

Acronym: EarthKAM

Title: Earth Knowledge Acquired by Middle School Students

Principal Investigator(s):

Sally Ride, Ph.D., University of California - San Diego, San Diego, CA

Contact(s):

PI - [Sally Ride](#), (858) 534-5827

Primary - [Brion Au](#), (281) 483-7926

Secondary - [Karen Flammer](#)

Mailing Address(es):

Dr. Sally Ride

University of California, San Diego

Department of Physics, 0426

9500 Gilman Drive

LaJolla, CA 92093-0426

Developer(s):

University of California, San Diego, San Diego, CA

Johnson Space Center, Houston, TX

Jet Propulsion Laboratory, Pasadena, CA

Texas A&M University, College Station, TX

TERC, Cambridge, MA

Sponsoring Agency: National Aeronautics and Space Administration (NASA)

Increment(s) Assigned: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Brief Research Summary (PAO): Earth Knowledge Acquired by Middle School Students (EarthKAM), an education activity, allows middle school students to program a digital camera on board the International Space Station to photograph a variety of geographical targets for study in the classroom. Photos are made available on the web for viewing and study by participating schools around the world. Educators use the images for projects involving Earth Science, geography, physics, and social science.

Research Summary:

- Middle School students program an on-board digital camera to take photographs of selected targets on Earth. The images are used to study land use, coastline erosion, volcanoes, deforestation and many other topics; as well as support curriculums for physics, technology, geography, math, Earth science, biology, art, history and cultural studies.
- This experiment exposes students to space operations and is inspiring the next generation of space explorers.
- To date, over 1200 schools from seventeen different countries (Argentina, Australia, Belgium, Brazil, Canada, Chile, France, Germany, India, Italy, Japan, Mexico, New Zealand, South Korea, Spain, United Kingdom and the United States) have participated in EarthKAM. The 73,000 students involved have received over 29,000 images from the ISS since EarthKAM began on Expedition 2.

Detailed Research Description: Earth Knowledge Acquired by Middle School Students (EarthKAM) is a NASA-sponsored education program that enables thousands of students to photograph and examine Earth from the unique perspective of space. The purpose of EarthKAM is to integrate the excitement of

ISS with middle-school education. EarthKAM invites schools from around the world to take advantage of this exceptional educational opportunity. In addition to the many schools in the United States, schools from 17 countries have also participated.

Middle-school students learn about spacecraft orbits and Earth photography, and then target and request their desired images by tracking the orbit of the station, referencing maps and atlases, and checking weather. Their requests are then collected and compiled by students at the University of California, San Diego, Calif. With help from representatives at NASA Johnson Space Center in Houston, compiled requests are uplinked to a computer onboard ISS. This computer records the requests and transmits them to the digital camera, which takes the desired images and transfers them back to the computer. The images are then downlinked to EarthKAM computers on the ground. Within hours, the EarthKAM team makes the photographs available on the World Wide Web for easy access by participating schools as well as the general public. Schools then explore the images in support of national, state, and local education standards. Students learn to recognize and research features in the images, place the images in global context using maps and atlases, and make connections with the topics and subjects they are studying.

Project Type: Payload

Images and Captions:



This image shows two students from Sacaton, Arizona who participated in the EarthKAM project for three missions. The students are locating area's on a map that were captured by the EarthKAM camera.



Third graders from Sacaton, Arizona tracking the ISS for their EarthKAM project.



A student from Sacaton, Arizona using a computer to correlate images captured by the EarthKAM camera to the position of ISS.



Expedition 10 Science Officer and Commander Leroy Chiao in front of the EarthKAM camera holding a student greeting from Wissahickon Middle School, Ambler, PA.



Students from Lowery Intermediate in Louisiana are studying a map to compare "Delta's around the world to our Delta".



Students at Gonzalez Middle School are using computers to help select potential target sites for the EarthKAM camera.



Images from left to right: Flat Stanley, a 3rd-grader who was flattened by a blackboard and now travels the world collecting adventures. Stanley is sent out across the country to have adventures. This image was taken before Flat Stanley traveled to ISS during Expedition 11. NASA ISS Expedition 11 Science Officer, John Phillips and Flat Stanley onboard ISS.



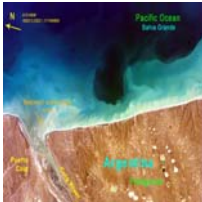
NASA Image: ISS012039214802 - EarthKAM students captured this picture of fragile coral reefs in the Tuamotu Islands in the South Pacific. The students are investigating the formation of atolls, the kinds of plants and animals found on this remote island, and how the people who live there support themselves.



NASA Image: JSC2006E03489 - During EarthKAM operations, ISS Deputy Program Scientist Julie Robinson uses a globe to showcase a potential photo target to sixth-grader Lucas at Westbrook Middle School in Friendswood, Texas.



NASA Image: JSC2006E03491 - Seventh-graders Emily and Jessica from Westbrook Middle School in Friendswood, Texas use a map and the Internet to determine the latitude and longitude of their next picture during the February 2006 EarthKAM session.



Annotated EarthKAM image of the Coig River showing the sediment outflow into the Pacific Ocean from the river, requested by students during the EarthKAM session in August 2006. Students relate these sediment patterns to those in their own regions, such as along the gulf coast.



NASA Image: ISS014-ESC2-054080412 - This image of India and the Arabian Sea was taken by students from Bernotas Middle School in Crystal Lake, IL during Expedition 14 in February 2007. This image highlights the geographical features of a coast line and peninsula.

Operations Location: ISS Inflight

Brief Research Operations:

- Using the EarthKAM Web page, students control a digital camera mounted in a window on ISS to capture images of the Earth. The resulting photos are available on the World Wide Web for viewing and study by participating classrooms.
- Each mission is scheduled to provide 96-hours of image gathering opportunities. The missions are scheduled to coincide with the traditional public school year, operating in the late fall, mid-winter, spring and mid-summer.

Operational Requirements: EarthKAM requires no crew interaction after initial setup. It requires power only during operation.

Operational Protocols: Using the Internet and interactive Web Pages, students target sites that the ISS passes over during the mission time frame. The image requests are collected and compiled into a Camera Control File, which the EarthKAM team uploads to the Station SSC. The SSC then activates the camera at specified times and stores the resulting images onto the Ops LAN File Server. The images are then downlinked as quickly as Ku resources permit for posting to the Internet.

EarthKAM is monitored from the Telescience Support Center at JSC (Mission Control) and operated from

the EarthKAM Mission Operations Center at UCSD. Operations are coordinated through the Payload Operations Center at MSFC.

Review Cycle Status: PI Reviewed

Category: Observing the Earth and Educational Activities

Sub-Category: Educational Activities

Space Applications: The students at UCSD are gaining experience as real time flight controllers while working on EarthKAM. This experience is inspiring the next generation of flight controllers for space programs.

Earth Applications: ISS EarthKAM offers a powerful way for students to investigate Earth from the unique perspective of space. The image collection is posted on the Internet for both public use and participating classrooms around the world. In addition to the raw images, the EarthKAM Data-system contains selected images that have been annotated and even more images that can be displayed as overlays on various format maps. Learning guides and activities are available to support education in Earth science, space science, geography, social studies, mathematics, communications, and even art. The concepts in these projects support the National Science Education Standards, National Math Education Standards, National Geography Standards, and the National Science Education Teaching Standards.

Manifest Status: Continuing

Supporting Organization: Space Operations Mission Directorate (SOMD)

Previous Missions: KIDSAT, a precursor to EarthKAM, was performed on five Shuttle missions. EarthKAM has been performed on ISS Expeditions 2 and 4-13.

Results: As of November 2006, 73,648 students from 1170 schools worldwide, as well as members of the general public, have used EarthKAM to investigate every corner of the globe. Images taken by the participating schools are posted on the EarthKAM Web site at <http://www.earthkam.ucsd.edu/> for use by the public and participating classrooms around the world. Started in 1996, EarthKAM has conducted 24 missions on ISS and offers more than 29,000 photos of the Earth. No other NASA program gives students such direct control of an instrument flying on a spacecraft orbiting Earth, and as a result, students assume an unparalleled personal ownership in the study and analysis of their Earth photography.

Results Status: Pending More Information

Results Review Status:

Results Publications:

[Hurwicz M. Case Study: Attack Of The Space Data -- Down To Earth Data Management At ISS EarthKAM. New Architect. Aug 1, 2002 ;38.](#)

Related Publications:

[Buckley D. Science & Technology: A Workshop, Technology & Learning. Sep 1, 2003 ;27.](#)

Web Sites:

[ISS EarthKAM](#)

[NASA Fact Sheet](#)

[Picturing Earth From Space](#)

[NASA Education Program](#)

[Earth Science Picture of the Day](#)

Related Payload(s): CEO, SEM

Last Update: 03/07/2008