THE GLOBE PROGRAM

Annual Review

2018–2019

Sponsored by: NASA Supported by: NSF NOAA Implemented by: UCAR

THE GLOBE PROGRAM

The GLOBE Program (GLOBE) is an international science and education program sponsored by the National Aeronautics and Space Administration (NASA); supported by the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), and the United States Department of State (DoS); and implemented by the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado, USA. GLOBE provides students and the public the opportunity to participate in data collection and the scientific process, and to contribute in a meaningful way to our understanding of the Earth system and the global environment. For nearly 25 years, GLOBE has connected students, teachers, and professional and citizen scientists from around the world to conduct hands-on science within their local environment to enhance their awareness of —and their scientific contribution to—the global environment.

GLOBE Milestones

1994	Earth Day, U.S. Government announces The GLOBE Program as a multiagency effort.
1995	Earth Day, The GLOBE Program launches (with 11 protocols); 33 countries join the program.
1998	Finland hosts the first GLOBE Learning Expedition (GLE) in Helsinki.
2000	USA hosts second GLE in Fayetteville, Arkansas.
2003	Croatia hosts third GLE held in Sibenik.
2004	GLOBE receives the Goldman Sachs Award for being an "outstanding program that makes use of media/ technology to educate students or teachers about other world regions and cultures, or international issues."
2005	Earth Day; GLOBE celebrates its 10th birthday, with 15,000 schools in 106 countries.
2008	South Africa hosts fourth GLE in Cape Town.
2009	GLOBE establishes Regional Offices in Africa, Asia and Pacific, Europe, Latin America and the Caribbean (LAC), and North Africa and the Near East (NENA) to support professional development workshops, capacity building, and regional sustainability efforts; data in GLOBE database reaches 20 million.
2011	GLOBE launches concept of Student Research Campaigns.
2014	India hosts fifth GLE in New Delhi.
2015	Earth Day, GLOBE celebrates its 20th birthday! GLOBE launches new mobile data entry app; offers 51 protocols; data reaches 128 million measurements.
2016	GLOBE provides online eTraining; hosts International Virtual Science Fair and six regional U.S. science fairs and various student scientific campaigns.
2017	Data reaches over 140 million measurements; International Virtual Science Symposium increases in number of submitted projects and worldwide representation; new mosquito protocol launched.
2018	Ireland hosts the sixth GLE in Killarney; data reaches over 150 million measurements; U.S. Department of State initiative on mosquito education launched; all six GLOBE regions entered over one million measurements into the GLOBE database
2019	GLOBE (via the GLOBE Zika Education and Prevention Project) connects with Google Voyager to highlight GLOBE's story, "Stopping the Spread of Zika."

On the cover: Students and teacher at the GLOBE Learning Expedition in Ireland, 2018

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A Message from the Director

GLOBE Implementation Office

Another year has flown by and, once again, in our Annual Review, we reflect back on the year's achievements. This has been a remarkable year for The GLOBE Program.

A year ago, we held a very successful and spirited GLOBE Learning Expedition (GLE) in Ireland. This seems to have been the impetus for heightened engagement by the community since then! The video that captured the highlights of the GLE allowed everyone to feel what a remarkable experience this was and what an incredible community GLOBE is!

- We have received enthusiastic reports of increased participation at many of the various regional activities, such as the Pokhara Expedition, Triple Frontier Trainings for the Zika Education and Prevention Project, and the United States Student Research Symposia.
- We have surpassed all previous records for student participation in the International Virtual Science Symposium, as well as for the number of scientists providing project feedback; enhancements to the website are being added with regularity; and new tools have been added to GLOBE Observer App (Land Cover; Tree Height).
- Our debut on Google Voyager gave us a new platform for sharing our work globally.
- And we added two new GLOBE countries: Togo and the Republic of Botswana.

While the numbers are revealing, reflections about our work and our influence lead to larger questions about the measure of a good life and what it means to leave a lasting mark on the world. These questions are even more significant as we find ourselves approaching GLOBE's 25th Anniversary.

What are our most lasting accomplishments and how can they be measured? Is our success really told by participation metrics, data collected, new countries joined, new protocols developed? Or is it something more, but less tangible?

It may be that our real accomplishments appear at the intersection of the science we do and the community we build. We weave our knowledge of the natural world (based on facts learned through observation and experimentation) with the wisdom of many distinct cultures, and find ourselves better equipped to address global issues than we ever could alone. I believe the real strength of our program is, simply and truly, all of you—all of you who have a desire to preserve what is good and beautiful about our planet; all of you who work to support an understanding of a healthy Earth system; and all of who share your knowledge and expertise with others.

The founders of GLOBE went about building an infrastructure that would support a worldwide network of students, working with educators and scientists, to learn about their environment, take measurements of key indicators of the Earth system, and share their results. Our pathway to safeguarding the Earth would be, and still is, through science and education.

I am grateful to all of you who work to implement GLOBE in your schools, in your communities, and in your countries. This shared sense of purpose has driven this community from the beginning and will continue to propel us into the year ahead as we prepare to celebrate, together, GLOBE's 25th Anniversary in 2020.

Sincerely,

Dr. Tony Murphy

GLOBE Impacts Around the World

A core element of The GLOBE Program is science, from data collection and entry to analysis, research, and focused scientific interactions between community members. GLOBE's uniqueness stems from the opportunity that it offers community members to collect and submit data that can be used by students, teachers, citizen and professional scientists, and STEM professionals in their scientific research efforts. The table below shines a light on some of the critical results of the community's ongoing data measurement efforts during 2018.

The international GLOBE network now includes engaged and inspired representatives from 127 U.S. partners and 121 participating countries. GLOBE's dedicated and data-driven community members have now contributed to the over-160 million measurements in the GLOBE database. Be sure to check the GLOBE website often—and watch these numbers continue to climb higher!

GLOBE's Regional Footprint

REGION	COUNTRIES THAT ENTERED DATA IN 2018*	TOTAL CUMULATIVE MEASUREMENTS BY 2018	MEASUREMENTS ENTERED IN 2018
Africa	23	1,013,259	67,625
Asia and Pacific	18	1,266,865	121,085
Europe and Eurasia	41	67,327,452	5,171,558
Latin America and Caribbean	20	1,216,504	62,604
Near East and North Africa	13	1,083,327	201,863
North America	02	111,390,202	6,535,074

**In 2018–2019, GLOBE had 121 countries; 4 countries did not enter data as they were new to the program or the program may have been inactive in the country for a number of reasons. However, 97 percent of countries have reported data, showing a high level of participation in the program.*

2018 At a Glance

REGION	SCHOOLS	TEACHERS	PRE-SERVICE	STUDENTS	ALUMNI	GLOBE OBSERVERS
Africa	968	1,168	98	22,055	36	1,025
Asia and Pacific	3,812	2,919	580	54,601	22	14,793
Europe and Eurasia	4,739	3,988	305	89,270	29	24,611
Latin America and Caribbean	1,647	2,159	701	35,981	26	6,151
Near East and North Africa	711	680	148	37,814	7	986
North America	21,783	24,207	4,346	538,472	27	76,395
Total	**33,660**	**34,071**	**6,178**	**778,193**	**147**	**123,961**

GLOBE: An International Community

The GLOBE Program is an international community of practice—one that offers a unique opportunity for community members to engage in authentic scientific exploration using the same language: science.

- **GLOBE Regions**—GLOBE administration is divided into six regions: Africa, Asia and Pacific, Europe and Eurasia, Latin America and Caribbean (LAC), Near East and North Africa (NENA), and North America (which consists of Canada and the United States). GLOBE partners (Country Coordinators and U.S. Partners) facilitate the implementation of GLOBE in their country or within their service area.
- **GLOBE Working Groups**—GLOBE Working Groups (WGs) are dedicated to enhancing the role of partners, STEM professionals, scientists, and educators in shaping the future of GLOBE—and in supporting the development and implementation of GLOBE worldwide. There are four GLOBE WGs (Education, Evaluation, Science, and Technology), with up to seven members (serving on a rotating basis).
- **U.S. Partner Forum**—The U.S. Partner Forum (USPF) works to enhance the contribution of GLOBE toward improving STEM education in the United States, which is divided into six regions: Midwest, Northeast and Mid-Atlantic, Northwest, Pacific, Southeast, and Southwest. Each region has one representative on the U.S. Partner Forum who works to guide the work of GLOBE in the United States. A representative from the NASA Centers, and one at-large member, complete the USPF.
- **The GLOBE International STEM Network (GISN)**—The GISN is an international network of STEM professionals who work with GLOBE students around the world. These scientists and professionals mentor teachers; explore national and international components of science and research; design and create unique field campaigns; and inspire students to engage in the hands-on exploration of cutting-edge science and research.

Sandra Alba Cauffman addresses participants of the 2018 GLOBE Learning Expedition

1 • The GLOBE Program

GLOBE Implementation Office Staff

Members of GLOBE's international community routinely engage with each other through online interactions, as well as through participation in meetings, trainings, and other events. GLOBE Annual Meetings, GLOBE Learning Expeditions (GLEs), and annual regional meetings are invaluable and enriching events where community members come together to: share best practices and solutions to common issues; engage in collaborative data-collection adventures and horizon-expanding expeditions; share and discuss ideas, challenges, and opportunities; and plan for the future of The GLOBE Program. In 2018, GLOBE held a vibrantly successful GLE in Killarney, Ireland, where GLOBE's international members engaged in learning and sharing that transcended borders.

GLOBE Implementation Office: Serving the Community

The daily goal of the GLOBE Implementation Office (GIO)—hosted by the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado, USA —is to serve the needs of the community. GIO works to provide robust support for the GLOBE common elements of communication, education and evaluation, science, technology/website, and overall community support. These common elements, and the NASA-hosted Data Information System (DIS)—focusing on database and website infrastructure—are instrumental to enabling the worldwide implementation of GLOBE.

Thanks to ongoing interaction and collaboration with NASA, the Regional Coordination Offices, the U.S. Partner Forum, and the GLOBE Working Groups, GIO is able to effectively meet the

needs of its worldwide community. Specifically, GIO provides technical support services; undertakes activities to encourage community engagement, growth, and training; coordinates and facilitates campaigns, projects and meetings; and generates high-quality education and science materials and resources.

GIO's approach to implementing The GLOBE Program is informed by ongoing interactions with all of the unique members of the community. GIO's commitment to collaboration with community members—listening to suggestions and responding to needs—is the highest GIO priority. The people at the GIO hold themselves accountable to YOU, the GLOBE community, aiming to provide exceptional levels of service, support, and science-expanding possibilities.

GLOBE's New Program Manager: Dr. Allison Leidner

In September 2018, Dr. Allison Leidner became The GLOBE Program Manager. Dr. Leidner is the Program Manager for Education and Communication in the Earth Science Division of NASA's Science Mission Directorate. In this role, she manages the Earth Science component of the NASA Earth and Space Science Fellowship (NESSF) program, as well as the New Investigator Program (NIP), and a variety of other Earth science communications activities.

A conservation biologist by training, Dr. Leidner and began her tenure at NASA in 2010 as a AAAS Science and Technology Policy Fellow working with the Biodiversity Program. She coordinated and managed numerous aspects of the program, led involvement in special activities such as the 2016 IUCN World Conservation Congress, and served as a liaison to the domestic and international conservation remote sensing community via her work with the Group on Earth Observation (GEO) and the Committee on Earth Observation Satellites (CEOS). Allison also coordinated NASA's involvement in the Third National Climate Assessment, a U.S. Global Change Research Program (USGCRP) activity, and later served as the co-chair for the USGCRP Sustained Assessment Interagency Working Group. She received a NASA Special Service Award in 2014.

Dr. Allison Leidner

"GLOBE is a dynamic part of NASA's work in Earth observation. I am so pleased to be part of this remarkable community and I am committed to fostering the cooperation, collaboration, and communication that is so vital to the work we do."
—Dr. Leidner

GLOBE and NASA Satellite Missions and Field Measurements

A core tenet of The GLOBE Program is to support NASA's satellite missions through hands-on field measurement campaigns. GLOBE campaigns are regional and worldwide projects that provide students with the opportunity to step out into the field and question, research, explore, measure, and collect data that NASA can then use to validate, and expand upon, skyhigh scientific data. 2018-2019 GLOBE campaigns are:

- **The Trees Around the GLOBE Campaign:** This campaign, which began in 2018 and will run through 2021, works in conjunction with NASA's Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2) mission (which is using lasers and a very precise detection instrument to measure the elevation of Earth's surface). The campaign is creating an organized community of people who take tree-height measurements; compare these measurements to established NASA programs; research tree-height data from other GLOBE schools and countries; and take supplemental protocol measurements. Those involved in the campaign can compare their data to the data obtained from ICESat-2.
- **Urban Heat Island Effect/Surface Temperature Student Research Campaign:** This ongoing campaign is focused on examining the impact urbanization has on the Earth's surface temperature—and how the surface temperature changes the dynamics of the Earth's atmosphere. Studying the energy cycle is fundamental to understanding how the Earth's spheres function within its system.
- **The GLOBE Mission Mosquito Campaign**: This campaign, which began in 2018, is creating an organized citizen science community who conduct and report local observations using the Mosquito Habitat Mapper within the GLOBE Observer App. Citizen scientists identify potential breeding sites for mosquitoes, sample and count mosquito larvae, and (with optional equipment) examine and photograph a specimen to identify its genus.

GLOBE students observing mosquito larvae in water sample, Peru

Arctic and Earth SIGNs Workshop participants, U.S.A.

GLOBE and NASA-funded Earth Science Projects (Sci-Activation Projects)

GIO provides support for four innovative, educational, and inspiring NASA-funded Earth science projects (through STEM agreements with GLOBE U.S. Partners):

- **GLOBE Mission EARTH (GME)**—GME is a collaborative of multiple institutions across the United States formed to increase involvement in The GLOBE Program with the goal of connecting students to scientists in the common pursuit of real-world science.
- **AEROKATS and ROVER Education Network (AREN)**—The goal of AREN is to train the next generation of scientists, engineers, and other professionals to observe and understand Earth through experiential learning using NASA technology and data in realworld settings.
- **Impacts and Feedbacks of a Warming Arctic**—Engaging Learners in STEM using NASA and GLOBE Assets (Arctic and Earth SIGNs)—This program connects youth and adults to climate issues and Earth science learning through inquiry-based GLOBE investigations and community stewardship projects.
- **NASA Earth Science Education Collaborative (NESEC)**—NESEC is a partnership between four organizations that are GLOBE Partners: Institute for Global Environmental Strategies (IGES), and the Earth sciences at three NASA Centers (Goddard Space Flight Center, Jet Propulsion Laboratory, and Langley Research Center). GLOBE is working with NESEC on enhancing STEM teaching and learning by creating engaging, meaningful, and authentic STEM experiences and resources.

Using the GLOBE Observer app

GLOBE Observer App: 2018 Land Cover Challenge

Why study land cover? Because understanding land cover is important for evaluating a community's risk of certain disasters. (For example, some types of land cover are more vulnerable to wildfires or floods).

"Adopt-a-Pixel" is the latest protocol for the GLOBE Observer App. It allows participants to contribute photos of the land around them, classify their images and compare their observations to satellite data. With the observations from the Land Cover Challenge, and ongoing community-member contributions—thanks to the app—the scientific dataset is growing! NASA scientists are putting these observations to use in improving global land cover maps—and in enriching our understanding of land cover processes that affect our daily lives.

2 • Science in Action

Answering the call for the 2018 Land Cover Challenge, GLOBE community members and citizen scientists from around the world submitted nearly 4,000 photos! The challenge took place from U.S. National Public Lands Day (22 September) to NASA's 60th Anniversary (01 October). People from 25 countries, representing all of the GLOBE regions, contributed their land cover observations.

GLOBE Zika Education and Prevention Project

As part of a two-year project, in partnership with the United States Department of State, GLOBE continues to expand its efforts to combat the spread of the Zika Virus. The GLOBE Zika Education and Prevention Project is taking place in three GLOBE regions: Africa, Asia and Pacific, and Latin American and Caribbean, and is enlisting thousands of students, teachers, and community members in the collection of larvae samples in 30 participating countries.

The goal of the project is to build networks with public health officials to better control mosquitos and reduce mosquito-borne infectious disease. Global data collection on this scale will help international scientists predict new outbreaks—and will help to minimize the adverse impacts of mosquitos.

To launch the effort, participants at Regional Mosquito Trainings (RMTs) learned which types of mosquitoes are breeding in their communities; how to collect larvae samples safely; how to upload photos/data into the global map tracker; and ways to eliminate breeding places. Using a "train-the-trainer" approach, those trained at RMTs are now conducting

Training on using the GLOBE Observer Mosquito Habitat Mapper

Students doing science at the 2018 GLOBE Learning Expedition, Ireland

Country Mosquito Trainings (CMTs). Those trained at CMTs, are now, in turn, training participants at Local Mosquito Workshops (LMWs). Country Coordinators have also been trained on the GLOBE Observer App's Mosquito Habitat Mapper (MHM) tool. Since the RMTs, Country Coordinators have organized 120 CMTs, 34 LMWS, trained over 2,575 individuals (T2 Trainers), and collectively have added over 80,500 data points (as of 22 May 2019). In addition, two student teams from each region were selected to present their research at the GLOBE Learning Expedition in Ireland in July 2018.

GLOBE International STEM Network

The GLOBE International STEM Network (GISN) is an international network of STEM professionals engaged in meaningful relationships with GLOBE students and teachers who are involved in scientific field investigations and research projects.

As of 2018, in order to keep information up-to-date and centered on current science and research, GISN members are now required to complete at least one GISN-related activity per year. Also, in order to empower the next generation of STEM leaders, the GISN is recruiting early career STEM professionals (undergraduate or graduate students who are studying in a STEM field or recent graduates who have less than five years of experience in a STEM field).

3 • Education in Action

GLOBE Weather 2018 Field Test teachers and developers

GLOBE and UCAR SciEd: GLOBE Weather

In 2018, GLOBE continued its innovative endeavor with the UCAR Center for Science Education (UCAR SciEd) and Biological Sciences Curriculum Study (BSCS) Science Learning in order to create a set of educational materials aligned with GLOBE and NGSS for middle school grades: GLOBE Weather.

The primary achievement in 2018 was the revision of the GLOBE Weather Instructional Unit, along with the associated week-long professional development workshops. After the training, field test teachers implemented the unit in their classroom (and submitted samples of student work and assessments used for future refinements and finalization). The developers have analyzed the field test results in order to make refinements and to finalize the curriculum and website development for delivery to the GLOBE community and to middle school science teachers. The final curriculum will be prepared for wide-spread distribution through state science networks and STEM education organizations.

2018 GLOBE International Virtual Science Symposia

In 2018, GLOBE held its fifth International Virtual Science Symposium (IVSS). This completely virtual science symposium allows GLOBE students (K16) to use the GLOBE data they've entered into the database in hands-on research and to apply their work to a real-world problem.

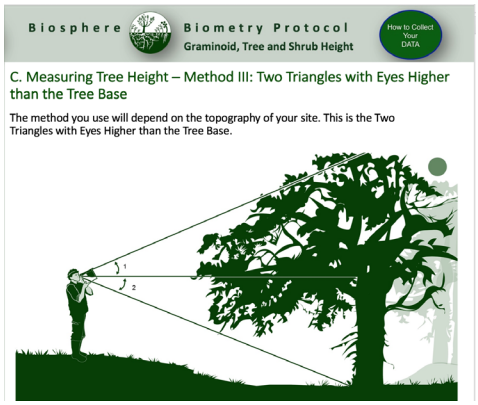
Four eligible projects (two U.S./two international) were randomly selected to receive NSF stipends to help offset the costs of attending the 2018 GLE in Killarney, Ireland:

- **USA:**
  - "Surface Ozone" (St. Francis Xavier Catholic School; Gettysburg, Pennsylvania)

- "Analysis of Data Collected During the 2017 Solar Eclipse at Eighty Percent Totality" (Crestwood High School; Dearborn Heights, Michigan)

- **International:**
  - "The Influence of Fireworks on the Amount of Aerosols" (Helen Parkhurst; Almere, Flevoland, Netherlands)
  - "Investigating the Effectiveness of Using Common Reed (Phragmites australis) in Fertilizing Plants and its Impact on Water and Soil" (Um hany basic school; Nizwa, Oman)

Eligibility is based on results from rubrics used to assess the projects. In all, 113 projects were submitted from all six regions. There were 44 mentors and 70 judges who stepped up to assist, guide, and support the students and to judge the quality of their work.



GLOBE Biosphere Biometry Protocol eTraining

GLOBE Protocol eTraining

In order for a school to fully participate in The GLOBE Program, at least one teacher must be trained in GLOBE science measurement protocols and education activities by attending a GLOBE Teacher Workshop.

GLOBE's eTraining Program offers a powerful portal where you can access the training materials you need to lead a classroom in data collection and lab procedures associated with a GLOBE protocol. There are now 49 eTraining modules available (including modules introducing The GLOBE Program and modules covering all four protocol areas).

In 2018, GLOBE announced the new "Carbon Cycle Protocol" and Carbon Cycle eTraining Module. (The global carbon cycle is the movement of carbon between the atmosphere, land, and oceans—and is a key regulator of Earth's climate system and is central to ecosystem function.) The new eTraining module uses a systems-thinking approach to gain a foundation in the carbon cycle and its relation to climate and energy.

Tree Height Protocol—GLOBE Teacher's Guide

GLOBE Teacher's Guide

The Teacher's Guide—a centerpiece of GLOBE—is constantly being updated and improved to account for changes in practices (such as new data collection equipment or improved methodology) and to reflect changes with campaigns and data entry. In 2018-2019, the following updates, enhancements, and innovations were presented to the community:

- the clouds and contrails sections of several atmosphere data sheets were replaced with the S'COOL clouds and contrails observations document;
- the Mosquito Larvae Protocol was phased out (links to the protocol were redirected to the GLOBE Observer Mosquito Habitat Mapper site);
- the Phenological Gardens and Lilac Site definition sheets were removed (site definition for these two protocols has been incorporated into the main Site Definition Sheet used for all protocols across the spheres); and
- a column to record latitude and longitude was added to all five of the Measure Tree Height data sheets.

4 • Technology/Website in Action

GLOBE Program Bundles

In early 2019, GLOBE offered new "protocol bundles" (groups of related protocols) on the website's "Earth as a System" page. The bundles are designed to help students study certain topics across multiple spheres. The available bundles are:

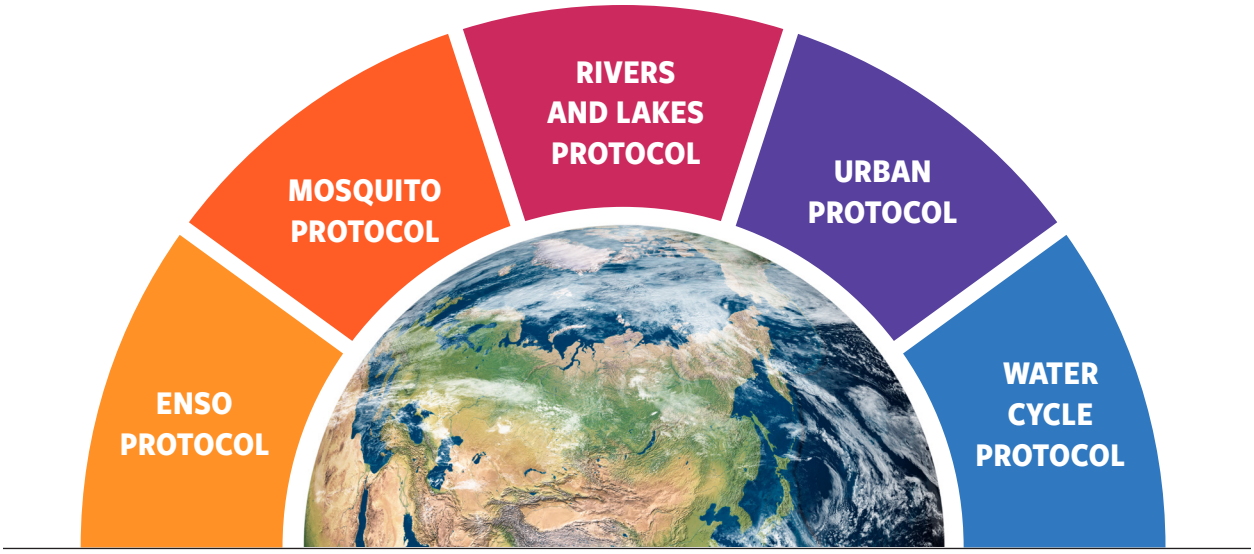
- **ENSO Protocol Bundle:** This bundle includes atmosphere, hydrosphere, and pedosphere protocols used for the GLOBE El Niño Southern Oscillation Campaign.
- **Mosquito Protocol Bundle:** This protocol bundle combines all GLOBE protocols related to the Mosquito Habitat Mapper tool (in the GLOBE Observer App) and explains how they are related.
- **Rivers and Lakes Protocol Bundle:** This bundle groups GLOBE protocols that may provide students with the knowledge and ideas of various interactions happening in their local rivers and lakes.
- **Urban Protocol Bundle:** This bundle suggests a group of GLOBE protocols that can provide students and teachers with integrated knowledge of the environment in urban areas, including various processes and their interactions.
- **Water Cycle Protocol Bundle:** This bundle contains atmosphere, hydrosphere, and pedosphere protocols.

GLOBE Teams

If you are a GLOBE account holder, you will soon be able to create and join teams of people, called "GLOBE Teams," which will enable you to track your group's data-collection efforts. GLOBE Teams can be used to set up a competition, coordinate a community's citizen science efforts, support an educational or corporate initiative, or simply enable a group of people to work together.

Even if you do not belong to a specific learning facility, you will now be able to associate your data with an entity that consists of friends, family, and coworkers. This ability will allow you, and others, to search via your group's name and find data associated with your group.

These GLOBE Teams can be made public, private, or closed to new members. (Member contact information will not be made publicly available.) Each group will be associated with a general location, such as a state or country. You can even join more than one group! The GLOBE Teams page will display the number of members and observations, and will provide a contact form to contact group managers.



GLOBE SSAI team, California, U.S.A.

GLOBE Website Upgrades

Several exciting changes have been made to the GLOBE website over the last year—all with the goal of improving the level of ease and comfort in navigating through the variety of GLOBE-related options, including:

- the addition of the Carbon Cycle Protocol to the Teacher's Guide, Data Entry, and eTraining, as well as the Visualization and Advanced Data Access Tool (ADAT);
- the ability for teachers to add as many as 50 students (per school account);
- the ability for trainers to use the system to administer workshops;
- new visualization enhancements, including the ability for users to: visualize observations under a school or partner and identify dates with measurements on the calendar by simply looking for the protocol icons; new photo layers for clouds, mosquitoes, and land cover protocols; and a feature allowing users to enter custom minimum/maximum ranges for plotting data;
- new "Sphere" pages (Atmosphere, Biosphere, Hydrosphere, and Pedosphere) were created (each page organizes all of the GLOBE information associated with that sphere onto one convenient page);
- the evolution of the "Join GLOBE" into a new "Get Started" tab;

GLOBE Webpage

- the ability of GLOBE Observer App to be supported on Android 4.x devices;
- new email notifications that allow Country Coordinators and Partners to stay current on new accounts (such as GLOBE accounts awaiting approval), and a new monthly member report;
- the ability for users to retrieve photos (clouds, mosquitoes and land cover) on the GLOBE website using ADAT; and
- the ability of users to associate Student Research Reports with multiple report types (for example: IVSS, Mission Mosquito, SRS, etc.).

The 2018 GLOBE Learning Expedition video

GLOBE News and Events

A critical, and daily, goal of the GIO is to inform, educate, inspire, and engage GLOBE community members. GIO scours the globe for what's new, what's happening (and when, where, and why it's happening), as well as all other pertinent information about what other community members are up to—then works to announce this "news" to the community.

In addition, GIO encourages community members, sponsors, partners, and collaborating orgranizations and programs to provide the information necessary to ensure that the website is constantly being updated with vital information regarding GLOBE-related news and events. Over 500 GLOBE-related news and events were posted to the website in 2018 alone!

In addition to "printed" news and events listings on the website (as well as those shared in the monthly News Brief and mass mailings), GIO has been amping up the production of vital and informative video presentations for the community. GIO Director Dr. Tony Murphy travels the globe to meet with, and connect with, community members on a regular basis; however, there are times when he is not able to attend all of the important GLOBE events taking place around the world. Crafting virtual (video) personal messages is a key ingredient in ensuring that all community members know how invaluable they are to the enduring and expanding success of The GLOBE Program.

GLOBE Letter to Community Transitions from Print to Video

The monthly Director's Letter to the Community has transitioned from print to video! Community members will now be hearing from GIO Director Dr. Tony Murphy quarterly. These inspirational and informative videos will provide news of current happenings in the GIO, as well as throughout the community.
During these videos, Dr. Murphy will also be answering questions submitted by GLOBE community members. In

Quarterly video address to GLOBE community

addition, transcripts are available! So, if you miss a video, or want to go back and catch something you may have missed, visit the GLOBE website and visit the News and Events communiy letters archive.

GLOBE Star Stories

GLOBE Star Stories shine a light on extraordinary examples of community members engaged in vital projects, activities, and experiences taking place in connection to GLOBE. GLOBE Stars are the bright lights that spark our imagination and inspire us to commit on an ever-deeper level to the passion and the purpose of The GLOBE Program. The dedicated, inquiry-based and community-expanding work that GLOBE teachers, students, STEM professionals, and scientists do on a day-in and day-out basis is the foundation of The GLOBE Program—and the heart of every GLOBE Star Story.

Are you a GLOBE Star? GLOBE is always seeking to shine a spotlight on outstanding examples of community members and their activities. Visit the GLOBE website and complete the easy template—and share your Star Story today!

GLOBE Social Media

Want to know what's happening with GLOBE right now? Follow The GLOBE Program on social media! GLOBE continues to expand efforts to reach out to community members through an expansive social media platform that includes Facebook, Twitter, Instagram, and Pinterest. So, no matter where you are in the world—or how you are uniquely pursuing your GLOBE endeavors—you can "click in" to connect with the latest news, events, trainings, data challenges, and other rich resources GLOBE shares every day.

Students at Lexington School for the Deaf in New York (USA) Participate in GLOBE Air Quality Campaign – Discover their Power to Contribute to Science in a Significant Way

Jun 05, 2018

In March 2018, GLOBE students at the Lexington School for the Deaf (located in East Elmhurst, New York, USA) began participating in the GLOBE U.S. Air Quality Student Research Campaign. Raising their focus to the sky, the high school students soon became adept at using GLOBE's atmosphere protocols and Calitoo sun photometers to gather their elevated observations. Along the way, they also discovered their ability – as individuals and as a team – to make significant contributions to science.

GLOBE Star—July 2018

GLOBE Welcomes Two New Partnering Countries: Togo and the Republic of Botswana

In January 2018, an agreement between NASA and the Ministry of Education to implement The GLOBE Program was signed. Togo is the 120th country to participate in GLOBE!

In July 2018, an agreement between NASA and the Ministry of Education to implement The GLOBE Program was signed. The Republic of Botswana is the 121st country to participate in GLOBE!

GLE in Killarney, Ireland

Almost 400 participants, from more than 35 countries, attended the 2018 GLOBE Learning Expedition (GLE), which was launched with a jubilant parade through the town of Killarney. Participants engaged in an amazing weeklong examination of various field sites in Killarney National Park; student presentations; a storytelling workshop; cultural presentations; special interest and professional development sessions; and addresses by GIO Director Dr. Tony Murphy, sponsors, scientists, and extraordinary student keynote speakers from the regions.

Everyone agreed that the beautiful setting; the extraordinarily helpful Killarney National Park administration and rangers; Killarney town police; An Taisce (GLOBE Ireland's organization); hotel event managers; and the collegial GLOBE students and community members in attendance, made for a memorable event that is likely to live on in the minds and hearts of participants for years to come.

The GIO would like to thank everyone for their participation and contributions—helping to make this scientific and educational event a success of global proportions.

Parade of Nations—2018 GLOBE Learning Expedition , Ireland

BE PROGRAM
Supported by:
Implemented by: UCAR

6 • The GLOBE Community

GLOBE Collaboration

GLOBE's ongoing collaborative engagements continue to focus on expanding and enhancing the work of The GLOBE Program. Collaborative efforts include:

- **Eco-Schools**—GLOBE and Eco-Schools USA are continuing efforts to integrate school sustainability and Earth system's observations and data collection. On the international level, GLOBE continues to facilitate collaboration between GLOBE countries and Eco-Schools (including via the Foundation for Environmental Education Board, which operates the worldwide Eco-School program). Eco-Schools USA now offers two GLOBE Trainings: 1) covering Monarch recovery gardens; and 2) covering schoolyard habitats.
- **SciGirls**—GLOBE is continuing its educational partnership with SciGirls (an NSF-funded STEM education production in the United States). Efforts focus on training GLOBE partners in SciGirls methodologies to help increase interest in STEM by girls and minorities.
- **Peace Corps**—In 2018, GIO continued to strengthen its partnership with the United States Peace Corps by providing online resources and programmatic consultations on GLOBE materials. During this period, GIO developed lessons for Peace Corps' World Wise Schools program; worked with Peace Corps Response Volunteer in Peru to support regional and country trainings; and met with Peace Corps Volunteers interested in doing GLOBE in their communities.
- **USAID**—GLOBE supported the Institute for Global Environmental Strategies' (IGES) USAID Zika project in Peru and Brazil by coordinating in-country collaboration and support. GLOBE received support from IGES to purchase mosquito kits for in-country use and the distribution of action-based grants.
- **UCAR's COMET Program**—GLOBE deepened collaborative efforts with UCAR's COMET Program (through funding from USAID) on designing and fabricating a low-cost 3D-Printed Automatic Weather Stations (3D-PAWS). Work is underway to enable automatic data entry, which will allow data to be sent directly to the GLOBE database.
- **INCLUDES**—GLOBE continued participation in an NSF INCLUDES Project, "Collaborative Research between Four Indigenous Communities and NCAR to Enhance Hydrologic Understanding." The project is a collaborative endeavor between UCAR/NCAR, university partners, and communities. The GLOBE Program is involved in the collaborative research citizen science component, which connects GLOBE to four indigenous communities in the United States.

Africa Region Highlights

2018 REGIONAL MEETING

In June, the 2018 Africa Regional Meeting and Teacher's Training Workshop took place at the American Corner, University of Lomé, Togo Republic. Participants from Kenya, Namibia, Nigeria, Mauritius, South Africa, Uganda, Madagascar, Benin, Guinea, Togo, Senegal, Tanzania, Cameroon, Namibia, The Gambia, Burkina Faso, Liberia, Ghana, and the United States attended the event. The meeting concentrated on capacity building, website interactions, administration tools, and addressing the disconnect between collected data and the submission of the collected data. The Zika Education and Prevention Project was launched with a workshop presented by Dr. Rusty Low, Dorian Jenney, and the GLOBE Mission Mosquito team.

REGIONAL HIGHLIGHTS

GLOBE Zika Education and Prevention Project Training, Benin

Science

In 2018, the International Biomes Project concentrated on the Savanna Biome. Three scientists (two international scientists and one local expert) and 30 students participated in the event. The project resulted in a following of approximately 10,000 students. All African countries with Savanna biomes participated in the project: Kenya, Botswana, South Africa, and Namibia.

The Lake Victoria Project grew to include participation from the United States, Europe, and Asia—with all participants monitoring the conditions of their local waterbodies. Tanzania and the Tanzania Meteorological Services served as hosts for the project.

In 2018, the RCO loaned hydrology equipment to a group at the University of Pretoria in exchange for collaboration that culminated in a presentation at the 2018 GLOBE Learning Expedition in Killarney, Ireland.

Education

A variety of educational activities, meetings, and events occurred in various forms throughout the region, including:

- SciFest 2018 attracted more than 62,000 visitors, and offered a festival program that consisted of 64 exhibitions and over 700 events (presented by 291 contributors from 77 organizations) in South Africa and the international STI (Science, Technology, and Innovation) sector.
- 30 Participants from Africa attended the GLOBE Learning Expedition in Ireland in July 2018
- Prior to the signing of the GLOBE Agreement in Botswana, the RCO (as requested by the U.S. Embassy) presented an overview of The GLOBE Program to representatives of the media, several universities, and to the country's Education Department.
- A Train-the-Trainer Workshop and Zika Education and Prevention Project training occurred in Togo.
- A Train-the-Trainer Workshop for regions of Namibia, Windhoek, Tsumeb, and Ondangwa took place.
- The RCO conducted a GLOBE and Zika Education and Prevention Project training in Kigali, Rwanda.
- In collaboration with the U.S. Embassy in Rwanda, the RCO funded a Train-the-Trainer Workshop in Gaborone; 27 teachers attended the event.
- The RCO conducted a training for citizen scientists at Eden Botanical Gardens, George, South Africa.

Multicultural Experience at 2018 GLOBE Learning Expedition in Ireland

School visit in Madagascar, 2019

Community

The GLOBE community in Africa continued to enjoy a collaborative relationship with U.S. Embassies in Africa following participation at the U.S. Department of State's Environment, Science, Technology, and Health (ESTH) Conference, which was held in Gaborone, Botswana. Botswana signed the GLOBE Agreement, and is now the newest country in Africa to have joined The GLOBE Program.

Rwanda assigned a new Country Coordinator and a government point of contact. Thanks to collaborative efforts with the U.S. Embassy, Burkina Faso and Ghana made great strides in reengagement with the program.

The RCO for Africa participated at the Africa Health Agenda International Conference in Kigali, Rwanda—and met with the U.S. Embassy, the new Country Coordinator, and local students. Rwanda has established a new "WhatsApp" group, and is downloading the GLOBE Observer App to encourage increased program participation.

Asia & Pacific Region Highlights

2018 REGIONAL MEETING

In May, the 2018 Regional Meeting took place in Hanoi, Vietnam. Participants from India, Japan, Marshall Island, Micronesia, Magnolia, Maldives, Nepal, New Zealand, Palau, Philippines, Republic of Korea, Sri Lanka, Taiwan Partnership, Thailand, and Vietnam attended the event. Opening remarks were presented by Dr. Vu Anh Tuan (Vietnam Country Coordinator), Dr. Dale Fenn (U.S. Embassy, Vietnam), Dr. Desh Badhu (Asia and Pacific RCO), David Overoye (SSAI), and GIO Director Dr. Tony Murphy.

The event included a presentation on The GLOBE Program; a World's Café event; a presentation on activities; trainings on GLOBE protocols; and a discussion of the progress and achievements made by the countries in the region. In addition, the report on the "needs assessment" was distributed and discussed. The Country Coordinators agreed to organize at least one program each year in their countries.

REGIONAL HIGHLIGHTS

10th GLOBE Japan Student Conference in Tokyo, Japan

Science

In January 2019, nine students, their teacher, and the Taiwan Country Coordinator visited a GLOBE school in the Republic of South Korea as part of the GLOBE International Exchange Program. Students shared the results of their GLOBE research, and gained a better understanding of how students at other schools have been similarly involved in GLOBE.

In November 2018, the 10th GLOBE Japan Student Conference was held at Tokyo Gakugei University and Koganei Kominkan, in Tokyo, Japan. Forty-one students and 17 teachers from 15 GLOBE schools participated in the conference. This event, held every two years, is designed to provide an opportunity for students to present their science research and interact with other students from schools throughout Japan. This event was made possible with support from the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT).

In July, the GLOBE Partner-Taiwan organized the 2018 GLOBE Taiwan Science Festival for the region. The event was held in Taichung, Taiwan; 76 teachers and students from Taiwan, Thailand, and the Philippines participated. Posters were presented by students and teachers during the science festival. This annual event aims to provide opportunities for students to present their GLOBE science investigations results to the public. Dr. Desh Bandhu and Anna Wang (American Institute in Taiwan) spoke at the event. The festival was also part of the annual exhibition of the HIGHSCOPE Program and FORESEEING Program, which focuses on STEM education.

Asia and Pacific Region participants at the 2018 GLOBE Learning Expedition, Ireland

Education

A variety of educational activities, meetings, and events occurred in various forms throughout the region, including:

- In May 2018, 35 teachers attended a training in Hanoi, which was organized by the RCO and GLOBE Vietnam.
- 59 participants from the Asia and Pacific Region attended the GLOBE Learning Expedition in Ireland
- In January 2019, 25 teachers from Palau attended a GLOBE teacher training at Koror Palau, which was organized by the RCO. Thanks to the distribution of instruments at the event, teachers learned protocols covering the use of pH meters, TDS meters, surface thermometers, alcohol-filled thermometers, clinometers, and the cloud and soil charts.
- The RCO worked to implement the GLOBE Zika Education and Prevention Project in the region, under the title "GLOBE: Engaging Citizens in the Forecasting and Observation of Mosquito Threats." The goal is to enlist thousands of students, teachers, and community leaders to collect data on mosquitoes. The region is currently engaged in Country Mosquito Trainings and Local Mosquito Workshops.
- In January 2019, the RCO, in association with IES, organized the Youth Outdoor Education Foundation (YOEF) Program, which was held in Panjim, Goa. Twenty-two people from New Delhi, Telangana, and Hyderabad participated in the program. Expedition participants were able to collect measurements related to water temperature, pH values, total dissolved solids, turbidity and conductivity, transparency, and soil temperature; they were also able to collect cloud observations.

Participants of the 2018 Lake Pokhara Expedition, Nepal

Community

In October 2018, in association with the Indian Environmental Society (IES), and in collaboration with the Environmental Camps for Conservation Awareness (ECCA), the RCO organized an adventurous seven-day GLOBE Learning Expedition in Kathmandu and Pokhara, Nepal. The goal of the expedition was to create a platform for culturally diverse participants to engage in a hands-on learning experience centered around understanding the effects of climate change in the region through the use of relevant GLOBE protocols. Expedition participants were able to collect measurements related to water temperature, pH values, total dissolved solids, turbidity and conductivity, transparency, and soil temperature; they were also able to collect cloud observations. During the expedition, biotic life and environmental conditions near the lake's periphery were studied. Participants were able to observe, and to learn about, topographical variation and the type of vegetation in hilly areas—and to observe the impact of the landscape on the lifestyles of the nearby villagers.

Europe & Eurasia Region Highlights

2018 REGIONAL MEETING

In November, the 2018 Regional Meeting took place at CNES (French Space Agency) in Toulouse, France. Participants from Croatia, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Ireland, Israel, Italy, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Malta, Netherlands, Russia, and Switzerland attended the event. Speakers included Allison Leidner (NASA GLOBE Program Manager), Simon Hankinson (U.S. General Consul), and Juliette Lambin (GLOBE Program Government Point of Contact at CNES).

The meeting focused on the new GLOBE Strategic Plan, with discussions about how to achieve the goals of the plan. Participants also learned about activity highlights from around the region. Following the meeting, a two-day training took place. This included a visit to the Collège Jules Vallès, Portet-sur-Garonne, where students prepared a performance ("Watter Matters") based on a research project on the river Garonne. Participants also trained in GLOBE hydrosphere and atmosphere protocols. An advanced group of trainers worked together to discuss the role of a trainer, show effective training methods, and present examples of good practice.

REGIONAL HIGHLIGHTS

2018 GLOBE Games, Czech Republic

Science

As part of the GLOBE NASA Spring Cloud Observation Data Challenge, a national campaign "Observers of the Spring Sky," was held in Poland. The campaign was organized to promote GLOBE among the general public. Altogether 14,720 observations from 2,752 places in Poland, were sent to NASA during the challenge. Over 2,500 observations were made by citizen scientists using the GLOBE Observer App, including students from 30 area schools. Two "most active" schools (Primary School No. 1 in Gora, with 4,431 reports; and Janusz Korczak Primary School No. 10 in Tarnobrzeg, with 2,072 observations) won the special award, which was an online lecture with a NASA scientist.

Regional students involved in European Phenology Campaign observed the early onset of the leaf color change in the autumn of 2018 that was caused by the extremely hot and dry summer. The campaign focused on tree species (such as oak, lime, beech, birch, sour-cherry, hazel, and fig) common in most of Europe. The schools continued with the observations in spring, tracking the date when buds opened and measuring the growth of young leaves. By early 2019, there were more than 150 schools, from 12 countries, involved in the campaign. The campaign encouraged students to share their results, and compare them with schools from other parts of Europe.

The GLOBE Program Coordinator in Ireland, An Taisce, collaborated on the 2018 International Air Quality Campaign—and successfully implemented the activities in Ireland. The campaign was conducted from 01 March through 30 May. After the training, where teachers were introduced to GLOBE, thirteen schools contributed over 350 measurements to the GLOBE database (over a two-month period). Five schools presented their findings at the 2018 GLE in Killarney, Ireland.

U.S. Embassy's Deputy Chief of Mission in Bern Switzerland and Swiss students who participated in the 2018 GLOBE Learning Expedition in Ireland

Education

A variety of educational activities, meetings, and events occurred in various forms throughout the region, including:

- Earth Day at GLOBE schools, Macedonia (April 2018)
- Croatia National Student Conference (May 2018)
- School on River Learning Expedition in Italy (May 2018)
- GLOBE Games Czech Republic (June 2018)
- GLOBE Games Ukraine (June 2018)
- National Science Fair, Netherlands (June 2018)
- Estonia Learning Expedition (August 2018)
- Lithuania Summer Camp (August 2018)
- Annual Students Conference in Lithuania (December 2018)
- GLOBE Day, Netherlands (April 2019)

In addition, with the aim of reactivating the program in Kyrgyz Republic, the RCO and the GLOBE Kyrgyz Country Coordinator organized a teacher training at the Kyrgyz National University in Bishkek in February 2019. More than 40 teachers arrived from different regions of the country to learn atmosphere, biosphere, hydrosphere, and pedosphere protocols. Participants developed their skills in science and environmental education methods. The training was well received by the representatives of the Ministry of Education, the U.S. Embassy, the National Teachers Association, and various departments of Kyrgyz National University. According to one of the teachers, "three days were too short" and "The GLOBE website is like a university, so many materials for teachers!"

Community

In July 2018, a group of five Swiss students and their teacher, Andreas Schmid, from Kantonsschule Olten, traveled to Ireland for the 2018 GLE to present two scientific research projects. On 06 September 2018, the U.S. Embassy in Bern invited the students to come and present their projects and share impressions of their GLE experience to students, teachers, school administrators, GLOBE Swiss representatives, and U.S. Embassy staff. Their lively, and very professional, presentation provided a taste of what they experienced in Ireland. The reception was extremely friendly, animated, and cheerful; it will leave a lasting impression on everyone involved.

As part of an Earth Day celebration, students of the Jan Palach Gymnazium in Melnik, Czech Republic, prepared a student research experience for the public. The highlight of the event came when the U.S. Ambassador in the Czech Republic, Stephen King, joined students for their field activities. Students guided King through research at the shores of a lake (including water quality analysis, soils and geology investigations, and bird watching).

In 2018, the Country Coordinator in Latvia (Children's Environmental School) introduced a new incentive for participation in The GLOBE Program. Schools can be granted "GLOBE Ambassador" status, which is designed to highlight schools that have made a significant contribution as a result of their work with GLOBE. In 2018, GLOBE Ambassador status was given to GLOBE schools that participated in the project "Young Environmental Researchers for Future Latvia." Teachers and students organized activities for the public in their municipalities, enlisted the involvement of local citizens in their environment projects, and published articles in the media. The first 10 Latvian schools were granted certificates by Paul Poletes (Deputy Chief of Mission, at the U.S. Embassy in Latvia) at an awards ceremony held at the Academic Centre, University of Latvia.

GLOBE students from Kenya, USA, Thailand and Ireland at the 2018 GLOBE Learning Expedition in Ireland.

2018 GLOBE Games in Czech Republic—photo courtesy TEREZA, Educational Center Archives

In Israel, GLOBE schools from all over the country joined the GLOBE Video for Earth Day competition. Students filmed short movies to present their GLOBE research projects in a creative way. In May, three winning videos were featured at the GLOBE National Annual Meeting, which was held in Herzliya. The event was attended by 300 students and teachers. This event highlighted the fact that The GLOBE Program not only promotes teaching and learning of science and understanding Earth's environment, but also unites schools from different diverse ethnic and religious communities.

The GLOBE Games, shown above, were held in the Czech Republic from 31 May to 03 June 2018 in the beautiful setting of Humpolec. The Games were exceptional in terms of research, and in terms of diversity. Students from 40 schools throughout the Czech Republic andlong with 12 foreign teams (from Israel, Italy, the Netherlands, Poland, Slovakia and Ukraine) attended the event.

Latin America & Caribbean Region Highlights

2018 REGIONAL MEETING

In October, the 2018 Regional Meeting took place in Panama City, Panama. Participants from Argentina, Bahamas, Bermuda, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Paraguay, Panama, Trinidad and Tobago, Uruguay, and Suriname attended the event. Topics included: The GLOBE Strategic Plan, the Master Trainer certification process, Working Group updates, the Zika Education and Prevention Project, and the announcement that the 2019 Regional Meeting will take place in Natal, Brazil, in August 2019.

REGIONAL HIGHLIGHTS

GLOBE training, Colombia

Science

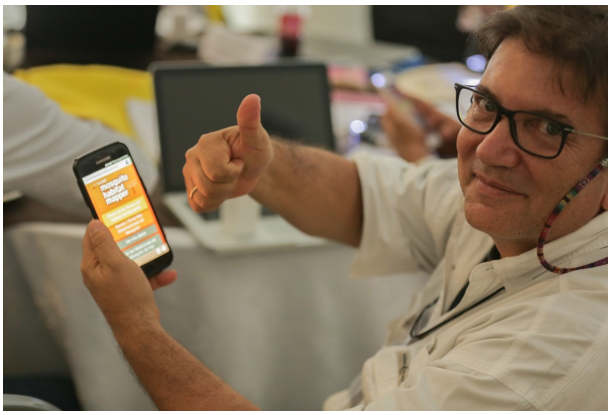
The Brazilian Space Agency has modeled its Virtual Student Science Fair after the GLOBE International Virtual Science Symposium. Student projects are based on GLOBE protocols and/or space-related themes. The deadline for submission is August 2019; winners will be funded to attend to the CVT Space Camp in Natal, Brazil.

In October, the Local Lake Challenge was held at Lacar Lake in San Marrin de los Andes, Argentina. During the event, students applied the Mosquito Protocol. In November, a GLOBE training workshop was held in Chia, Cundanimarca, Colombia. Fifteen teachers from Antioquia, Atlántico, Bolívar, Cundinamarca, Huila, and Valle del Cauca attended the event.

Education

A variety of educational activities, meetings, and events occurred in various forms throughout the region, including:

- In May, Dr. Rusty Low and Dorian Janney led a Regional Mosquito Training (RMT) in Lima, Peru, for 42 Country Coordinators, Deputy Country Coordinators, and trainers
- 31 participants from Latin America and Caribbean attended the GLOBE Learning Expedition in Ireland in July 2018
- At the 2018 GLE, two students from Argentina presented their research.
- Following the regional meeting, 43 webinar trainings were carried out in all of the countries participating in the Zika Education and Prevention Project (Argentina, Uruguay, Brazil, Panama, Colombia, Peru, Surinam, Dominican Republic, Costa Rica, and Guatemala). Approximately 900 students were trained on how to prevent mosquito-breeding sites. In August 2018, a mosquito training was conducted for teachers and researchers in partnership with Brazil´s Triple Frontier (co-organized with Argentina, Paraguay, and Brazil). Participants in Argentina joined the workshop at the Itaipú Hydroelectric Dam by videoconference. Marta Kingsland presented data from the activities carried out by the schools in her country. Representatives from Paraguay presented on the epidemiology of mosquitoes. Representatives from Brazil presented on the importance of space applications in the construction of a global map of possible foci of vectors as Aedes aegypti.
- GLOBE Surinam participated in the Moravian Teachers' Days of the Stichting Onderwijs der EBGS Education Foundation. Thirty-three teachers were trained in the measurement of tree height and density using a clinometer and densitometer.
- Four student interns from the Natuur-Technisch Instituut (NATIN) completed a six-week internship with GLOBE Surinam, which was focused on hydrology protocols.



Happy participant at GLOBE Mosquito Training

GLOBE students identify mosquito larvae, Peru

Latin America and Caribbean participants at 2018 GLOBE Learning Expedition, Ireland

Community

As AEB, GLOBE Partner in Brazil, is actively developing a scientific outreach program on CVT-E (Barreira do Inferno Launch Center), GLOBE Brazil is working on a space devoted to GLOBE protocols. AEB has approached partners like INPE (Brazilian Institute of Space Research) and universities to encourage the use of GLOBE protocols in their distance education programs. Dengue and Zika are also education focal points in the south of Brazil, where a Zika Bus is being built by GLOBE Master Trainer Rodrigo Reis and his team.

GLOBE Uruguay held a competition for primary, secondary, and university students to create a 10-minute video on how to carry out a GLOBE atmosphere protocol. The winning videos will be announced in late October 2019, and will be included in the next edition of the online GLOBE atmosphere course (through the Educantel platform).

Near East & North Africa Region Highlights

2018 REGIONAL MEETING

In November, the 2018 Regional Meeting took place in Amman, Jordan. Participants from Jordan, Oman, Kuwait, Bahrain, Pakistan, Morocco, Lebanon, and the United Arab Emirates attended the event. The meeting included discussions on the GLOBE Strategic Plan, Master Training events, as well as on recent GLOBE website developments and upgrades. Students were able to present their work on GLOBE projects, and engaged in GLOBE games and competitions.

REGIONAL HIGHLIGHTS

Training of teachers and Ministry officials in Kuwait 2018

Science

August 2018, training was held to develop a new cadre of GLOBE science trainers so that more teachers and GLOBE activity could occur in Kuwait. The training was sponsored by the Kuwait Foundation for the Advancement of Sciences and the Ministry of Education. The training covered various GLOBE science protocols from atmosphere, hydrology, and pedosphere. In addition, data entry and visualization was also covered as part of the training. It is hoped that this training will result in further data submissions from the country.

Training in GLOBE soil protocols, Saudi Arabia

Education

A variety of educational activities, meetings, and events occurred in various forms throughout the region, including:

- In September, Kuwait schools implemented what they called "GLOBE sessions" into their schools' systems. Each school now has specific times in which students can perform GLOBE protocols.
- In July 2018, 41 participants from the Near East and North Africa region participated in the GLOBE Learning Expedition in Ireland.
- In November, teachers from throughout the region underwent training from a Master Training following the annual regional meeting in Amman, Jordan.
- In December, trainers from Saudi Arabia held a workshop for teachers to enhance their ways of teaching GLOBE protocols to their students.

Earth Day at Wadi Rum, Jordan

In November, students from Jordan met with Salma Al-Zubi (NENA RCO) and former NASA Administrator and Astronaut Charles Bolden—and took a research-oriented trip to Wadi Rum (or "Valley of the Moon," a valley cut into the sandstone and granite rock in southern Jordan to the east of Aqaba). Students engaged in a competition that focused on the difficulties (and on associated solutions) related to moving across a Martian-type landscape.

Near East and North Africa participants and friends at 2018 GLOBE Learning Expedition, Ireland

Community

In August 2018, a team of trainers from Jordan travelled to Kuwait in order to train teachers and to reintroduce The GLOBE program in Kuwait. The trainers engaged with 30 teachers from various schools all across Kuwait. This has resulted in an increasing level of data entered into the GLOBE database.

In December 2018, Saudi Arabia held a science fair in which GLOBE students presented their GLOBE projects for the local community.

During the last week of January 2019, schools in the United Arab Emirates presented over 50 GLOBE projects in the national science and innovation fair. Students presented their work to the community and introduced them to The GLOBE Program.

North America Region Highlights

2018 REGIONAL MEETING

In March, the NASA Langley Research Center Partnership hosted the North America Regional Meeting (NARM) and an Atmosphere Professional Learning Workshop in Hampton, Virginia, USA. The atmosphere workshop provided introductory information, as well as in-depth understanding of atmosphere concepts; specifically focusing on clouds and aerosols, and the relation to NASA's Missions studying this area of atmospheric science.

The NARM began with a welcome by Dave Young (Langley Director of Science), Allison Leidner (NASA GLOBE Program Manager), and GIO Director Dr. Tony Murphy. The NARM was attended by 59 people representing 23 partnerships, the Country Coordinator from Canada, Kevin O'Connor, and affiliated organizations. Updates and perspectives of the United States GLOBE Office were shared. Lightning talk sessions (a series of six-minute presentations followed by a block of time to speak with the presenters), networking, tours of NASA Langley, and GLOBE observation data collection filled the rest of the two-day meeting.

GLOBE students visit University of Colorado, Boulder

REGIONAL HIGHLIGHTS

UNITED STATES

Science

United States GLOBE joined an international virtual expedition that took place October 02-08, 2018, in several GLOBE countries around the world. Ten teachers and their students followed the GLOBE expedition to Lake Victoria in Africa and Pokhara Lake in Nepal, and visited their own lake to compare measurements to the ones collected on other expeditions. The measurements collected at local lakes included: Water Temperature, pH, Transparency, Dissolved Oxygen, and Cloud Observation.

The University of Wisconsin-Madison Partnership received a grant to conduct GLOBE workshops over the next three years in collaboration with the Nelson Institute for Environmental Studies, Center for Climate Research; and in partnership with school districts along the National Ice Age Trail (through the Wisconsin Ice Age Trail Alliance). "This program will offer students the opportunity to experience hands-on inquiry as they learn more about the changes occurring in their community," said Center for Climate Research Associate Director Michael Notaro. GLOBE training at the Butternut, Wisconsin, School District has been completed, with follow-up throughout the school year. The second grant is for two years as part of an NSF project with University of Wisconsin-Madison's Atmospheric and Oceanic Sciences Department. This project will identify 18 different data collection sites, with the Butternut School District actively collecting GLOBE data in support of the NSF project.

Education

In 2018, U.S. GLOBE held the third annual Student Research Symposia, a series of six regional face-to-face symposia highlighting student research using GLOBE protocols or GLOBE data. Over 260 students from around the country presented 110 projects; 37 partners (representing 27 partnerships) mentored student-teacher teams and attended the events. Photographs, live videos, and updates were posted to the GLOBE Facebook page and Twitter (and can be found on the media webpage of the Student Research Symposia).

The Purdue University College of Science K–12 Outreach Partnership hosted a 2018 Indiana Virtual GLOBE Science Symposium through sponsorship by the Haliburton Foundation. The symposium allowed students (individually or in groups) in grades 5–12 to share results from research investigations using GLOBE protocols and/or the GLOBE database. This experience prepared students for the GLOBE IVSS and the U.S. Midwest Regional SRS. One of the top projects submitted received travel support from the Purdue Partnership to attend the 2019 Midwest Regional SRS.

During the summer of 2018, the NASA Langley GLOBE Partnership hosted eight GLOBE teacher interns for ten weeks in Hampton, Virginia, USA. The interns participated in a variety of learning experiences that included connecting with NASA scientists, engineers, and educators; daily GLOBE data collection; and protocol exploration. Throughout the summer, each intern focused on an area of GLOBE that aligned with their grade level and standards representative of the state in which they teach. The areas they explored included: Elementary GLOBE, sphere investigations from an Earth System perspective, relationship between clouds and surface temperature, STEM Equity in GLOBE, and instrument calibration in support of the GLOBE Air Quality Campaign. As part of their experience, each intern completed a GLOBE Implementation Plan for the upcoming school year, aligning GLOBE protocols, learning activities, and NASA resources with their state curriculum standards.

GLOBE students at Midwest Student Research Experience 2019

2018 United States Regional STudent Research Symposia

SYMPOSIUM	LOCATION	DATE	PROJECTS	STUDENTS	TEACHERS	PARTNERS	PARTNERSHIPS*	STATES
Midwest	Wayne State University School of Medicine, Detroit, MI	May 18–19	31	53	9	6	4	MI, OH
Northeast & Mid-Atlantic	SUNY Fredonia, Buffalo, NY	May 4–5	25	60	14	3	3	NH, WV, NJ, PA, NY, MA, CT
Northwest	Montana State University, Bozeman, MT	June 1–2	7	16	6	7	7	MT, AK, SD, OR, NE
Pacific	NASA Ames, Mountain View, CA	May 18–19	22	73	20	9	5	CA
Southeast	University of North Carolina, Charlotte, NC	April 19–20	14	32	13	7	6	LA, MS, AL, NC, AR, PR, TN
Southwest	University of Colorado, Boulder, CO	May 4–5	11	32	7	6	3	CO, TX, NM, OK

**Plus the Leitzel Center, UNH Partnership at-large*

GLOBE students at Mid-Atlantic Student Research Experience 2018

Community

PROFESSIONAL LEARNING COMMUNITY—PARTNERS

The United States GLOBE partnerships have formed a Professional Learning Community (PLC), and regularly present to one another virtually. Topics this year have included:

- United States Status—What is Happening and What is Planned?
- Updating your GLOBE Partnership Page
- Engaging Citizen Scientists to Study Urban Heat Island Effect
- MULTI STEM, a Community-based Approach to Engaging Students and Teachers in Effective STEM Education.
- A Partnership Between the Mobile Earth and Space Observatory (MESO) and the GLOBE Partnership CIRES Education and Outreach in Colorado
- Implementing the GLOBE Strategic Plan

PROFESSIONAL LEARNING COMMUNITY—TEACHERS

Beginning in the fall of 2018, the U.S. GLOBE teacher network started a GLOBE PLC to share how teachers use GLOBE with their students. Topics have included:

- Value of the SRS to Teachers and Their Students
- Getting Started with GLOBE
- Student-led Citizen Science Education Program
- Student Experience at the GLE
- GLOBE in the Elementary Classroom
- Conducting Aerosol Research

YEARBOOK

The United States GLOBE Office is putting together an annual Yearbook, with one page for each partnership, to share their annual GLOBE accomplishments. The 2017 Yearbook is complete; the 2018 Yearbook is currently being edited. The final products are available as flip books on the United States page, and hard copies can be ordered for distribution at recruitment events and to interested organizations.

UNITED STATES REGIONAL NEWSLETTERS

The United States Partner Forum members worked with the U.S. Office to create seven versions of a regional newsletter—one for each region, plus a NASA-focused version by the NASA representative. This is emailed quarterly to the GLOBE Partnerships in each of the geographic regions of the United States.

CANADA

MOUNT ROYAL UNIVERSITY BACHELOR OF EDUCATION PROGRAM

Mount Royal University (located in Calgary, Alberta, Canada) Bachelor of Education program is running a third-year STEAM (Science, Technology, Engineering, Art, and Mathematics) semester that uses The GLOBE Program to facilitate many of the field experiences. Teacher candidates work with K-9 students and community partners in place-based learning activities. The curriculum is responsive to local conditions and the cultural, social, economic and environmental traditions of the educational context.

Focusing on theory and practice, the program integrates STEAM-focused, inquiry-based projects that center on ecological field studies and longitudinal environmental assessments. In-school seminars, integrated weekly within a five-week practicum (each involving cohorts of 8-12 teacher candidates from four partner schools), are facilitated by teacher educators. They are designed to help teacher candidates develop a sense of community and responsive educational practices and adaptive expertise.

Most of the activities involve environmental monitoring, and most are longitudinal in nature as they span over a period of years. Community issues that students address during their time in the program are typically characterized as place-based educational initiatives. The ability to infuse an outdoor activity with related environmental field studies benefits the whole educational enterprise. Field studies reinforce both labs and lectures in specific subjects, addressing a traditional education problem: integrating theory and practice. Courses such as geography, survey biology, quantitative chemistry, ecology and environmental studies are often integrated and lend themselves to field studies that link to a range of outdoor activities. Addressing "real" topics, and finding ways to apply the prescribed learning outcomes to these studies using GLOBE materials, have proven to engage students in ways that secure knowledge and strengthen positive community attitudes.

During the 2018 fall semester, 79 third-year candidates hit the road for some off-campus, in classroom practical learning experiences. The students spent time facilitating science, technology, and mathematics lessons, guided by GLOBE materials, at the Nakoda Elementary School (NES) in Morley, with 160 elementary students (grades 2 through 5). Students and faculty worked directly with NES representatives on all pre-planning and post-planning for the experience, which included a debrief session with NES students, staff, and elders the following day on the Mount Royal campus.

Teacher candidates worked with students in STEAM disciplines, connecting theory with practice in an actual K-to-6 classroom setting. Together they constructed devices that could be used to keep an ice cube cold, and built other structures that would warm up a brick. The experience debrief saw Elder Duane Mark focusing heavily on the importance of the Stoney Nakoda language, and the need for people who are working in the community to learn it—and to incorporate it into daily lessons as much as possible. "This was the most enlightening teaching experience I have had," teacher candidate, Ashley Williamson, said.

Canadian student leads North America participants at the 2018 GLOBE Learning Expedition, Ireland

NORTH
AMERICA

Thanks to Our GLOBE Countries Around the World

AFRICA

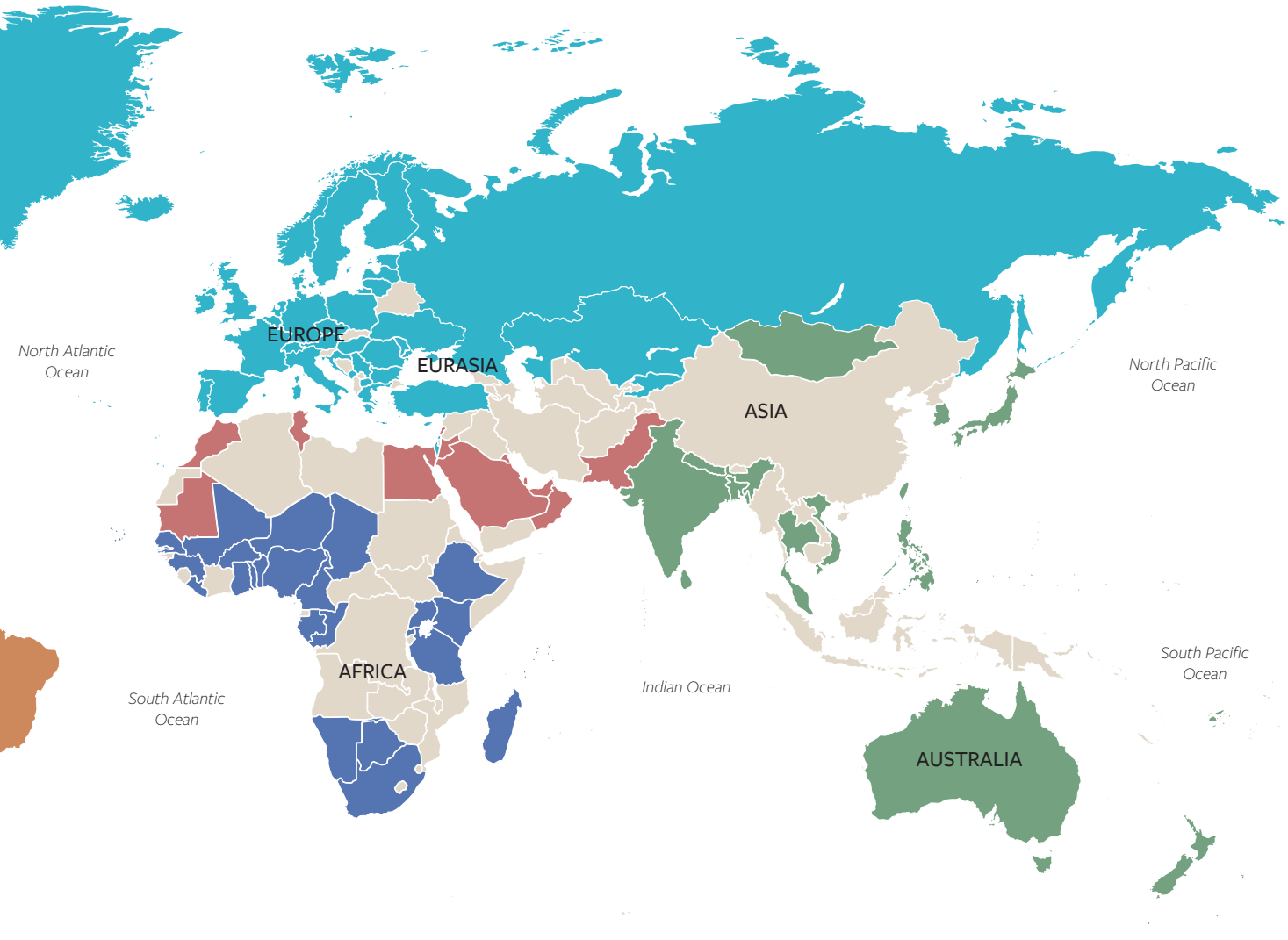
- Benin
- Botswana
- Burkina Faso
- Cameroon
- Cape Verde
- Chad
- Congo, Republic of the
- Ethiopia
- Gabon
- Gambia
- Ghana
- Guinea
- Kenya
- Liberia
- Madagascar
- Mali
- Mauritius
- Namibia
- Niger
- Nigeria
- Rwanda
- Senegal
- Seychelles
- South Africa
- Tanzania
- Togo
- Uganda

ASIA AND PACIFIC

- Australia
- Bangladesh
- Fiji
- India
- Japan
- Korea, Republic of
- Maldives
- Marshall Islands
- Micronesia
- Mongolia
- Nepal
- New Zealand
- Palau
- Philippines
- Sri Lanka
- Taiwan Partnership
- Thailand
- Vietnam

EUROPE AND EURASIA

- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Iceland
- Ireland
- Israel
- Italy
- Kazakhstan
- Kyrgyz Republic
- Latvia
- Liechtenstein
- Lithuania
- Luxembourg
- Macedonia
- Malta
- Moldova
- Monaco
- Montenegro
- Netherlands
- Norway
- Poland
- Portugal
- Romania
- Russia
- Serbia
- Spain
- Sweden
- Switzerland
- Turkey
- Ukraine
- United Kingdom



LATIN AMERICA AND CARIBBEAN

- Argentina
- Bahamas
- Bermuda
- Bolivia
- Brazil
- Chile
- Colombia
- Costa Rica
- Dominican Republic
- Ecuador
- El Salvador
- Guatemala
- Honduras
- Mexico
- Panama
- Paraguay
- Peru
- Suriname
- Trinidad and Tobago
- Uruguay

NEAR EAST AND NORTH AFRICA

- Bahrain
- Egypt
- Jordan
- Kuwait
- Lebanon
- Mauritania
- Morocco
- Oman
- Pakistan
- Qatar
- Saudi Arabia
- Tunisia
- United Arab Emirates

NORTH AMERICA

- Canada
- United States of America

Find the Annual Review can be found online at www.globe.gov/about/annual-reviews

GLOBE Regions Hit One Million Measurements

By early 2018, participants in the six GLOBE Program regions had each entered more than ONE MILLION measurements into the GLOBE database. Congratulations on this significant milestone! Overall data collection, including those from automated GLOBE weather stations worldwide, is approaching 200 million measurements.

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