A decade probing the sun

November 4 2019

Proba-2 is flight-testing a total of 17 technology demonstrators for future ESA missions. It also serves as a scientific platform for solar and space weather observations. Credit: ESA/Pierre Carril

Ten years ago, a small satellite carrying 17 new devices, science

instruments and technology experiments was launched into orbit, on a mission to investigate our star and the environment that it rules in space.

On 2 November, 2009, Proba2 began its journey on board a Rockot launcher from the Russian launch base, Plesetsk, and was inserted into a Sun-synchronous orbit around Earth.

Tracing this dusk-dawn line—where night meets day—Proba2 maintains a constant view of the Sun, keeping its batteries charged and its target in sight.

The second in ESA's "Project for Onboard Autonomy' series, Proba2 is so advanced it is able to look after itself on a day-to-day basis, needing just a small team at the Agency's control station at ESEC in Redu, Belgium, to run the mission.

Instrumental solar observations

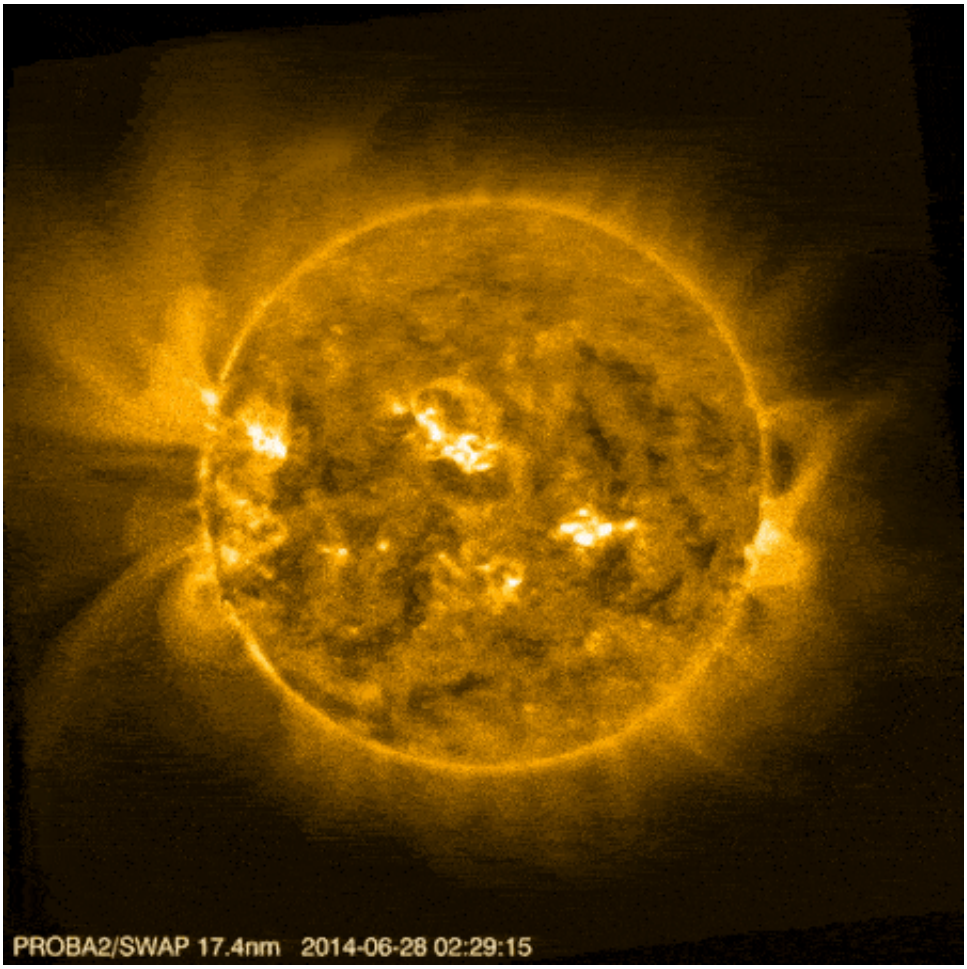
Proba2 has two main solar instruments, SWAP and LYRA, designed for studying events at the Sun that could impact Earth.

SWAP takes images of the Sun's corona, the roughly 1 million degree plasma-filled atmosphere that surrounds the star.

With an extremely wide field-of-view, SWAP is able to see structures around the edge of the Sun, such as huge outbursts of hot matter known as coronal mass ejections, sudden flares releasing enormous amounts of light as well as eerie "coronal holes," dark shadowy regions spewing out fast-moving solar wind.

The LYRA instrument monitors the Sun's ultraviolet output, and is able to make up to 100 measurements per second. This high rate means the instrument can make detailed studies of fast-moving "transient" events

such as solar flares.



This time-lapse video from PROBA2 shows rarely seen features in the Sun's corona. PROBA2's SWAP (Sun Watcher with APS detector and Image Processing) camera has been monitoring the Sun since February 2010 and, as seen in this sequence from July and August 2014, produces striking views showing the three-dimensional structure of the corona. Credit: European Space Agency

A stellar record

During its decade in space, the small satellite—less than a cubic meter in size—has:

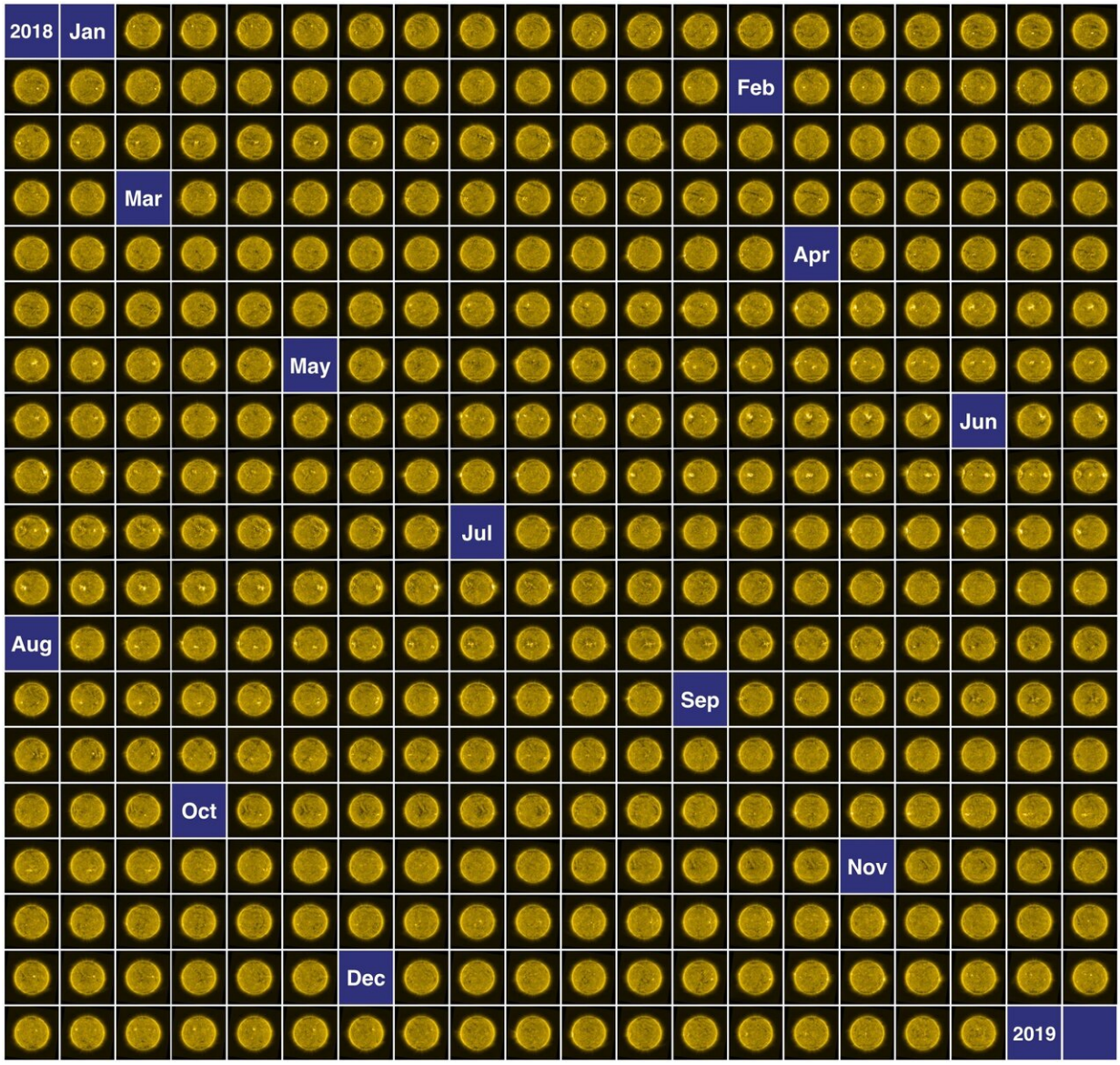
- Orbited the Earth ~53,000 times
- Produced ~30,000 LYRA data files on solar ultraviolet emission
- Produced ~2,090,000 SWAP images of the solar disk
- Passed our ground stations in Redu, Belgium and Svalbard, Norway (Arctic) 32,453 times
- Helped produce more than 100 peer-reviewed papers

What next for Proba2?

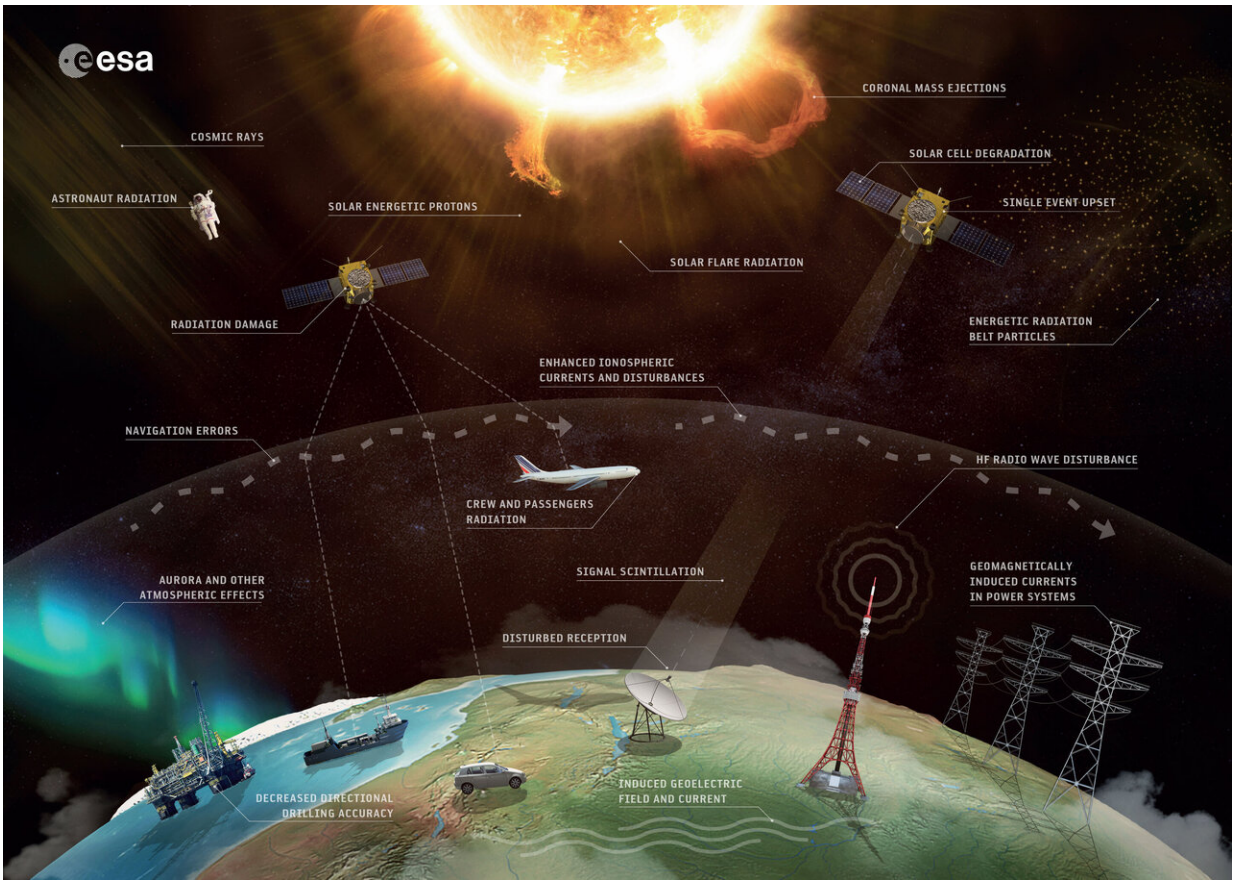
One of the many mysteries of our star is the way its activity rises and falls in 11 year cycles. From one cycle to the next, the Sun's north and south poles trade places and the number of flares, coronal mass ejections , sunspots and coronal loops fluctuate from many per day in active periods to weeks without any when it is quiet.

In 2020, the 11th year of the Proba2 mission, it will have been monitoring the Sun for a full solar cycle.

This landmark period will allow the satellite to probe the Sun's evolution over the long term, comparing the current quiet period with the last solar minimum, and ready for when the Sun again "wakes up" in 2024/2025.



This montage of 365 images shows the changing activity of our Sun through the eyes of ESA's Proba-2 satellite during 2018. The images were taken by the satellite's SWAP camera, which works at extreme ultraviolet wavelengths to capture the Sun's hot turbulent atmosphere – the corona, at temperatures of about a million degrees. Credit: European Space Agency



Space weather refers to the environmental conditions in space as influenced by solar activity. Credit: European Space Agency

Space weather

Unpredictable and temperamental, the Sun makes life on the innermost planets of the Solar System impossible due to intense radiation and colossal amounts of energetic material that it blasts in every direction, creating the ever-changing conditions in space known as "space weather ."

At Earth, extreme solar events have the potential to disrupt and damage

infrastructure in space and on the ground, and intense bursts of radiation threaten future explorers to the Moon and Mars.

ESA's Space Weather Office, part of the agency's Space Safety activities, is working to help European operators of sensitive infrastructure including satellites, power lines, aviation and transport to avoid adverse impacts of space weather. The mission of the Space Weather Office is to develop a system that provides timely and accurate space weather information and forecasts to operational users and public in Europe.

Find out about ESA's planned Lagrange mission to provide solar warning, here, and the Space Weather Service Network, getting the word out to those who need to know.

Provided by European Space Agency