Press Release

4 october 2019 **CP138-2019**

Jason-2 altimetry satellite decommissioned after more than 11 years of ocean monitoring

The ocean-observing altimetry satellite mission, Jason-2, will end on 10 October 2019 following a joint termination decision made by the four mission partners (NASA, CNES, NOAA, and EUMETSAT). Jason-2 was launched from Vandenberg Air Force Base in California on 20 June 2008. Designed to last just 3 to 5 years, Jason-2 exceeded all expectations lasting more than 11 years, and equaling the record of its predecessor Jason-1. Measurements made by the Jason-2 Ocean Surface Topography Mission (OSTM) payload instruments allowed researchers to monitor sea surface topography with extreme precision and provided unique insight into ocean currents, and was a powerful tool for climate monitoring, marine forecasting, and meteorology.

"Today we celebrate the end of this resoundingly successful international mission," said Thomas Zurbuchen, associate administrator of the Science Mission Directorate at NASA Headquarters in Washington. “Jason-2/OSTM has provided unique insight into ocean currents and sea level rise with tangible benefits to marine forecasting, meteorology, and our understanding of climate change.”

For Jean-Yves Le Gall, CNES President: "Jason-2 was an exemplary and multi-faceted altimeter mission. Not only did Jason-2 extend the precise climate record established by TOPEX/Poseidon and continued by Jason-1, it also made invaluable observations for mesoscale ocean studies in its second, interleaved orbit. Even when moved to a "graveyard" orbit, Jason-2 continued to make unprecedented new observations of the Earth's gravity field, with precise measurements right until the end. Jason-2 continued the exceptional contributions of the Jason Series to a multitude of scientific disciplines."

"Jason-2 was a high point of operational satellite oceanography as the first Jason mission to formally include EUMETSAT and NOAA as partners," said Steve Volz, Ph.D., assistant administrator, NOAA’s Satellite and Information Service. “During its 11-year run, Jason-2 helped improve NOAA’s hurricane intensity forecasts and provided important observations of marine winds and waves, and in doing so has anchored these essential ocean altimetry observations in NOAA’s operational observing system requirements.”

Alain Ratier, Director General of EUMETSAT said, “With the involvement of EUMETSAT and NOAA, Jason-2 brought high precision monitoring of ocean surface topography and mean sea level to operational status. Its 11-year lifetime in orbit was rewarding for the four programme partners and the ocean and climate user community. This paved the way for Jason-3 and the Copernicus Sentinel-6 mission, which will continue these unique measurements for one more decade, building on our continued transatlantic cooperation.”

From TOPEX to the Jason Series:
To ensure the continuity of the highly successful TOPEX/Poseidon and Jason-1 missions, CNES and NASA expanded their longstanding partnership, to include the operational meteorological agencies in both the USA and Europe (NOAA and EUMETSAT). Jason-2 significantly contributed to the successes achieved by these four partner agencies: first, by advancing the more than 35-year U.S.-French cooperation—extending from TOPEX to SWOT (the Surface Water and Ocean

Topography mission)—in the domain of satellite altimetry; and second, by confirming that satellite radar altimetry has become the keystone for international operational and scientific ocean monitoring from space. In the evolution from TOPEX/Poseidon, to Jason-1 and Jason-2, and to the still fully functional Jason-3 mission launched in January 2016, the main science objectives have remained unchanged. However, technology and responsibility sharing has deeply evolved. Much smaller and lighter than the original TOPEX/Poseidon mission, the Jason Series of satellites use the CNES-Thales Alenia Space PROTEUS platform. The main instrument, the TAS-developed radar altimeter instrument (Poseidon) proved the value of an entirely new digital design. The accuracy of the GPSP and DORIS orbit determination systems developed by the NASA Jet Propulsion Laboratory (JPL) and by CNES for the Jason Series of missions have also proved their efficiency and reliability in space applications. Other instruments on Jason-2 included the JPL-developed advanced microwave radiometer and laser retroreflector array.

The Jason-2 mission also advanced science with additional payload instruments for a time transfer experiment (T2L2, Time Transfer by Laser Link) and for monitoring radiation effects in space (CARMEN and LPT).

The technological advancements proven on both Jason-1 and Jason-2 will be realized well into future decades, with the responsibility for precise, reference altimetry missions being continued by Jason-3, launched in 2016, and two future Sentinel-6/Jason-CS missions planned for launch in 2020 and 2025.

Long-term monitoring of sea level rise:
From 2008 to 2019, Jason-2 provided a major contribution to the monitoring of sea level rise, an essential climate variable. This was due to its excellent measurement accuracy, the long-term stability of its instruments, and the continuous efforts of the calibration-validation team. During its lifetime, Jason-2 was carefully calibrated with respect to in-situ measurements, and cross-compared with other spaceborne sensors. The Jason scientific processing algorithms have been maintained to state-of-the-art standards under the expert supervision of the international Ocean Surface Topography Science Team (OSTST). Precise intercalibration of Jason-2 was performed during two critical periods of formation flying: with its predecessor Jason-1, in 2008; and then with its successor, Jason-3 in 2016. This cross-calibration assured that long-term measurement uncertainties in the data series remained well below the 0.5 mm/year mark.

Beginnings of operational oceanography:
TOPEX/Poseidon first demonstrated the capability of radar altimetry for observing ocean dynamics and variability. By the late 1990s, in synergy with Jason-1 development, an ambitious international effort was undertaken which allowed for the parallel development of a dense network of in-situ ocean sensors (more than 3000 ARGO floats were deployed), and the concerted development of new models and numerical methods to describe and predict the oceans (GODAE: Global Ocean Data Assimilation Experiment). With Jason-2, the world's meteorological agencies, led by NOAA and EUMETSAT, began to incorporate near-real-time ocean surface topography measurements into their analyses and forecasts of ocean state, and thereby increase the accuracy of wide variety of forecasting and operational products. These agencies all rely on a triad of observations: model, in-situ, and satellite. The Jason Series is now a key element for satellite observations, being the reference mission on which all other altimeter missions are calibrated.

Long life and abundant science results:
There is much to be proud of for the Jason-2 mission: with almost 12 years in orbit—4 times its nominal life expectancy—Jason-2 nearly 53,000 revolutions of the Earth; more than one-million data products were distributed to users; and more than 2100 science publications were released. Until the end-of-life decision taken on 26 September 2019, the entire Jason-2 mission system (space segment, ground segment, and data distribution systems) performed flawlessly, thanks to the long-term commitment of the four partner agencies; from their operational and support teams, to the scientists and engineers, and finally, the science and operational users. The continued guidance of the international scientific community is well represented by the OSTST, whose annual meetings allow space agency engineers to consult with oceanographers, meteorologists, and climate scientists, and share a common understanding of the ultimate objectives of the Jason Series of missions. This synergy enabled the Jason-2 mission performance to far exceed its formal mission requirements, as well as all scientific and operational expectations.

An exemplary end of life:
Since 2010, and the enforcement in France of the “Loi sur les Opérations Spatiales” (Space Operations Law), and the Jason-2 mission partners have worked diligently on a joint strategy to avoid leaving an un-passivated and hazardous objects in orbit with the potential to collide or interfere with other satellite missions, and most notably the altimetry reference orbit (1336 km, 66° inclination). This reference orbit is currently occupied by Jason-3 and will be occupied for decades to come by planned continuation missions such as the Sentinel-6/Jason-CS series.

In July 2017, the degradation of critical onboard components and control systems required that Jason-2 vacate the reference orbit, deplete excess propellant reserves to mitigate explosive risks, and be maneuvered into a final “graveyard” orbit. In close collaboration with the OSTST, the mission partners identified a mission-continuation orbit for Jason-2 that was compatible with all legal constraints, yet still of great scientific benefit. This new “geodetic orbit” was extremely useful for marine geoid (or gravity) studies and bathymetry characterization, and also provided valuable operational oceanographic and science observations. Two 368-day geodetic cycles were successfully completed in this 1309.5-km orbit, providing measurements of an unprecedented precision on a grid covering the whole globe with only 4 kilometers separation at equator. Thanks to these measurements, and updated gravity and bathymetric maps are currently being generated.

In recent weeks, additional degradation in the spacecraft’s power system forced the four mission partners to mandate that CNES terminate Jason-2 on 1 october 2019 in order to decrease risks to other satellites and future altimetry missions, and to comply with international space law. Final passivation and decommissioning operations on Jason-2 will be completed by CNES on 10 October 2019.

About CNES
CNES (Centre National d’Etudes Spatiales) is the government agency responsible for shaping France’s space policy and implementing it in Europe. Its task is to conceive and orbit satellites, invent the space systems of the future and nurture new services to aid us in our daily lives. Founded in 1961, it is the initiator of major space projects, launch vehicles and satellites, and the partner of choice for industry fuelling innovation. CNES comprises some 2,500 men and women with a passion for space working to open up new and infinite fields of applications in five core areas of focus: Ariane, science, Earth observation, telecommunications and defence. It is a key player driving technology innovation, economic development and industrial policy for the nation. It also fosters scientific collaborations and has forged numerous international partnerships. France, represented by CNES, is the leading contributor to the European Space Agency (ESA). **presse.cnes.fr**

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About NASA
NASA’s mission is to discover and expand knowledge for the benefit of humanity. The agency leads an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and bring new knowledge and opportunities back to Earth. NASA uses the vantage point of space to understand and explore our home planet, improve lives and safeguard our future. Our observations of Earth’s complex natural environment are critical to understanding how our planet’s natural resources and climate are changing now and could change in the future.

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About NOOA

NOAA enriches life through science. Its reach goes from the surface of the sun to the depths of the ocean floor, keeping the public informed of the changing environment around them. From daily weather forecasts, severe storm warnings, and climate monitoring to fisheries management, coastal restoration and supporting marine commerce, NOAA's products and services support economic vitality and affect more than one-third of America's gross domestic product. NOAA's dedicated scientists use cutting-edge research and high-tech instrumentation to provide citizens, planners, emergency managers and other decision makers with reliable information they need when they need it.

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About EUMETSAT

The European Organisation for the Exploitation of Meteorological Satellites is an intergovernmental organisation based in Darmstadt, Germany, currently with 30 **Member States**. EUMETSAT operates the **geostationary satellites** Meteosat -9, -10 and -11 over Europe and Africa, and Meteosat-8 over the Indian Ocean. EUMETSAT also operates a constellation of three **Metop polar-orbiting satellites** as part of the Initial Joint Polar System (IJPS) shared with the US National Oceanic and Atmospheric Administration (NOAA). EUMETSAT is a partner in the cooperative sea level monitoring Jason missions (**Jason-2**, **Jason-3** and **Copernicus Sentinel-6**) involving Europe and the United States. The data and products from EUMETSAT's satellites are vital to weather forecasting and make a significant contribution to the monitoring of environment and climate change.

The European Union has entrusted EUMETSAT with exploiting the four **Sentinel missions** of Copernicus dedicated to the monitoring of atmosphere, ocean and climate on its behalf. EUMETSAT carries out these tasks in cooperation with ESA and already exploits the **Sentinel-3** marine mission. EUMETSAT has also established cooperation with operators of Earth Observation satellites from Europe and from China, India, Japan, Russia, South Korea and the United States.

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