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Parker Solar Probe: French research takes off for the Sun

Parker Solar Probe will soon become the spacecraft to travel the closest to the Sun, by positioning itself a little over 6 million kilometers from our star's surface. During its journey within the solar corona, the NASA probe will notably have an on-board instrument developed by researchers from the CNRS, université d'Orléans, and the CNES. In total five French laboratories are involved in this mission seeking to lift the veil on phenomena observed in the Sun's atmosphere. The probe is planned to leave Earth on August 11, 2018.

A little closer to the stars, inside the plasma corona surrounding the Sun. That's the goal of NASA's Parker Solar Probe mission, in an attempt to solve one of the biggest mysteries of contemporary physics: how can its atmosphere's temperature rise above a million degrees when that of its surface only reaches 6,000° Celsius? Astrophysicists have already proposed that the corona could be heated by electromagnetic waves produced on the surface, although it is impossible to test this hypothesis without going to this environment of extreme conditions, as the probe will do. Its measurements will also make it possible to study other phenomena, such as the sources of solar wind.

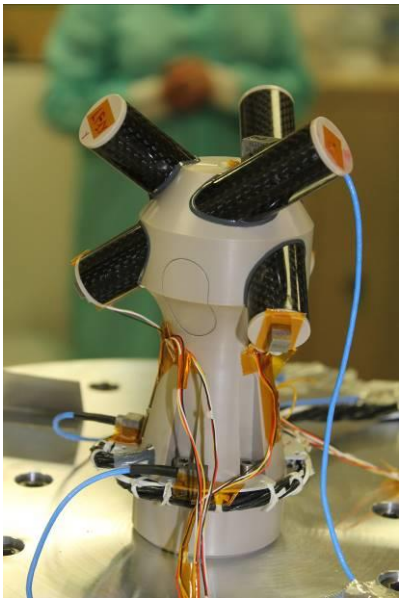
Parker Solar Probe will reach its target in November 2018, just three months after its launch from Cape Canaveral scheduled for August 11, on board NASA's most powerful launcher, the Delta IV Heavy rocket. To reach its target so quickly, the probe will break the speed relative to the Sun[1] record: at the closest point to the star, it will reach 700,000 kilometers per hour. At that speed relative to Earth, Parker Solar Probe would travel from Paris to Sydney in less than 2 minutes! The probe will complete twenty-five orbits near the Sun on this mission, interspersed with flybys near the Earth's orbit, during which the collected data can be sent to scientists. Its last three orbits will take it very near the Sun, nearly 6 million kilometers from the solar surface.

This American mission made the most of the expertise of five French laboratories, including the Laboratoire de physique et chimie de l'environnement et de l'espace (LPC2E; CNRS/CNES/Université d'Orléans), which developed an instrument aboard Parker Solar Probe, a search-coil magnetometer for measuring variations in the corona's magnetic field. These measurements will be crucial for understanding how the corona can be heated to temperatures above a million degrees.

In addition, teams from the Laboratoire d'études spatiales et d'instrumentation en astrophysique (Observatoire de Paris–PSL/CNRS/Université Paris Diderot/Sorbonne Université) and the Laboratoire de physique des plasmas (CNRS/Observatoire de Paris–PSL/Ecole polytechnique/Université Paris-Sud/Sorbonne Université) contributed to the development of a radio receptor and two spectrometers produced in the United States. With regard to l'Institut de recherche en astrophysique et planétologie (CNRS/CNES/Université Toulouse III-Paul Sabatier), it will be involved in the utilization of the images taken by the probe's on-board camera. Finally, the solar oven from the Procédés, matériaux et énergie solaire laboratory of the CNRS enabled the testing of Parker Solar Probe's materials and sensors in conditions similar to those they will face near the Sun.

The know-how of these laboratories will also benefit another solar exploration mission planned for 2020, the European Space Agency's Solar Orbiter mission, which will set out for the Sun with various on-board measuring instruments developed by a number of French laboratories.

[1] To express spatial speeds clearly, they are defined relative to the object exerting the strongest gravitational influence. The previous speed record relative to the Sun was set in 1976 by the Helios B mission, with a speed of 252,782 km/h.



Search-coil magnetometer designed and produced by the LPC2E laboratory, with support from CNES and the CNRS. The sensor is undergoing a vibration test.

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Assembly of Parker Solar Probe.

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Contacts

LPC2E Team
Université d'Orléans Researcher | Thierry Dudok de Wit **| T +33 2 38 25 52 77 |** thierry.dudok-de-wit@cnrs-orleans.fr *(in the United States (EDT) from August 9 to 14, 2018)*
CNRS Engineer | Guillaume Jannet | **T + 33 2 38 25 53 05** | guillaume.jannet@cnrs-orleans.fr

CNRS Press Officer | François Maginiot | **T +33 1 44 96 43 09** | francois.maginiot@cnrs.fr