylor, On-site Lead
Ann Martin, Evaluator

Focus: CAN Award Education Components
- S’COOL/GLOBE Integration
  - Sarah McCrea
  - Support: Tina Rogerson
- GLOBE at Langley
  - Tina Harte
  - Support: Preston Lewis, Sarah McCrea
- MY NASA DATA
  - Team Collaboration
  - Support: Tina Harte, Jill Teige, Daniel Oostra, Penny Oots

Continuing Mission Related Education Support
- CERES
  - Sarah McCrea
- CALIPSO
  - Jessica Taylor
- SAGE III on ISS
  - Kristyn Damadeo
- TEMPO
  - Margaret Pippin
- DISCOVER/KORUS-AQ
  - Amber Richards
  - Lin Chambers

Communications Team
- Denise Lineberry
- Aimee Amin
- MaryAnn Jackson
- Jay Madigan
- Tim Marvel

*Additional Support from Translators Personnel (Camelia Dellar) and ASDC Personnel
NASA SD Education mainly funded through the NASA Cooperative Agreement Notice (CAN)

- Missions are no longer required to set aside 1% of funding for mission-specific education efforts.

- Cooperative Agreements for thematic educational content and activities were awarded in late 2015. LaRC CAN Awards include:
  - NESEC: Interagency Collaborations (NASA Earth Science: JPL, Goddard, Wallops...)
  - Mission Earth: Academic Collaborations (Tennessee University, Berkeley, Boston, Toledo, WestEd...)

- Missions can still set aside funds for communications or fund additional education as needed.

- Full SMD Education awardee list: http://www.nasa.gov/feature/list-of-science-education-partners-for-nasa-stem-agreements
Reminder: New Plan

- **Communications**
  - Earth Right Now
  - Earth Observatory
  - Science Visualization Studio

- **Education**
  - Funded Projects from 2015 CAN Awards (NESEC, Mission Earth)
  - The GLOBE Program
  - MY NASA DATA
  - S’COOL
  - Office of Education Efforts: NIFS, Educator Professional Development, STEM Engagement activities, and Outreach Events

*Slide Credit: Jessica Taylor and Dr. Todd Ellis, CALIPSO Science team Meeting 2016*
Focus on providing many opportunities to involve educators (formal/informal), reaching students and the citizen science community, in real world science.

The SD EPO Team...
- Collaborates with the education community to bring authentic Earth science practices and real-world data into the classroom.
- Provides Learners with unique NASA experiences, engaging activities, and advanced technology.
- Provides products developed and reviewed by science and education experts.

Our goals include inspiring the next generation of Science, Technology, Engineering and Mathematics (STEM) professionals and improving STEM literacy by providing innovative participation pathways for educators, formal and informal, to reach students and the public.
New Education Priorities

Current Initiatives

- S’COOL - Cloud Resources and Satellite Data Matching
- MYNASADATa – Website and Data Visualization
- GLOBE
  - National/International Partnerships
  - Elementary GLOBE
  - Field Campaigns
  - GLOBE Observer/Citizen Science
- 21CCLC- Collaboration with Department of Education
- TEMPO- Student Collaboration and C/PE
- NASA Earth System Science Award Intel ISEF
- Evaluation
- Agency/Langley/SD Support
- Outreach/Teacher Recruitment
New Communication Priorities

NASA Communications
Agency Communications Priorities

**Earth Right Now.** Your planet is changing. We're on it. #EarthRightNow
NASA's fleet of satellites, its airborne missions and researchers address some of the critical challenges facing our planet today and in the future: climate change, sea level rise, freshwater resources, and extreme weather events.

**ISS.** Off the Earth, for the Earth. #ISS
The International Space Station is a blueprint for global cooperation and scientific advancements, a destination for growing a commercial marketplace in low-Earth orbit, and a test bed for demonstrating new technologies. The space station is the springboard to NASA's next great leap in exploration, including future missions to an asteroid and Mars.

**Mars.** Join us on the journey. #JourneytoMars
We are on a journey to Mars. Today our robotic scientific explorers are blazing the trail. Together, humans and robotics will pioneer the next giant leap in exploration.

**Technology.** Technology drives exploration. #NASATech
We develop, test and fly transformative capabilities and cutting edge exploration technologies. Our technology development provides the onramp for new ideas, maturing them from early stage through flight and giving wings to the innovation economy.

**Aeronautics.** NASA is with you when you fly. #FlyNASA
Every U.S. aircraft and air traffic control tower uses NASA-developed technology. We're committed to transforming aviation by reducing its environmental impact, maintaining safety, and revolutionizing aircraft shapes and propulsion.

**Solar System and Beyond.** NASA: We're Out There. #NASABeyond
NASA's exploration spans the universe. Observing the sun and its effects on Earth. Delving deep into our solar system. Looking beyond to worlds around other stars. Probing the mysterious structures and origins of our universe. Everywhere imaginable, NASA is out there.

*Slide Credit: Jessica Taylor and Dr. Todd Ellis, CALIPSO Science team Meeting 2016*
**MY NASA DATA/GLOBE**  
Earth System Science Poster

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<th>Year</th>
<th>Insolation</th>
<th>Surface Temperature</th>
<th>Cloud Fraction</th>
<th>Precipitation</th>
<th>Aerosols</th>
<th>Biosphere</th>
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[https://mynasadata.larc.nasa.gov/globe/](https://mynasadata.larc.nasa.gov/globe/)
Moving Forward...

- NESEC asset for multiple applications to get NSAS Earth Science into the hands of Educators and Students.

- Collaboration with Intel ISEF and the Creation of the NASA Earth System Science Award Criteria

- Mission Earth partnership, vertically integrating NASA assets and resources across grade band and developing an effective educator professional development model.
The S’COOL Project: Cloud Ground Observation

Entry Avenues
- Formal S’COOL
- Informal ROVER

Participation Steps
- Request Sat. Overpass
- Observe Clouds
- Report Clouds
- Explore Data

2-Way Comm.
- Match Email
- Comment & Analysis

Repeat

Reaching Participants Worldwide
- 236,480 participants
- 132,734 ground observations
- 73,746 satellite matches
- 75 countries
- 17 Years
- All 7 continents

Scool@larc.nasa.gov
Match/Comparison Email
Observers will receive a ‘Match’ email when their observations have fallen within the selected overpass time period. The ground observation will be on the left and the satellite observation and images will be on the right.
S’COOL Resources
Scool@larc.nasa.gov

Use your Cloud Tube to practice geolocation, learn different cloud names and help with.

S’COOL Cloud Identification Chart

Clouds are an essential part of our atmosphere. Clouds allow us to understand more about our planet's temperature, weather patterns, and other aspects. Visit the links below for more S’COOL activity:

- What is a Cloud? https://www.esrl.noaa.gov/psd/resouces/education/teacher.cfm
- Cloud Chart: https://www.esrl.noaa.gov/psd/resouces/education/cloud_chart.html

To build the Cloud Tube, usewashere:

- S’COOL - http://www.scool.larc.nasa.gov
- NASA's Earth Observing System (EOS) - http://www.eos.nasa.gov
- National Aeronautics and Space Administration (NASA) - http://www.nasa.gov
Moving Forward...

- **S’COOL integration into the GLOBE Program**
  - Formal application: Updated Cloud Observation Protocol, NEW hard copy materials, training slides, online data input, communication to internal and external GLOBE community, training opportunities around NEW cloud protocol
  - Informal application: Clouds is the first protocol translated to the GLOBE Observer APP, designed to extend GLOBE’s audience and participation

- **Mission Earth partnership, vertically integrating NASA assets and resources across grade band and developing an effective educator professional development model.**
The GLOBE Program: www.globe.gov

http://www.globe.gov/web/guest/home
CERES, Engaging Educators, Students and Public Learners for the past 20 years

You can Observer
You can Analyze
You can Be A Scientist
There is Value in Engaging Citizen Scientists to Enhance Science Understanding!
What is Citizen Science?

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<tr>
<td>Level 1 ‘Crowdsourcing’</td>
<td>Citizens as sensors</td>
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<tr>
<td>Level 2 ‘Distributed Intelligence’</td>
<td>Citizens as basic interpreters</td>
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<td>Level 3 ‘Participatory science’</td>
<td>Participation in problem definition and data collection</td>
</tr>
<tr>
<td>Level 4 ‘Extreme’</td>
<td>Collaborative Science – problem definition, data collection and analysis</td>
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Research shows that students benefit greatly from being involved in scientific inquiry, because they model the actual scientific process and they are more engaged in the learning environment.

Students learn how to collect data, interpret data, analyze data, think about the data and what might have affected the data, and present their data.
Citizen Science Channels: Globe Observer

Facebook Live App Kick Off

Data Visualization

Citizen Science Channels

- NSTA (National Science Teachers Association)
- CITIZEN SCIENCE.ORG
- scistarter: People-powered science.
- POLAR CRUISES
- ZOONIVERSE
Resources

- Contact the NASA SD Education Team for:
  - Hardcopy Handouts
  - Activity Kits
  - Table Demonstrations
  - Presentation Content
  - Web resources
Why is observing, studying, and monitoring clouds important?
How You Can Share Your Science Story!

- Collaborate with the SD Education Team throughout the year
  - GLOBE Integration Home Page Videos
  - Professional Development, Science Material Experts, Guest Speakers
  - Research assistance, utilize citizen science community to provide otherwise inaccessible data.
  - Etc...
Thank YOU!

We are here to help support your efforts!

sdepo@lists.nasa.gov

Sarah McCrea
Sarah.mccrea@nasa.gov
If you don’t collect a data point now, you will never be able to collect it again.
Collaborating Satellite Missions

https://www.youtube.com/watch?v=bWnlpRPbaSc