

# For NASA's Aquarius, quest for salt a global endeavor

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The Aquarius/SAC-D spacecraft is unpacked and unveiled in the Spaceport Systems International payload processing facility at Vandenberg Air Force Base in California. The container protected the spacecraft on its journey from Sao Jose dos Campos, Brazil, aboard a U.S. Air Force C-17 transport plane. Following final tests, the spacecraft will be integrated to a United Launch Alliance Delta II rocket in preparation for the targeted June launch. Aquarius, the NASA-built primary instrument on the SAC-D spacecraft, will map global changes in salinity at the ocean's surface. Credit: VAFB/Randy Beaudoin

(PhysOrg.com) -- With more than a few stamps on its passport, NASA's Aquarius instrument on the Argentinian Satélite de Aplicaciones Científicas (SAC)-D spacecraft will soon embark on its space mission to

"taste" Earth's salty ocean.

After a journey of development and assembly through [NASA](#) facilities; a technology center in Bariloche, Argentina; and testing chambers in Brazil, the Aquarius instrument, set to measure the ocean's surface salinity, recently made the trip from São José dos Campos, Brazil, to California's Vandenberg Air Force Base for final integration and testing before its scheduled launch on June 9.

Aquarius will map the concentration of dissolved salt at the ocean's surface, information that scientists will use to study the ocean's role in the global water cycle and how this is linked to [ocean](#) currents and climate. Sea surface temperature has been monitored by satellites for decades, but it is both temperature and salinity that determine the density of the surface waters of the ocean. Aquarius will provide fundamentally new ocean surface salinity data to give scientists a better understanding of the density-driven circulation; how it is tied to changes in rainfall and evaporation, or the melting and freezing of ice; and its effect on climate variability.

"The ocean is essentially Earth's thermostat. It stores most of the heat, and what we need to understand is how do changes in salinity affect the 3-D circulation of the ocean," said Gene Feldman, Aquarius Ground System and Mission Operations manager at NASA's Goddard Space Flight Center, Greenbelt, Md.

The development of the Aquarius mission began more than 10 years ago as a joint effort between Goddard and NASA's Jet Propulsion Laboratory in Pasadena, Calif. In 2008, Goddard engineers completed the Aquarius microwave radiometer instrument, which is the key component for measuring salinity from space.

"The radiometer is the most accurate and stable radiometer built for

sensing of Earth from space. It's a one-of-a-kind instrument," said Shannon Rodriguez-Sanabria, a microwave communications specialist at Goddard.

JPL built Aquarius' scatterometer instrument, a microwave radar sensor that scans the ocean's surface to measure the effect wind speed has on the radiometer measurements. The radiometer and scatterometer instruments, along with a 2.5-by-3-meter (8.25-by-10-foot) elliptical antenna reflector and many other systems, have been integrated together at JPL to form the complete Aquarius instrument. Other instruments aboard the SAC-D spacecraft are contributions from Argentina, France, Canada and Italy.

In June 2009, Aquarius was flown via a U.S. Air Force cargo jet to San Carlos de Bariloche, Argentina, a destination known for its natural scenery of blue lakes and verdant mountains, to be integrated with Argentina's SAC-D spacecraft. A year later, the fully assembled spacecraft and all the instruments now referred to as the "Aquarius/SAC-D Observatory" were shipped to Brazil. There, engineers began a nine-month campaign of alignment, electromagnetic, vibration, and thermal vacuum testing to ensure it will survive the rigors of launch and space.

JPL will manage the Aquarius mission through Aquarius' commissioning phase, scheduled to last 45 days after launch. Goddard will then manage the Aquarius instrument operations during the mission. Argentina's Comisión Nacional de Actividades Espaciales (CONAE) will operate the spacecraft and download all of the data collected by Aquarius several times per day. Goddard is responsible for producing the Aquarius science data products. JPL will manage the data archive and distribution to scientists worldwide.

[Aquarius](#) will collect data continuously as it flies in a near-polar orbit and circles Earth 14 to 15 times each day. The field of view of the

instrument is 390 kilometers (242 miles) wide, and it will provide a global map every seven days. The data will be compiled to generate more accurate monthly averages during the mission, which is designed to last a minimum of three years.

Provided by JPL/NASA

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