The GLOBE Program

UCAR

Global Learning and Observations to Benefit the Environment

15th United Nations / International Astronautical Federation Workshops
Kitakyushu, Japan
October 14, 2005

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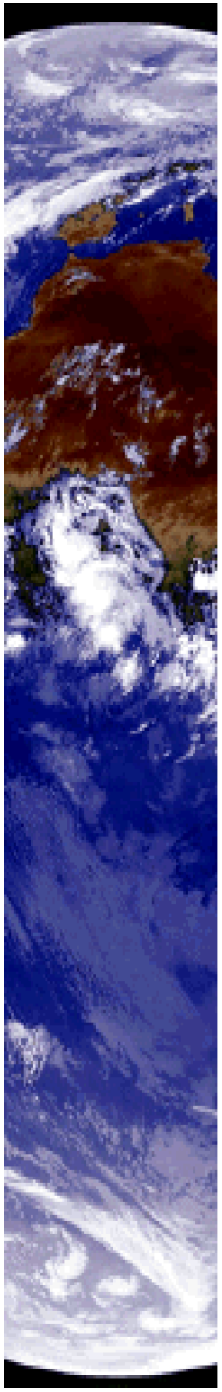
Secretary General, GLOBE Japan
Tokyo Gakugei University, Tokyo, Japan

NASA



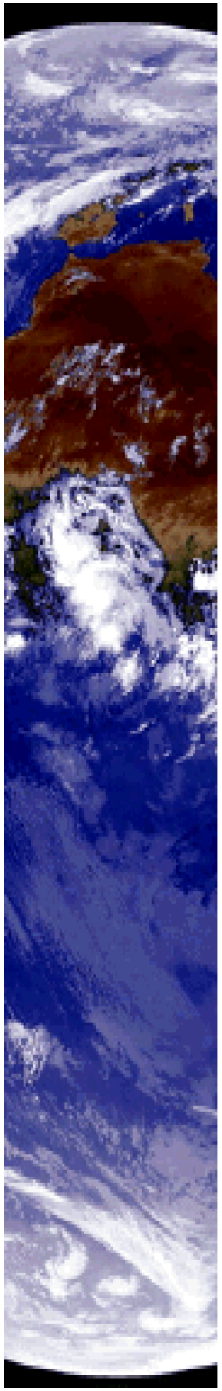
GLOBE—10 Years Old!

Global Learning and Observations to Benefit the Environment

- **Earth Day, April 22, 1994: Program Announced**
- **Earth Day 1995: Operations Began**
- **Earth Day 1996-2005:**
  Field Campaigns, Web chats and Forums,
  Student-Scientist Events

"GLOBE is the quintessentially ideal program for involving kids in science."
Nobel Laureate Dr. Leon Lederman

The GLOBE Program



Essential Elements of GLOBE

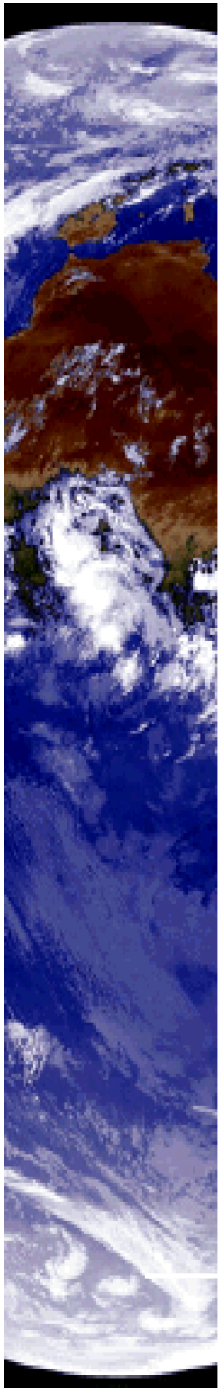
- GLOBE is SCIENCE and EDUCATION
- GLOBE brings together STUDENTS, TEACHERS and SCIENTISTS to:
  - Enhance environmental awareness of individuals throughout the world.
  - Contribute to scientific understanding of the Earth.
  - Support improved student achievement in science and mathematics.

Goldman Sachs
The Goldman Sachs Foundation
Asia Society

The Goldman Sachs Foundation Prizes for Excellence in International Education

Winner of the 2004 Media and Technology Category

The GLOBE Program



GLOBE Overview

- GLOBE students in primary and secondary schools as well as at many institutions of higher education throughout the world:
  - Take environmental measurements using GLOBE scientific protocols.
  - Report their observations to the GLOBE data archive via the GLOBE Web site.
  - Conduct student research on Earth science topics using GLOBE maps and graphs and other GLOBE educational materials.
- Every GLOBE school has a least one GLOBE-trained teacher.
- GLOBE teachers are recruited, trained, and mentored by GLOBE Partners.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NATIONAL SCIENCE FOUNDATION

UNITED STATES DEPARTMENT OF STATE

The GLOBE Program

GLOBE AROUND THE WORLD

109 GLOBE Partner Countries

GLOBE has trained over 30,000 teachers representing more than 16,000 schools worldwide.

Students have entered over 13 million GLOBE measurements.

The GLOBE Program

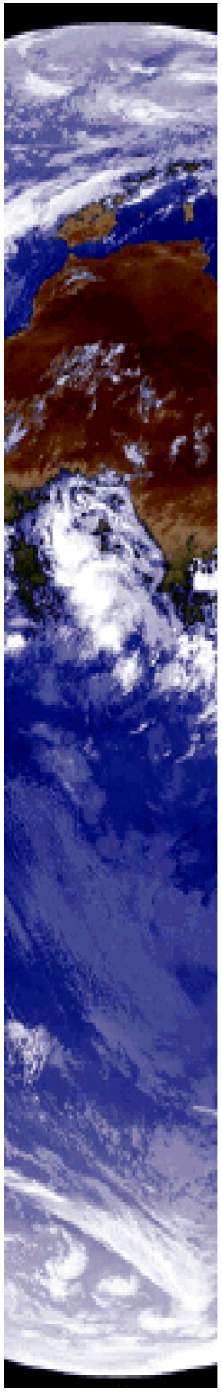
GLOBE Partner Countries

Africa	East Asia / Pacific	Europe / Eurasia	Latin America / Caribbean	Near East	North America	South Asia
Argentina	Australia	Austria	Bahamas	Bahrain	Bangladesh	Belgium
Benin	Bolivia	Bulgaria	Burkina Faso	Cameroon	Canada	Cape Verde
Chad	Chile	Colombia	Congo	Costa Rica	Croatia	Cyprus
Czech Republic	Denmark	Dominican Republic	Ecuador	Egypt	El Salvador	Estonia
Ethiopia	Fiji	Finland	France	Gabon	The Gambia	Germany
Ghana	Greece	Guatemala	Guinea	Honduras	Hungary	Iceland
India	Ireland	Israel	Italy	Japan	Jordan	Kazakhstan
Kenya	Korea, South	Kuwait	Kyrgyzstan	Latvia	Lebanon	
Liechtenstein	Lithuania	Luxembourg	Madagascar	Maldives	Mali	Marshall Islands
Mauritania	Mexico	Federated States of Micronesia	Moldova	Monaco	Mongolia	Morocco
Namibia	Nepal	Netherlands	New Zealand	Niger	Nigeria	Norway
Pakistan	Palau	Panama	Paraguay	Peru	Philippines	
Poland	Portugal	Qatar	Romania	Russia	Rwanda	Saudi Arabia
Senegal	Serbia and Montenegro	South Africa	Spain	Sri Lanka	Suriname	Sweden
Switzerland	Tanzania	Thailand	The Former Yugoslav Republic of Macedonia	Trinidad and Tobago	Tunisia	Turkey
Uganda	Ukraine	United Arab Emirates	United Kingdom	United States of America	Uruguay	

- **Internationally**, GLOBE is implemented through bilateral agreements between the U.S. government and the governments of GLOBE's 109 Partner Countries.
  - Typically implemented within the Ministry of Education, Science and Environment or assigned by the government to an NGO.

- **Within the U.S.**, GLOBE is implemented through mutual agreements (MOUs) with individual State Partners.
  - 130 U.S. Partners representing 48 states plus Washington D.C. and 2 U.S. Territories (Puerto Rico / Virgin Islands)

The GLOBE Program



GLOBE Science and Education

- GLOBE measurements have been selected by the international science and education communities to
  - Supplement existing K-16 curriculum through hands-on scientific experiences.
  - Provide data needed for Earth science research—scientists gain data that would otherwise go uncollected.
    - **Data complements satellite remote sensing missions.**
- GLOBE protocols ensure accurate results.
- GLOBE activities strengthen the links between scientists and students around the world through an inquiry-based learning approach.
  - **Data collection, reporting and analysis, followed by dissemination of research results.**
- GLOBE provides educational resources for primary, secondary, and higher education teachers.
  - GLOBE Teacher's Guide, Videos and related materials.

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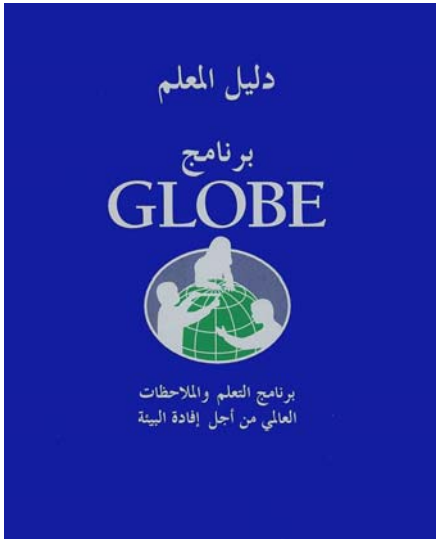
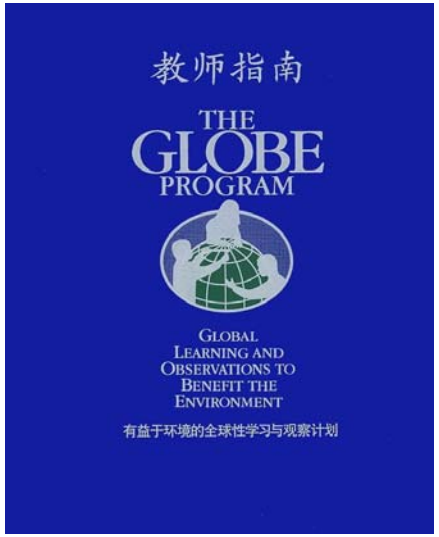
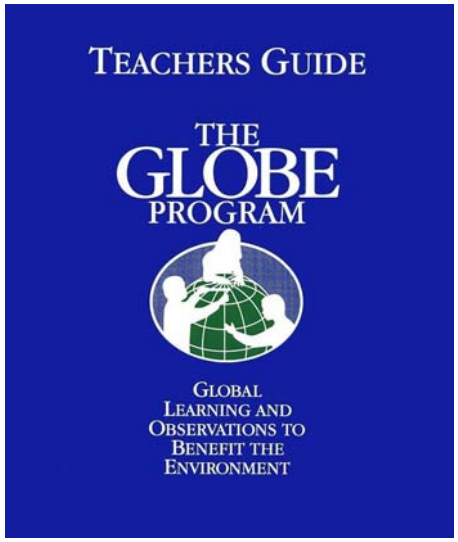
Chinese

Arabic

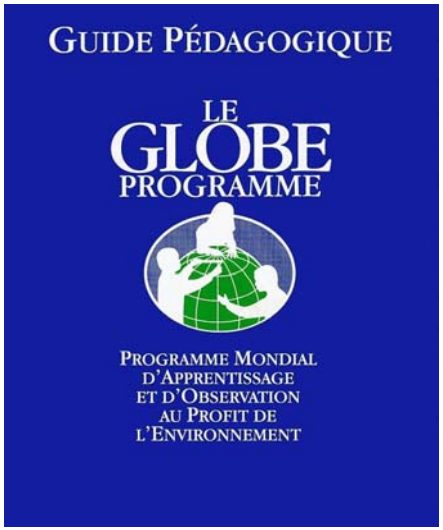




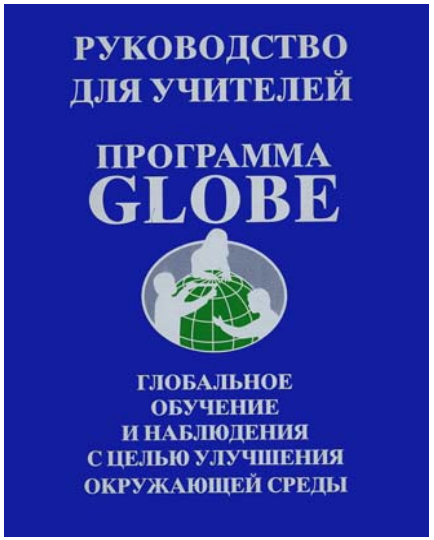
English



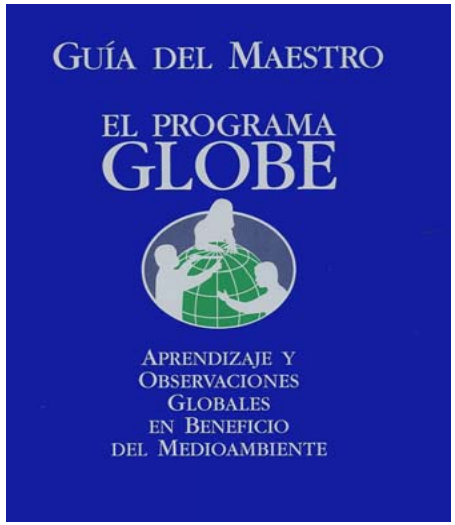
GLOBE Teacher's Guide in all 6 U.N. languages!



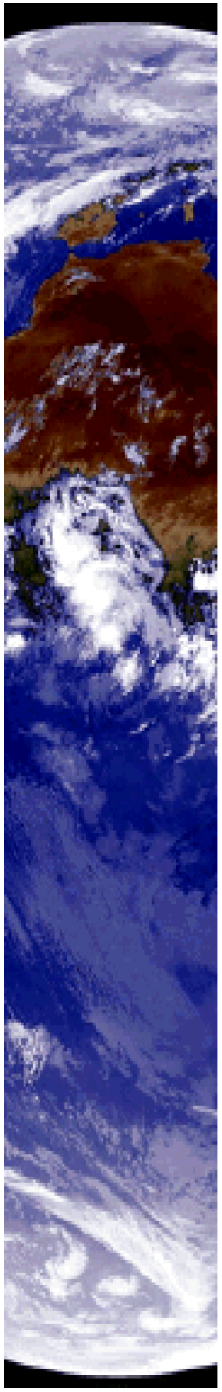
French



Russian



Spanish



GLOBE Measurements

Atmospheric/Climate Studies

- Air temperature (Maximum, Minimum, Current)
- Precipitation (Rain, Snow, pH)
- Cloud Cover/Type including contrails
- Relative humidity
- Barometric pressure
- Surface ozone
- Aerosols, water vapor

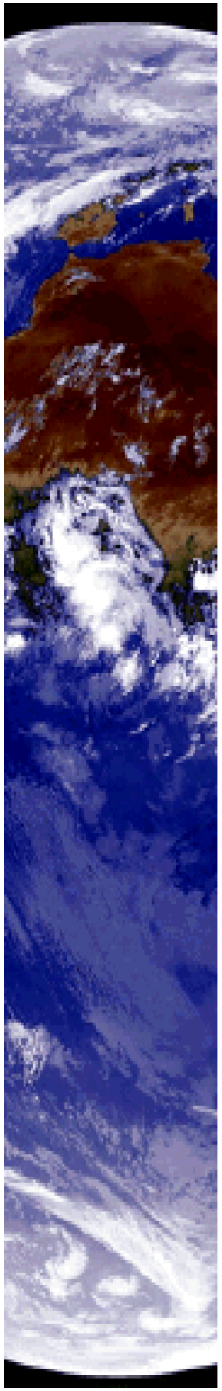
Hydrology Studies

- Water temperature
- Transparency
- Water chemistry
  - pH, dissolved O_2, alkalinity, nitrate, salinity or conductivity
- Freshwater macro-invertebrates

Soils Studies

- Soil temperature, soil moisture
- Soil bulk density, pH, particle size distribution, particle density, fertility
- Soil characterization
  - Structure, color, texture, consistency

The GLOBE Program



GLOBE Measurements

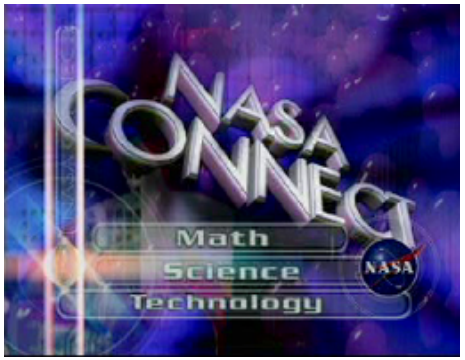
Land Cover Biology

- Land cover mapping (manual and computer-aided)
- Biometry (canopy and ground cover, tree and shrub height and diameter, grass biomass, species id)
- Land cover change detection
- Fire fuel ecology

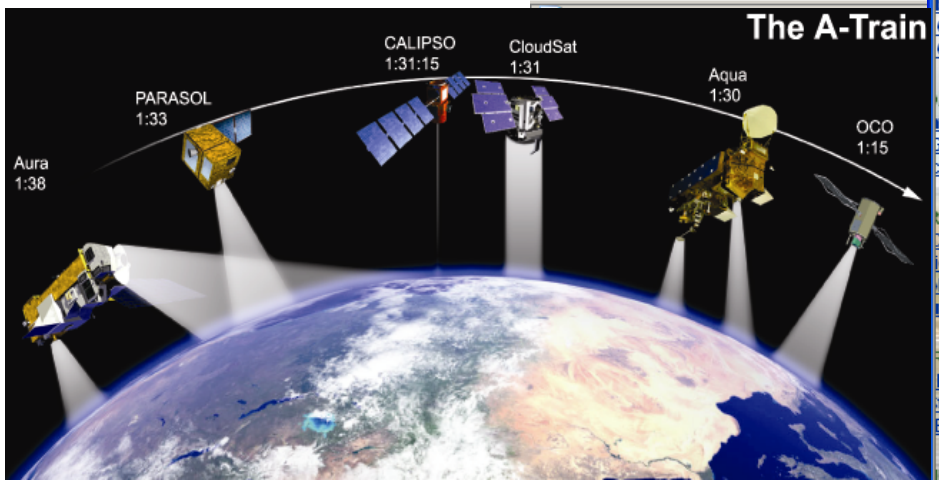
Phenology

- Green-up and green-down, budburst
- Ruby-throated hummingbird monitoring
- Phenological gardens
- Common and clonal lilacs
- Seaweed reproductive phenology
- Arctic bird migration monitoring

The GLOBE Program



GLOBE teams with many Satellite Missions.



The GLOBE Program: Welcome - Microsoft Internet Explorer

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Back Search Favorites Media

Address http://www.globe.gov/fsl/welcome/welcomeobject.pl

Go Links

GLOBE Schools Log-in

News and Events

The GLOBE Program

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How To Join GLOBE

EDUCATION & SCIENCE
Teacher's Guide
Protocols
Student Investigations
School Collaboration
Scientists' Corner
Educators' Corner

GLOBE DATA
Data Entry
Maps and Graphs
Data Access

GLOBE PARTNERS
Partners' Corner
Countries
Schools
U.S. Partners

LIBRARY
Resource Room
GLOBE Stars
News and Events

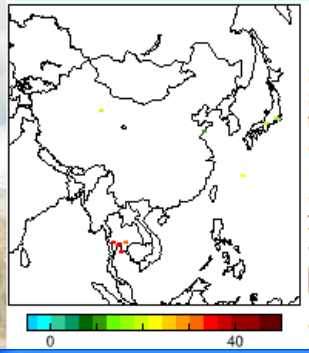
INFO & HELP
Learn About GLOBE
Contact GLOBE
FAQs

News & Events

News and Events

CALIPSO and CloudSat Education and Public Outreach

The Education and Public Outreach programs for two of NASA's A-Train satellites, CALIPSO and CloudSat, are partnering with NASA CONNECT to produce a show titled The A-Train Express . In the show students will learn how weather affects their daily lives and just what the difference is between weather and climate. The students will also be introduced to two of NASA's earth science satellite missions CALIPSO and CloudSat.
More...



GLOBE Stars

GLOBE Arctic POPs Project Moves Forward

Since 2001, 15 GLOBE schools in Canada, Finland, Iceland, Norway, Russia, Sweden, and United States have been working on a joint research project to better understand the distribution of Persistent Organic Pollutants, commonly called POPs, in the Arctic region. Teachers and students at these schools have been working closely with two scientists, Eldbjorg Heimstad and Geir Endregard, at the NILU Polar Environmental Centre in Tromso, Norway. More...

Scientists' Corner

Participate in the Calibration of Water Vapor Instruments

The GLOBE water vapor monitoring project, led by GLOBE scientists David

GLOBE: GLOBE News & Events - Microsoft Internet Explorer

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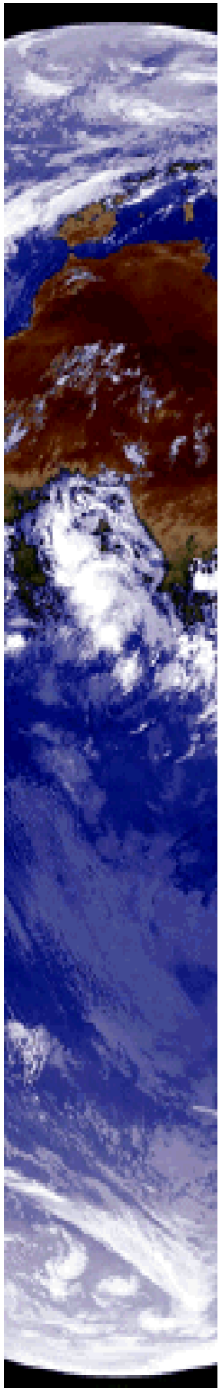
Address http://www.globe.gov/fsl/html/templ.cgi?calipso&lang=en&nav=1

Go

CALIPSO and CloudSat Education and Public Outreach programs partner with GLOBE and NASA CONNECT

The Education and Public Outreach programs for two of NASA's A-Train satellites, CALIPSO and CloudSat, are partnering with NASA CONNECT to produce a show titled *The A-Train Express* . In the show students will learn how weather affects their daily lives and just what the difference is between weather and climate. The students will also be introduced to two of NASA's earth science satellite missions CALIPSO and CloudSat.

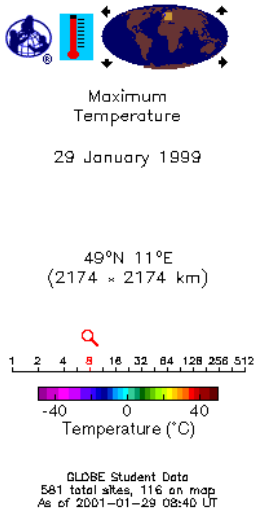
NASA CONNECT films students at the School of International Studies at Meadowbrooke, in Norfolk Virginia, for a video titled "The A-Train Express". The video includes students in the U.S. and France participating in taking sun photometer measurements for CALIPSO and cloud observations for CloudSat, which are then reported at the GLOBE website.

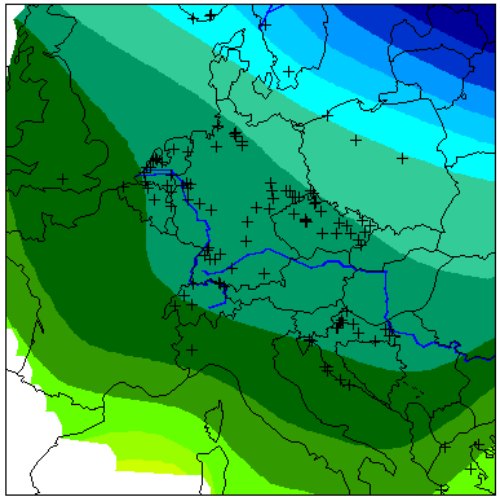


GLOBE Visualizations

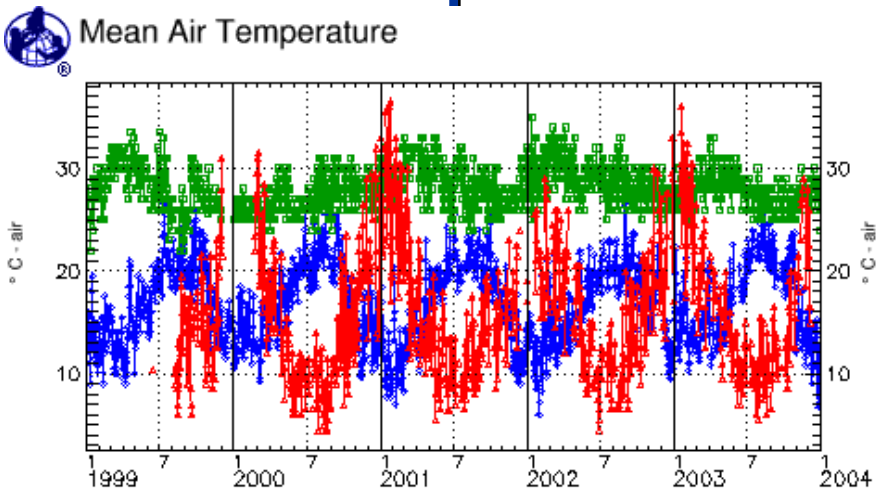
Students can visualize data through…

Maps





Graphs



Raw Data

Air Temperature

YYYYMMDD	LATITUDE	LONGITUDE	ELEVATN	SITEID	CTTMP	MXTMP	MNTMP
20000819	64.8497	-147.8268	133.0	ATM-01	10.0	-99.0	-99.0
20000819	64.8618	-147.7217	203.0	ATM-01	10.0	12.0	4.0
20000819	38.7777	-120.8897	454.0	ATM-02	32.0	34.0	24.0
20000819	32.1832	-110.9775	836.0	ATM-01	40.5	40.5	22.5
20000819	36.5197	-119.5463	27.0	ATM-02	30.5	32.0	-99.0
20000819	33.7769	-118.0386	7.0	ATM-01	27.0	29.5	14.0
20000819	39.1167	-105.0167	1647.0	ATM-02	31.0	31.0	18.0
20000819	31.7535	-106.4733	1165.0	ATM-02	36.0	37.0	20.0
20000819	31.7694	-106.5066	1154.0	ATM-01	30.0	31.0	20.0
20000819	48.5467	-117.9044	774.0	ATM-01	20.5	28.0	7.0
20000819	36.0612	-90.9550	84.0	ATM-02	31.0	33.0	18.0
20000819	29.0892	-97.2763	68.0	ATM-01	36.5	39.0	22.5
20000819	36.0906	-94.9200	280.0	ATM-01	29.0	29.0	19.0
20000819	29.0382	-82.6903	5.0	ATM-01	39.0	39.0	23.0
20000819	36.3720	-109.6243	1658.0	ATM-02	26.0	31.0	15.0
20000819	35.9510	-97.2358	278.9	ATM-01	36.0	36.0	19.0
20000819	35.2969	-94.0361	198.0	ATM-01	32.5	38.5	21.5
20000819	36.0000	-93.0032	834.0	ATM-01	32.0	38.0	21.0
20000819	28.1390	-82.5071	8.0	ATM-01	30.0	34.0	23.0
20000819	34.8982	-96.1000	239.0	ATM-01	35.0	-99.0	-99.0

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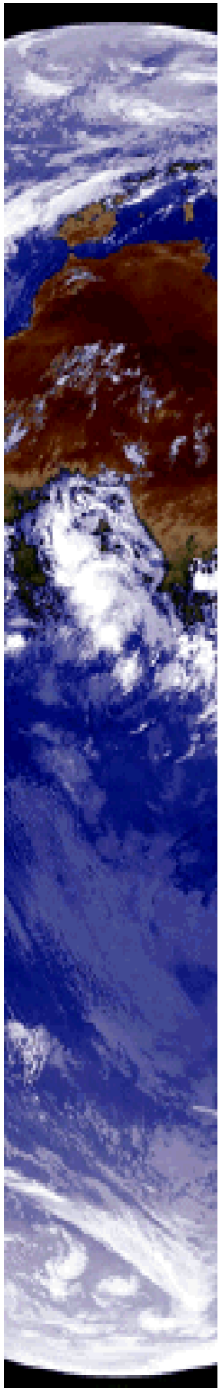
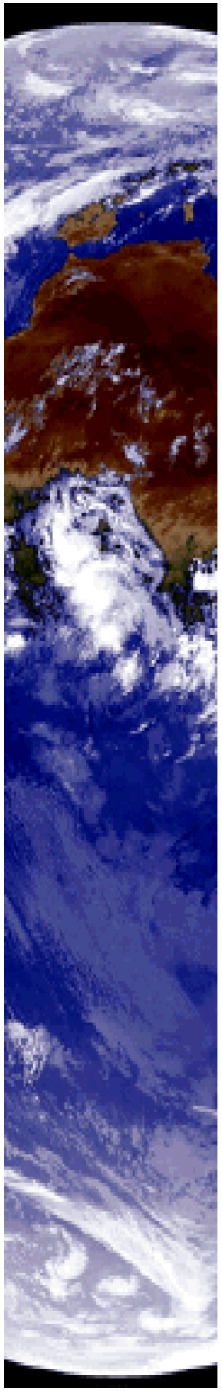


GLOBE Japan Activities

The GLOBE Program



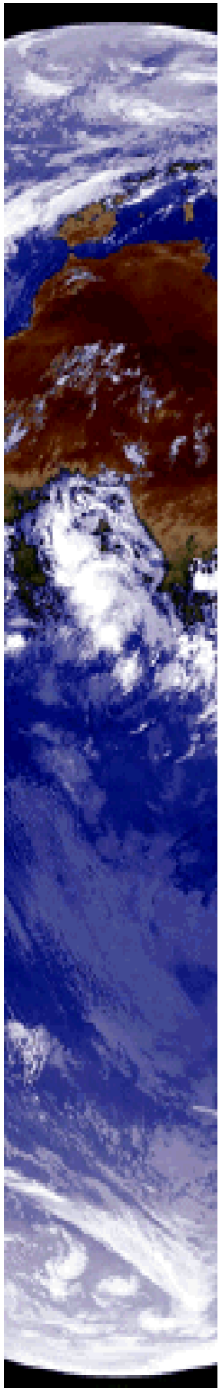
Supporting Ministries

Since 1995

- **Japanese Ministry of Education, Culture, Sport, Science and Technology (MEXT)**
  -MEXT has been supporting GLOBE activities in selected schools.
  -The period of support for 20 schools is two years.
  -120 GLOBE schools have been supported by MEXT to present. -This year is the sixth period.

- **Ministry of Environment**
  -Ministry of Environment also has been supporting the GLOBE activities related to social educational facilities and organizations in addition to schools.

The GLOBE Program



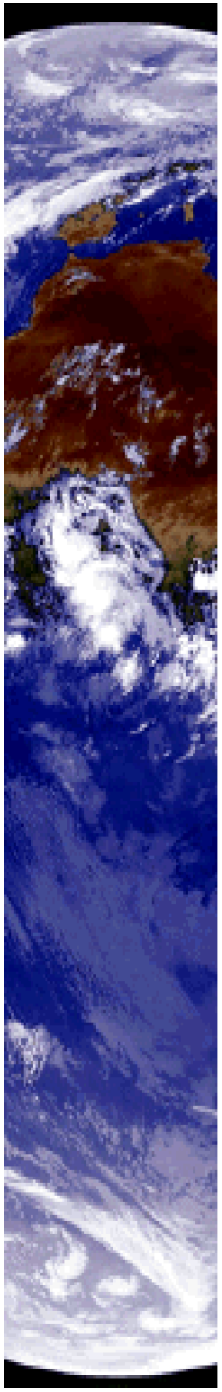
GLOBE Japan Center

Field Studies Institute for Environmental Education,
Tokyo Gakugei University

We operate and support various events and activities for GLOBE schools:

- Support of observation and data input,
- Meetings and conferences,
- Development of GLOBE related programs,
- Information offering on international activities, etc.

The GLOBE Program

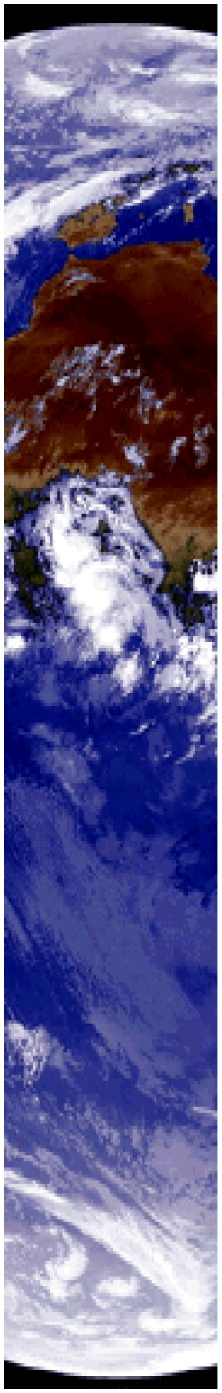


Student Conference

The 3rd GLOBE Japan Student Conference, December, 2004

- Twenty-five GLOBE schools participated.
- Schools described investigative activities using oral and poster presentations.
- High school students demonstrated GLOBE measurement and related original methods to primary and secondary school students.
- We offered the conference program using an e-mail system like chat for international exchange between GLOBE U.S. scientists and participating students in this conference.

The GLOBE Program

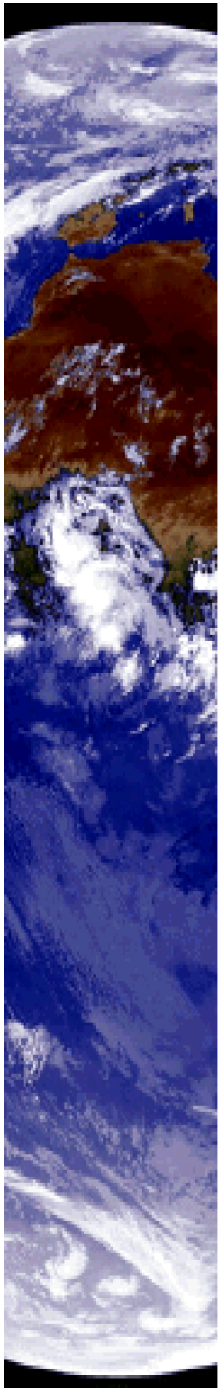


Teacher's Conference and Training Workshop

Teacher's Conference and Training Workshop, June, 2005

- The teacher's conference was held for information exchange and discussion of GLOBE activities in schools.
- The training workshops focused on fundamental GLOBE measurement methods using open space and experimental apparatuses.
- Previous GLOBE activities were introduced, and discussion of successful implementation of the GLOBE program for new teachers was conducted.
- In addition, a lecture on "What is the inquiry approach?" covered fundamental theory of inquiry, introduced case studies and demonstrated some experimental devices.

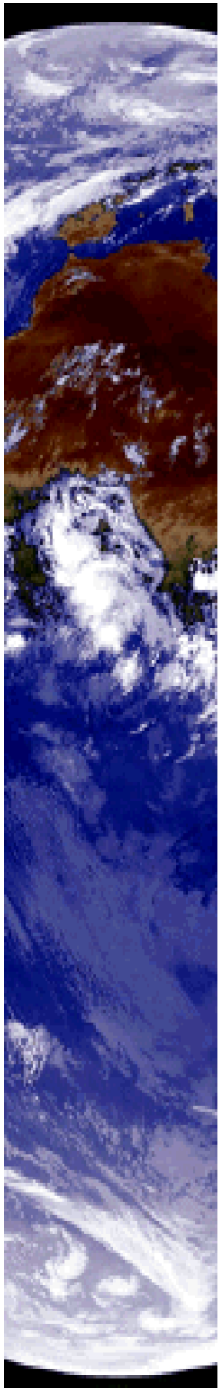
The GLOBE Program



Activity Trends in GLOBE Japan

- There are many types of activities in GLOBE Japan. GLOBE related activities are generally assigned to the "Integrated Studies" period that was introduced recently.
- In particular, measurements of atmosphere and water quality are popular. In addition, phenological activities for elementary schools have begun in some schools because of the easy observation methods.
- Recently, GLOBE Japan activities have expanded to include regional characteristics and issues such as regional endangered species, in addition to the standard protocols.
- In the above activities, the inquiry approach is gradually increasing.

The GLOBE Program



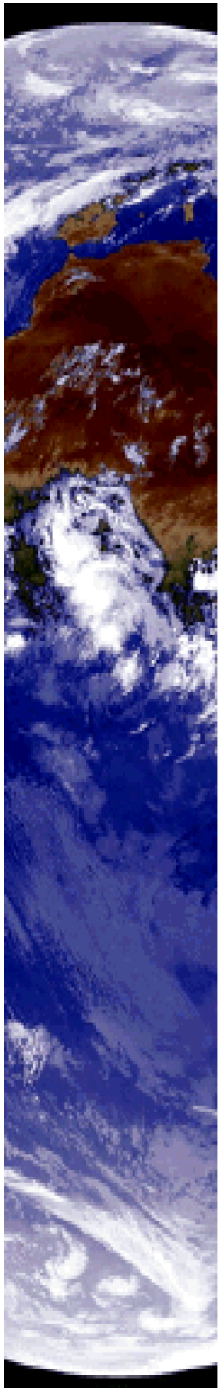
Promoting Information of GLOBE Japan

- Web site
- Leaflet
- Activity Report
- Measurement Manual

Web Site for Japanese

Leaflet for Japanese

The GLOBE Program



UNESCO Collaborations

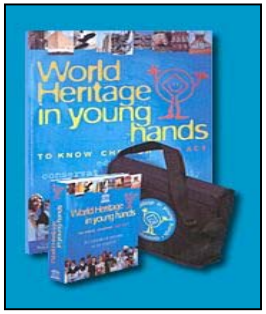
2005 Study Sites

India-World Heritage sites near Agra: Taj Mahal and Agra Fort.

Jordan-World Heritage sites near Petra, Quseir Amra, Omm ElRasas and Wadi Dana UNESCO Biosphere reserve.

Madagascar-World Heritage Site Ambohimanga Rova.

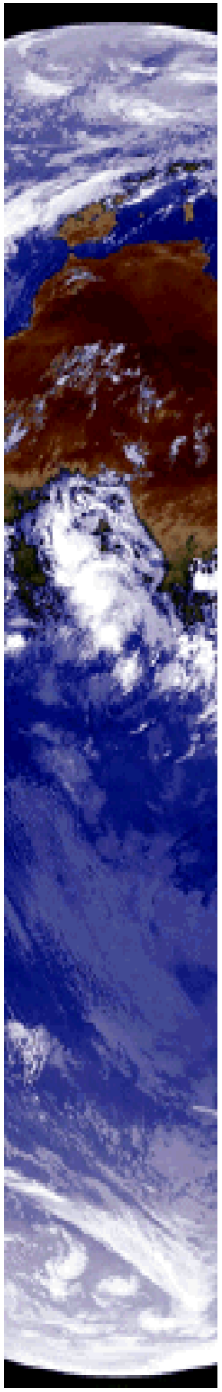
Mexico-Cultural Heritage Site in El Tajín, Veracruz (Mexican Golf)



Russia-Lake Baikal World Heritage Site, Russia.

Teaming GLOBE students and teachers with local World Heritage Site Managers.

The GLOBE Program



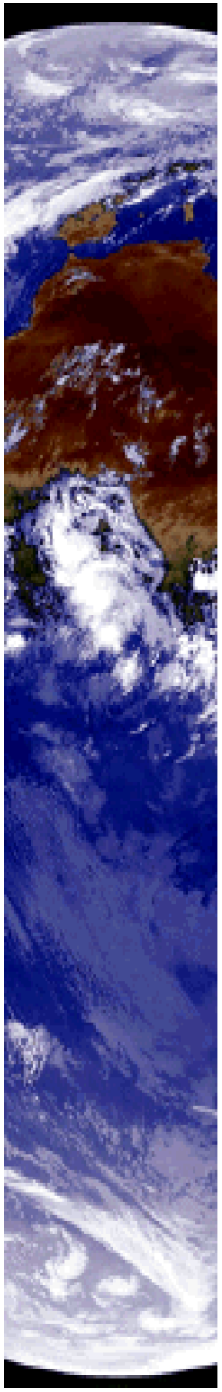
UNESCO Collaborations

2006 Study Sites

Guatemala

Machu Picchu, Peru

Iguaçu (Brazil) and Iguazu (Argentina)



GLOBE Program Evaluation

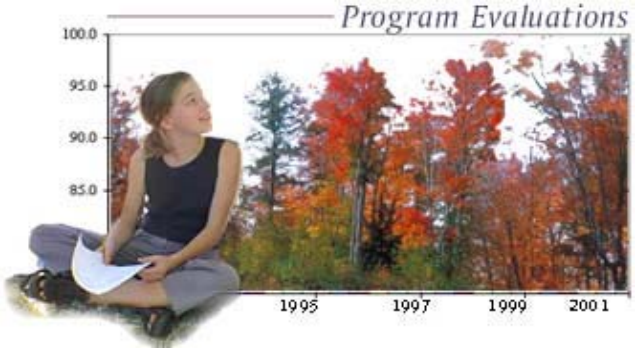
Stanford Research Institute (SRI)

Positive impact on student learning and performance

- GLOBE contributed to the development of students' science knowledge.
- More time hands-on / Less time memorizing.

Improved student higher order thinking skills

- Interpreting data.
- Drawing inferences.

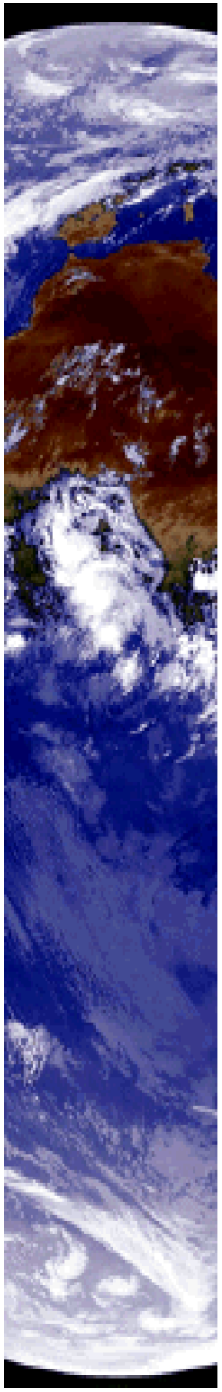


Enhanced student appreciation of what scientists do

- Studying problems without a clear solution.
- Collaboration with other scientists.

Heightened teacher expectations of students

The GLOBE Program



The Next Generation GLOBE

All essential elements of GLOBE remain intact.

- **10 years of student data—over 13 million measurements.**

New NSF Funding Strategy:

- Encourage partnerships between GLOBE, NSF and NASA-funded **Integrated Earth Systems Science Programs (IESSPs)** to leverage existing resources and expertise.
- **Build bridges** between top Earth Systems Science Programs and Scientists with GLOBE's worldwide community.

Result: Students and Teachers will have access to top scientists from around the world and become involved in cutting edge Earth Systems Science Research.

Stronger emphasis on students using and sharing data in the classroom as well as supporting partnerships between Teachers—Students—Scientists.

The GLOBE Program

The GLOBE Program

Students collaborate with scientists

Hands-on science

Atmosphere/Climate
Hydrology
Soil
Land Cover/Biology
Phenology

http://www.globe.gov

International Program in 109 countries

Over 13 million environmental measurements reported