CENTRE NATIONAL D'ÉTUDES SPATIALES

Press Release

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French-European SMOS mission celebrates 10 years of success

Launched in November 2009 from the Plesetsk Cosmodrome in Russia, the SMOS mission (Soil Moisture and Ocean Salinity) was the first to map soil moisture and ocean salinity directly from space with its interferometric instrument. Ten years on, this joint satellite of the European Space Agency (ESA) and CNES has more than fulfilled its mission and continues to teach us more every day about marine currents and our changing climate.

SMOS data provide precious insights for meteorologists, hydrologists and climatologists, as monitoring ocean salinity enables them to better understand the ocean circulation that strongly influences weather and climate patterns, while measuring soil moisture tells us about how Earth's surface, vegetation and the atmosphere interact, thereby increasing the accuracy of weather forecasts. Designed to last five years, SMOS is still going strong and delivering data in near-real time, less than three hours after measurements are acquired, to serve multiple applications in many domains.

"SMOS's radiometer measures microwave electromagnetic radiation emitted from Earth's surface. The frequency it operates at—1.4 GHz, close to that used by mobile phones—is highly sensitive to water content. At this frequency the signal is also relatively unaffected by the atmosphere, clouds and rain. It can even see through vegetation! We're thus able to estimate soil moisture and plant water content," explains Yann Kerr, SMOS principal investigator at CNES.

On the operational front, SMOS data are assimilated directly into prediction models used by the European Centre for Medium-range Weather Forecasts (ECMWF). They are also used by the U.S. Department of Defense (DoD) and the National Oceanic and Atmospheric Administration (NOAA). These data serve for example to track the path of hurricanes, optimize routing of ships circumnavigating the poles through analysis of thin sea ice, survey peri-Arctic freeze-thaw cycles and monitor variations in the Arctic ice cap.

From a science perspective, SMOS data are telling us more about a range of phenomena both on land and at sea. In 10 years, they have provided the basis for more than 1,800 scientific papers, three of them in the journal *Nature*. On land, SMOS data are allowing us to better assess flood and drought risks, helping to manage water resources more efficiently. In rivers and oceans, scientists are using SMOS data to build a multi-year record of outflows from the Amazon and other major rivers. And they are enabling multiple indicators to be tracked in the cryosphere for the purposes of monitoring global warming, such as the temperature of the Antarctic ice cap, snowpack melt water in Greenland and permafrost temperature.

A number of follow-on projects are under study to succeed SMOS. SMOS-HR (High Resolution) is seeking to achieve a resolution of the order of 10 kilometres compared to 43 kilometres on average today. Studies are also being pursued at the CESBIO biosphere space research centre, in partnership with CNES and the CMLA centre for mathematical studies and their applications. And a nanosatellite demonstrator paving the way for the next generation after SMOS-HR is underway.

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