



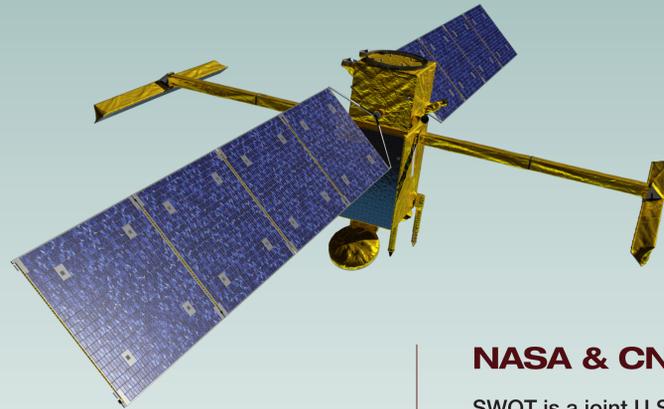
SWOT in the GLOBE Program: Hydrology science in the classroom

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Abstract

A cornerstone element of NASA's Surface Water and Ocean Topography (SWOT) Mission Education Program will be participation in the multinational, multiagency program, Global Learning and Observations to Benefit the Environment (GLOBE) (<http://www.globe.gov>). GLOBE brings together students, teachers and scientists through the GLOBE Schools Network in support of student learning and research, as well as support of science goals of NASA's Earth Science program. The objectives of the program are to promote the teaching and learning of science; enhance environmental awareness, literacy and stewardship; and contribute to scientific research and monitoring of the environment.

The SWOT mission will measure sea surface height and the heights, slopes, and inundated areas of rivers, lakes, and wetlands. This new SWOT-GLOBE partnership will focus on the lakes and river aspects of the SWOT mission. These measurements will be useful in monitoring the hydrologic cycle, flooding, and climate impacts of a changing environment.

The SWOT Education teams at NASA and CNES are working with the GLOBE Program implementers to develop and promote a new protocol under the Hydrology topic area for students to measure attributes of surface water bodies that

will support mission science objectives. This protocol will outline and describe a methodology to measure width and height of rivers and lakes.

This new GLOBE protocol will be included in training to provide teachers with expertise and confidence in engaging their students in this new scientific investigation. Performing this additional measurement will enhance GLOBE students experience in scientific investigation, and will provide useful measurements to SWOT researchers that can support the SWOT mission research goals.

SWOT engagement with the public, and students in particular, will involve communicating the value of its measurements of river and lake height, lake water storage, and river discharge. This is also important to the GLOBE Program as curriculum integration of its hydrology measurements can be enhanced by strengthened ties to the concepts of watersheds and the hydrologic cycle. Understanding can be increased of the relation of lake and river levels to drought and water supply as well.

NASA & CNES

SWOT is a joint U.S. and French space agency mission. Preparation and development of new hydrology measurement protocols for school partners in the GLOBE Program will further enhance the science and partner communities between the space agencies. CNES has extensive classroom partnerships already developed in their ocean-focused Argonautica program, and between 50 and 100 classes participating in that program each year.

What Can GLOBE Students Do for SWOT?

GLOBE students establish hydrology measurement sites where they take observations of the water body. Schools are asked to take these data at weekly or longer intervals. For SWOT, these measurements may, ideally, correspond to dates of SWOT overflights of the measurement area. The goal is for students to report data from 12 days of observations each year. Measurement protocols could be added to measure the height or width (a proxy for height) of their water bodies with the approach varying depending on whether the site is a lake, a stream or river, and its size. Student safety is a limiting concern, and the protocols specify conducting observations and taking samples from a dock, bridge, or on shore, but samples taken from boats have always been permitted. These methods for data collection should be adequate for measurements of lakes and rivers that will be measurable by SWOT.

Where GLOBE students can take data on larger water bodies – wide rivers and lakes greater than a certain size – direct comparisons of *in situ* and satellite data will be possible. Student observations of smaller water bodies can complement those of larger water bodies and provide a more complete picture of the overall status and flow in watersheds.



SWOT Hydrology Science Lead, Tamlin Pavelsky (Univ. North Carolina), right, works with high school teachers on a discharge measuring exercise similar to what may be planned for students working with GLOBE-SWOT measurements.

Engaging Communities

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GLOBE Events

GLOBE Annual Meetings bring together GLOBE Country Coordinators and U.S. Partnership Coordinators, participating scientists and educators, as well as Partnering Organizations from around the world to address key science and education elements of GLOBE. See <http://www.globe.gov/>



Students representing CNES and their schools participate in the 18th GLOBE Annual Meeting in Delhi, India in 2014. Image: CNES

GLOBE Learning Expeditions (GLEs) take place every 5 or 6 years to provide GLOBE students and teachers from around the world an opportunity to present their research projects to their peers, to GLOBE scientists, and to the greater GLOBE community. Teachers are able to share their innovative ideas and challenges, attend professional development sessions, learn more about GLOBE protocols, and build connections with other schools. The 2014 GLE was in India. A developed SWOT GLOBE Partner program will enable sharing of this new hydrology protocol to a diverse international community.



For more information:
swot.jpl.nasa.gov

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