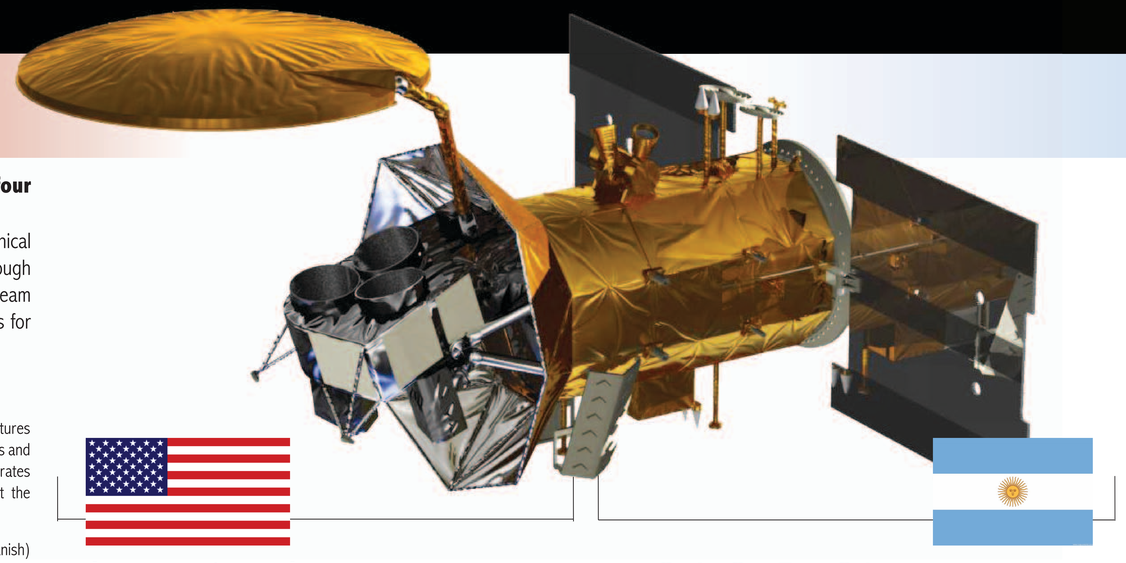
POSTER ID: B0721
SESSION 164: INTERNATIONAL EDUCATION AND OUTREACH ACTIVITIES

Aquarius/SAC-D Mission

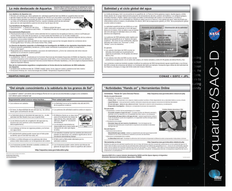
U.S. and Argentina Working Together to Understand Our Oceans

CONAE
COMISION NACIONAL DE ACTIVIDADES ESPACIALES



The Aquarius mission is brimming with educational content that hits all four areas of STEM: science, technology, engineering and mathematics.
The design and engineering of the satellite, the science of ocean observing, the technical speficiations for the mission and the importance of understanding global processes through data can all be illustrated using Aquarius as an example. NASA's education and outreach team has taken a multi-pronged approach to creating educational products and opportunities for educators to utilize information and data about Aquarius.

Mission Posters (English/Spanish)



The front of the Aquarius/SAC-D educational wall poster (24" X 20") features an image of the satellite in orbit and the back highlights the scientific goals and benefits of the Aquarius/SAC-D mission. The educational content illustrates how maps of sea surface salinity can increase our knowledge about the interactions among ocean circulation, the water cycle, and climate.

Thousands of these posters (which are available in both English and Spanish) have been distributed to educators and students thus far.

Educator Workshop

A week before Aquarius' launch in June 2011, a workshop for K-12 educators was held at NASA's Jet Propulsion Laboratory (JPL). The workshop featured five eminent NASA scientists working collaboratively with educators to examine connections between the water cycle, ocean circulation, climate and sea surface salinity. Using online concept mapping software developed by the Centers for Ocean Science Education Excellence (COSEE) Ocean Systems, the scientists developed concept maps to enable effective communication of these connections.

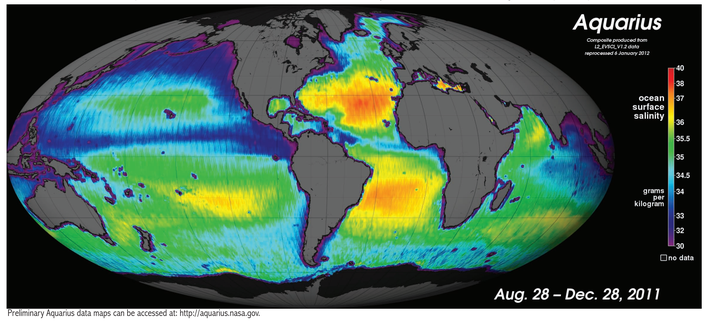
On the workshop's second day, the scientists presented their concept maps to an audience of 50 educators. Throughout the day, the educators worked in small teams directly with mission scientists to hone the maps, attach scientist-vetted content (e.g., NASA visualizations, images, news items) and learned how to teach several "hands on" activities supporting the workshop themes of salinity, density and circulation.

Two educators from the educator-scientist collaborative workshop at NASA/JPL work together on an interactive concept map.

The five participating scientists: Tony Lee, Victor Zlotnicki, Felix Landerer, Josh Willis and Dimitris Menemenlis.

Webinar Series

In January Principal Investigator (PI) Gary Lagerloef, Deputy PI David Le Vine and Project Scientist Yi Chao presented a two-part webinar on Aquarius data. The presenters discussed the many complexities of getting accurate salinity measurements from space, and shared recent data collected by the instrument using concept maps.

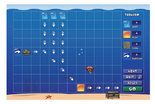


Preliminary Aquarius data maps can be accessed at: http://aquarius.nasa.gov.

The webinar reached 75 unique participants from 25 states and included participants from Puerto Rico, India and Poland. The audience of formal and informal educators, students and researchers found the presentations highly relevant and 93% of those surveyed (n=27) plan to "use the subject matter in their work." The webinars and its resources are also available online - further increasing the reach of the presentations.

Interactive Game

The new "Go with the Flow" game at http://spaceplace.nasa.gov/ocean-currents incorporates ocean science concepts from several missions (including Aquarius) to educate students about ocean currents and circulation. Players of the game use heat and salt (as well as horizontal currents and walls) as "tools" to set up flow patterns that allow a little submarine to reach a key that will open a treasure chest. After playing "Flow," students are not likely to forget the roles that heat and salinity play on ocean currents; important principles to learn in order to understand the potential effects of climate change.



Aquarius Instrument

The Aquarius/SAC-D satellite's components were developed, tested and assembled in four sites across two continents. By the time it was ready for launch, Aquarius was already a world traveler.

SAC-D Project Manager Daniel Caruso fields a question during the L-30 briefing.

NASA Aquarius Program Scientist Eric Lindstrom holds up a 1/8 teaspoon during a demonstration at the L-30 briefing. Aquarius is sensitive enough to detect salinity changes a subtle as 1/8 of a teaspoon of salt in a gallon of water - the equivalent of 2 parts in 10,000.

Aquarius/SAC-D launch from Vandenberg Air Force Base on June 10, 2011.

SAC-D Observatory

Aquarius/SAC-D is a collaboration between NASA and Argentina's space agency, Comisión Nacional de Actividades Espaciales (CONAE). The Argentine-built spacecraft, Satélite de Aplicaciones Científicas (SAC)-D (right), carries several CONAE-sponsored science sensors, including those that measure sea ice concentration and sea surface temperature. The primary payload, NASA's Aquarius instrument (left), began mapping global sea surface salinity in late August 2011 and has detected large-scale salinity distribution features clearly and with sharp contrast. Ocean-related data from Aquarius/SAC-D are complementary, as are the U.S. and Argentine approaches to education and public outreach for this satellite mission.

A journalist from Argentina asks a panel of scientists a question during the L-30 briefing on May 18, 2011. Pictured in the photo from left to right: Eric Lindstrom (NASA Aquarius Program Scientist), Eric Ianson (NASA Aquarius Program Executive), Gary Lagerloef (Aquarius Principal Investigator), Amit Sen (Aquarius Project Manager), Daniel Caruso (SAC-D Project Manager).

In the months leading up to launch, close communication was vitally important, including international collaboration to develop key messages, create educational products, coordinate media opportunities, and facilitate the broader impacts of the mission's scientific goals. Collectively, the Aquarius/SAC-D mission has been featured in more than 2500 news stories, through wire services, radio stations, television news broadcasts and internet media.

With new ocean data now being collected, education and public outreach staff in both countries are continuing to help communities to use Aquarius/SAC-D observations to better understand the interactions between global ocean circulation, the water cycle and Earth's climate and to address socio-economic applications such as fisheries management products, events and media.

For more information on Aquarius/SAC-D please visit:

NASA - http://aquarius.nasa.gov/
CONAE - http://www.conae.gov.ar/

By continuing to spotlight the importance of satellite technology, CONAE plans to inspire a new generation of space scientists.
The SAC-D satellite is the fourth in a series of satellites built by CONAE to study the earth through instruments and imagery. By publicizing the results of each mission, integrating the rich science content into nation-wide classrooms and training teachers to use current satellite data, CONAE is reaching out to the educators of today and scientists of tomorrow.

National Outreach

In October 2011, President Cristina Fernández de Kirchner met with NASA Administrator Charles Bolden to sign a cooperative agreement for joint development of NASA-CONAE projects. The agreement reaffirms the committment for both agencies to continue their collaborative work, and demonstrates that science and exploration are at the top of the national agenda.

"For men of science to come across government leaders with such determination to apply science for the well-being of their people is always a source of inspiration."
-Charles Bolden, NASA

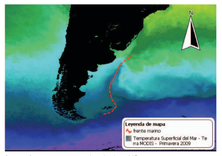
Christina Fernandez de Kirchner, President of Argentina (far right) meets with NASA Administrator Charles Bolden (left center) and U.S. Ambassador to Argentina, Vilma Martinez (far left).

The Aquarius SAC/D mission and its education programs have caught the attention of both Argentinian media and other international news sources.

Satellite Images for Schools (2MP)

Educators learn to use the 2MP software.

Students use 2MP software to look at satellite imagery.



Sea surface temperature data in the 2MP program.

CONAE has developed free geospatial software known as "2MP" to help teachers incorporate satellite technology into the classroom. The software is designed to display, analyze and generate outputs of satellite imagery, enhanced with other information sources such as maps, text and photographs. The objective is to convert satellite images into an everyday tool for teachers and students in the fields of social sciences, geography, and history. A teacher training program, targeting schools across Argentina and Latin America, will help teachers utilize satellite technology in science education. The overall goal is to reach two million children and young people with the 2MP program through multiple programs including the following:

Primary and Middle School Educators
Teacher training for primary and middle school educators in Buenos Aires and surroundings and Province of Cordoboa interested in participating the 2MP program.

Satellite Project Latin America
Open to primary schools throughout Latin American and the Caribbean who are interested in participating in the 2MP program.

Oceans Project
Open to primary schools or media that are interested in participating in the Oceans Project. The Oceans Project seeks to introduce students to understanding the basics of oceanography and using data from satellites to understand phenomena occurring in the ocean.

The "Oceans Project" focuses on:
-General Aspects and Concepts of Physical Oceanography
-Contributions of Satellite Technology on Fishing Activity
-Satellite Information and Oil Spills

For more information on 2MP projects, visit: **https://2mp.conae.gov.ar/**

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