Sun, Moon and Earth line up for Proba-2

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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. Credits: ESA/Pierre Carril

ESA's Proba-2 microsatellite experienced a conjunction of the spheres on Tuesday, as the Sun, Moon and Earth all lined up in front of it.

As people on the ground observed the 4 January partial solar eclipse, Proba-2 provided a privileged top-of-atmosphere view – at least briefly. Shortly after the Moon partially blocked Proba-2's view of the Sun, the Sun-watching satellite flew into Earth's shadow. At that point – when the video seen here goes dark – the Sun, Moon, Earth and Proba-2 were all on the same line in space.

"This is a notable event," said Bogdan Nicula of the Royal Observatory of Belgium (ROB), who calculated where and when this double-eclipse

would happen. “It is a nice exercise to model the orbit and relative positions of all three celestial bodies.”

The images making up this video were observed by Proba-2 with its SWAP imager – designed and operated by ROB – which operates at extreme-ultraviolet (EUV) wavelengths to monitor the swirling layer of the solar corona just above the Sun’s surface.

During the eclipse event, SWAP’s view of the Sun and Moon faded as EUV was progressively blocked by Earth’s atmosphere – an EUV-sunset. After passing through Earth’s shadow, Proba-2 saw a brightening Sun – an EUV-sunrise. At that point of the orbit the Moon was no longer eclipsing the Sun.

“We had to work very hard to get this high-resolution pointing needed for these images,” explained David Berghmans, SWAP’s principal investigator, adding that with the whole of Proba-2 less than a cubic metre in volume, SWAP is only the size of a large shoe box.

“And, as far as I am aware, the Mayans did not predict this alignment should cause concerns!”

The event proved scientifically useful for LYRA, Proba-2’s other Sun-monitoring instrument normally used to track solar radiation intensity, explained LYRA principal investigator Marie Dominique: “While the EUV sunset–sunrise season blinds SWAP, it allows LYRA to track the amount of solar EUV light passing through Earth’s atmosphere, which helps determine its particle content.”

Proba-2’s eclipse season

Proba-2’s orbit is optimised for solar observation, but for part of the winter season it experiences sunsets and sunrises, with Earth starting to

obstruct Proba-2's view of the Sun for a few minutes per orbit.

The 4 January 2011 eclipse as seen from ESA's ESTEC technical centre in Noordwijk, the Netherlands, photographed using a 500 mm f/5.6 Maksutov-Cassegrain Telescope with a Canon EOS 30D DSLR camera. No filter was used- the Sun was already too dim due to the clouds and thick atmosphere. Exposure time was ranging due to cloudness: Typical value was 1/100s at ISO 200. Photographer Kosmas Gazeas comments: "This is the typical photographic equipment I use for solar and lunar eclipses when I travel around the world, since it provides portable, solid and light observing and recording setup." Credits: Kosmas Gazeas

Because both SWAP and LYRA are observing in particular areas of the EUV spectrum, these instruments experience gradually progressing EUV sunsets (and sunrises), as the light in question is absorbed by lower layers of the terrestrial atmosphere.

The satellite continues to operate well during this eclipse season, and in some cases scientifically-useful data can be gathered – by tracking how much EUV light is blocked, LYRA gains insight into atmosheric composition, for example.

Proba-3: blotting out the Sun

Another mission in ESA's technology-testing Proba series will manufacture its own artificial solar eclipses.

Scheduled for 2015-16, Proba-3 will comprise two formation flying satellites, with one casting the other into shadow to allow ongoing observation of the faint outer layers of the still-mysterious solar corona.

Provided by European Space Agency