



PRESS BRIEFING: Solar Orbiter Science Begins

Thursday, 10 December

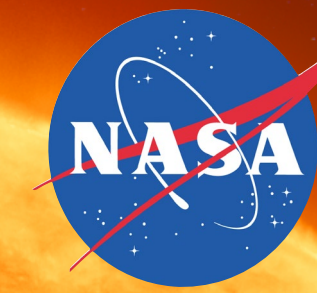
11:00 am US Eastern Time

AGU FALL
MEETING

**SHAPING
THE FUTURE
OF SCIENCE**

INFORMATION FOR REPORTERS

- Slides from this presentation are available in the Fall Meeting Media Center:
<https://www.agu.org/Fall-Meeting/Pages/Attend/Media-Center>
- A recording of this event will be posted to AGU's YouTube channel:
<https://www.youtube.com/c/AGUvideos>
 - Playlist "Fall Meeting 2020 Press Conferences"
- An informal, 30-minute discussion room via Zoom will follow this event:
 - Link will be posted in this event's chat box
 - Meeting ID: 962 1469 2326
 - Passcode: agupress
- Questions: Email news@agu.org



European Space Agency

Solar Orbiter

On its way to explore the Sun and Heliosphere

Press Briefing, AGU Fall Meeting 2020

Daniel Müller

ESA Solar Orbiter Project Scientist
European Space Agency, ESTEC, The Netherlands

Teresa Nieves

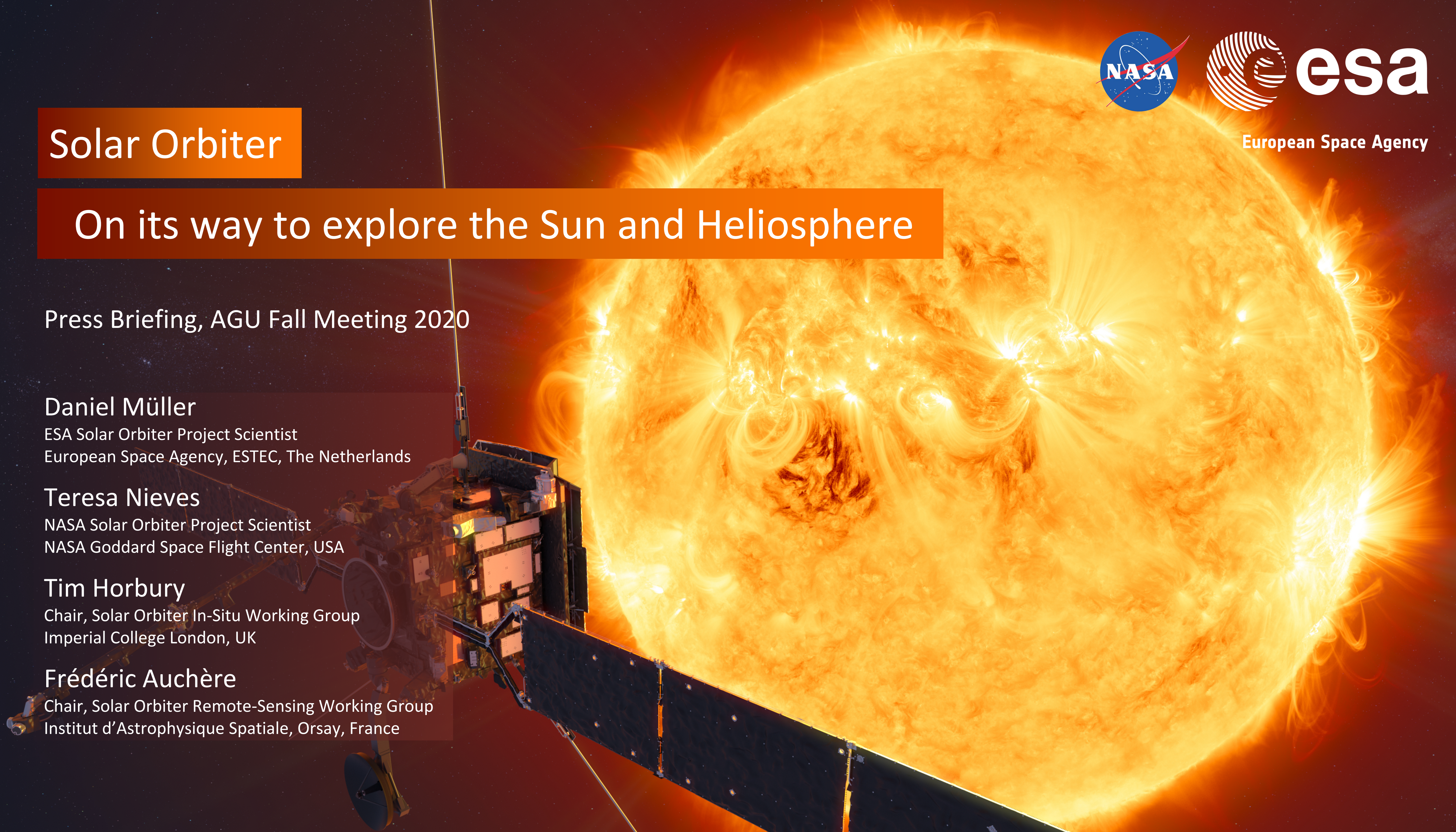
NASA Solar Orbiter Project Scientist
NASA Goddard Space Flight Center, USA

Tim Horbury

Chair, Solar Orbiter In-Situ Working Group
Imperial College London, UK

Frédéric Auchère

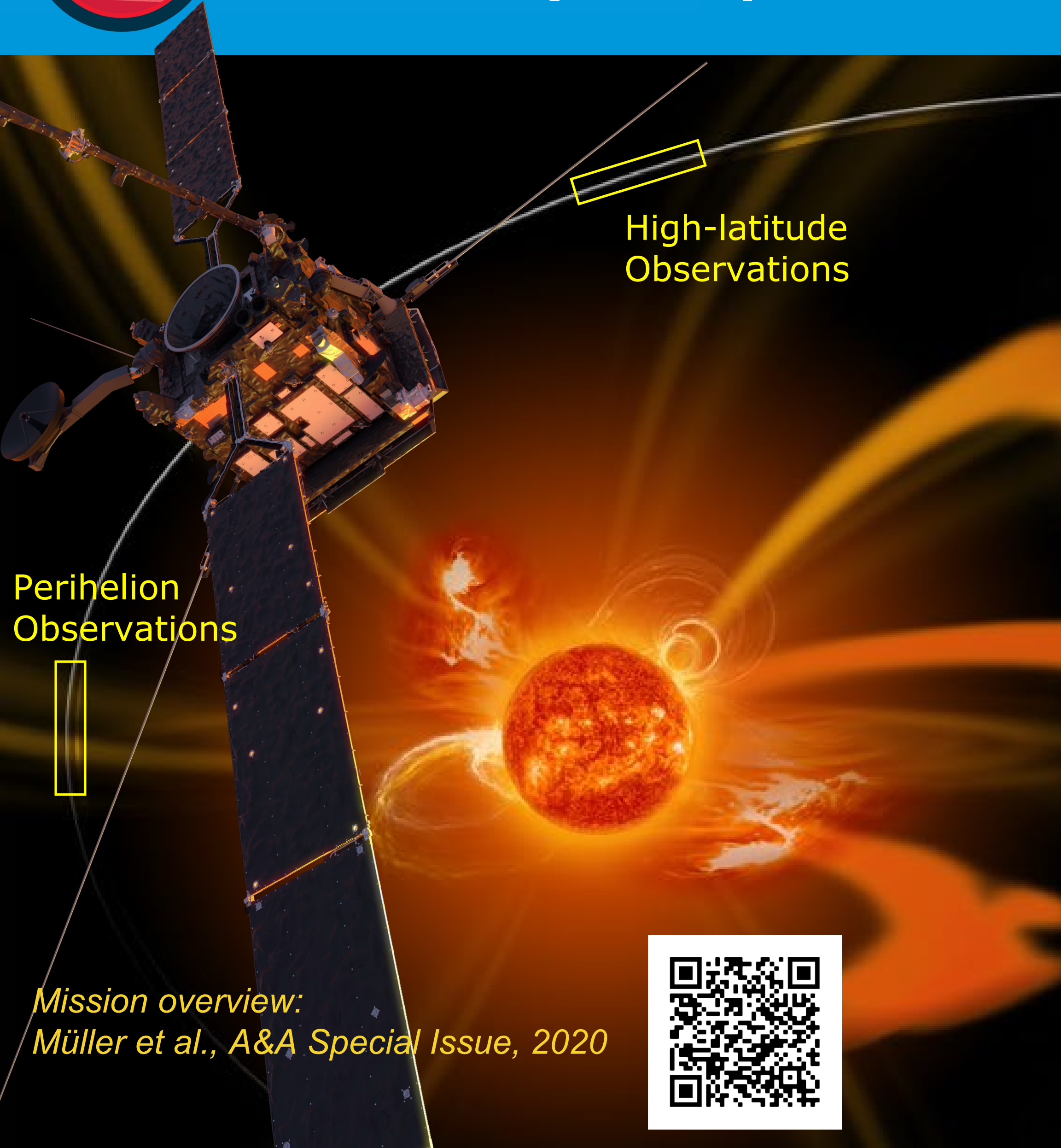
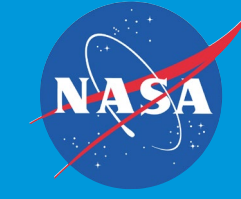
Chair, Solar Orbiter Remote-Sensing Working Group
Institut d'Astrophysique Spatiale, Orsay, France





Solar Orbiter

On its way to explore the Sun and Heliosphere



High-latitude
Observations

Perihelion
Observations

Overarching Science Question

How does the Sun create and control the heliosphere – and why does solar activity change with time?

Observations

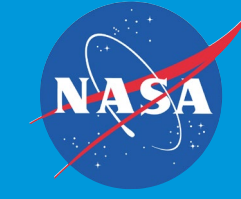
- *In situ*: Measurements of the solar wind plasma, fields, waves and energetic particles as close as 0.28 AU
- *Remote-sensing*:
 - Observe the entire Sun in visible light, UV, X-rays, including its uncharted polar regions
 - Simultaneous high-resolution imaging and spectroscopy
 - Measure the Sun's vector magnetic field at the surface
 - Image the corona and heliosphere

Mission overview:
Müller et al., A&A Special Issue, 2020





Mission Milestones

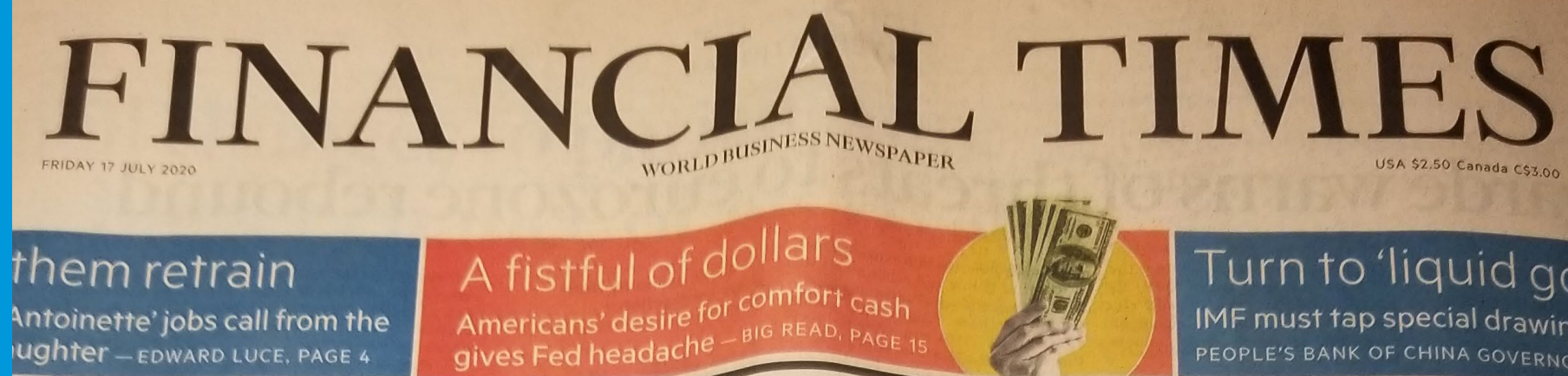


- 10 February 2020 UTC: Launch
- 15 June: Commissioning completed, cruise phase starts; first perihelion @0.51 AU
- 16 July: 'First Light' media event
- 30 September: First public data release
- 27 December 2020: First gravity assist manoeuvre at Venus
- November 2021: Start of nominal mission
- March 2022: First close solar encounter @0.32 AU





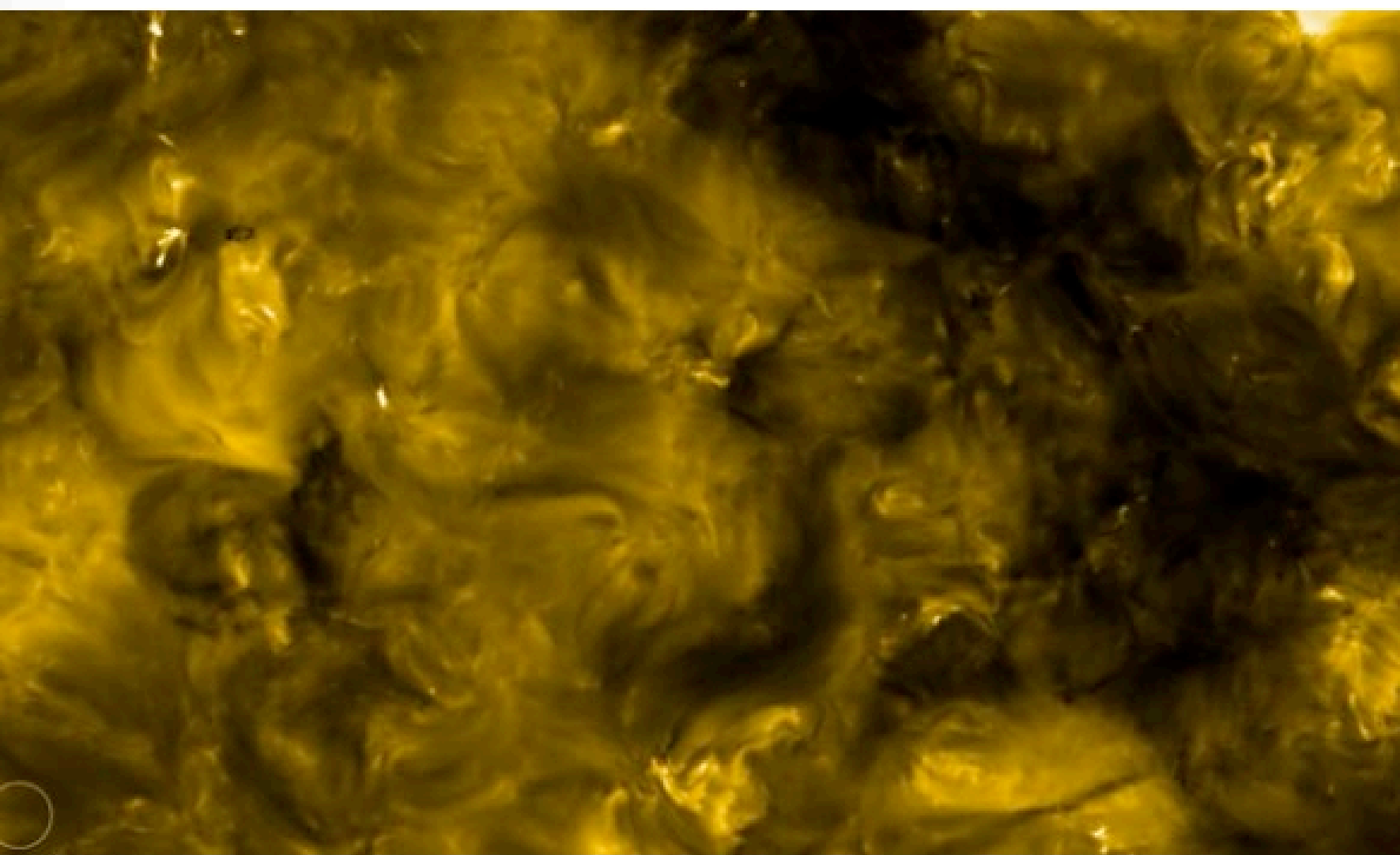
First Light media event



The New York Times

Closest Pictures Ever Taken of Sun Show Tiny Campfire Flares

Images of the new phenomenon were captured by Solar Orbiter, a joint European-NASA mission to study the sun.



Images captured by the European Space Agency's solar orbiter show many tiny solar flares that scientists are calling "campfires." The small circle at left represents the Earth to scale.

Selected Headlines

Solar probe reveals sun's tiny 'campfires' in closest-ever photos

Reuters, 16.07.2020

ESA-SONDE SCHICKT ERSTE BILDER

So nah haben wir die Sonne noch nie gesehen!

bild.de, 16.07.2020



BBC World News, 16.07.2020

Las imágenes más cercanas del Sol muestran minierupciones nunca vistas antes

EFE, 16.07.2020

Esa-Raumsonde Solar Orbiter macht spektakuläre Sonnenbilder

spiegel.de, 16.07.2020

Una nave europea toma la imagen más cercana del Sol

elpais.com, 16.07.2020

Il Sole tra fuochi e caos calmo Mai fotografato così da vicino

Corriere della Sera, 16.07.2020

Le vaisseau spatial Solar Orbiter zoome sur le soleil et dévoile ses tourments

Les Echos, 17.07.2020

Sånn har du aldri sett sola

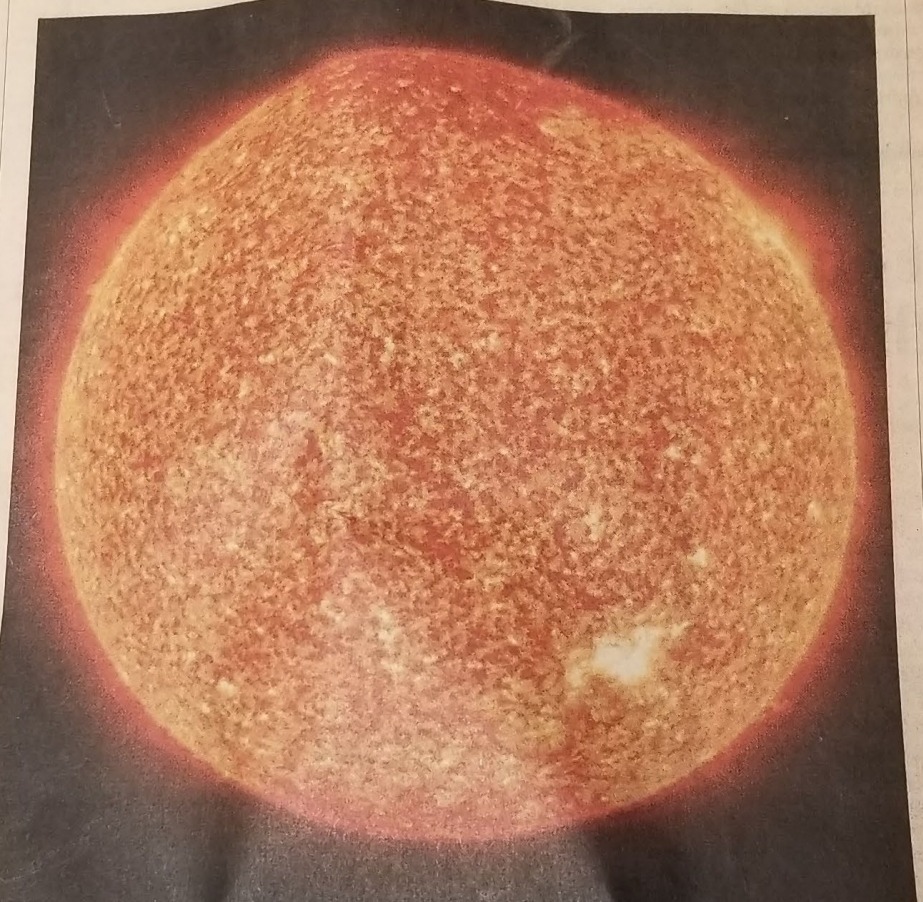
dagbladet.no, 16.07.2020

Russia hackers ing vaccine arch, say spy chiefs

scientists hit with malware
lenies cyber attack charge

Committee before the 2016 US election. Its intelligence targets are typically governments and embassies, as well as think-tanks, healthcare organisations and energy companies. The allegations of cyber espionage were robustly denied by Moscow. "We do not have information on who could have hacked pharmaceutical companies and research centres in the UK," Dmitry Peskov, President Vladimir Putin's spokesman, told the Financial Times. "We can say one thing: Russia has nothing to do with these attempts. We do not accept such accusations." The US has previously accused China of hacking its healthcare and research

Flare for drama Closest view of the sun shows 'campfires' on surface



Briefing

Morgan Stanley beats Wall
The bank has emerged as the only
groups to report an increase in pro
quarter. Bank of America by contr
by provisions for loan losses.—PAG

Lagarde flags threats to eu
European Central Bank chief Chri
warned that the nascent recovery
wrought by the pandemic faces se
the main eurozone interest rate w

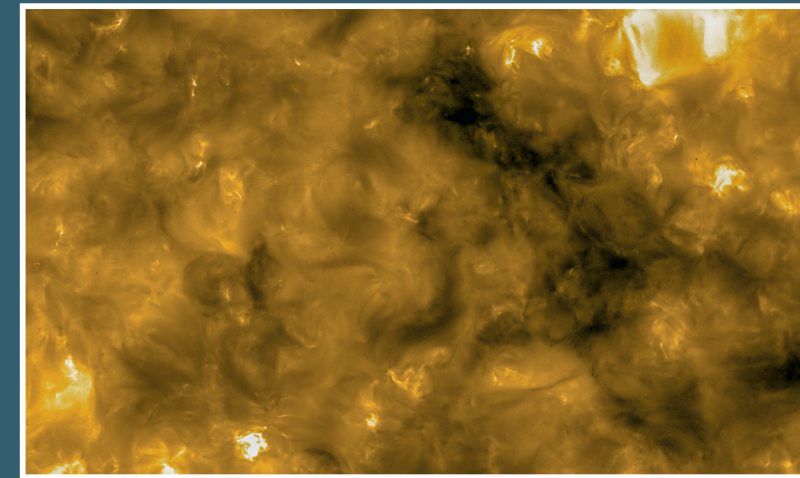
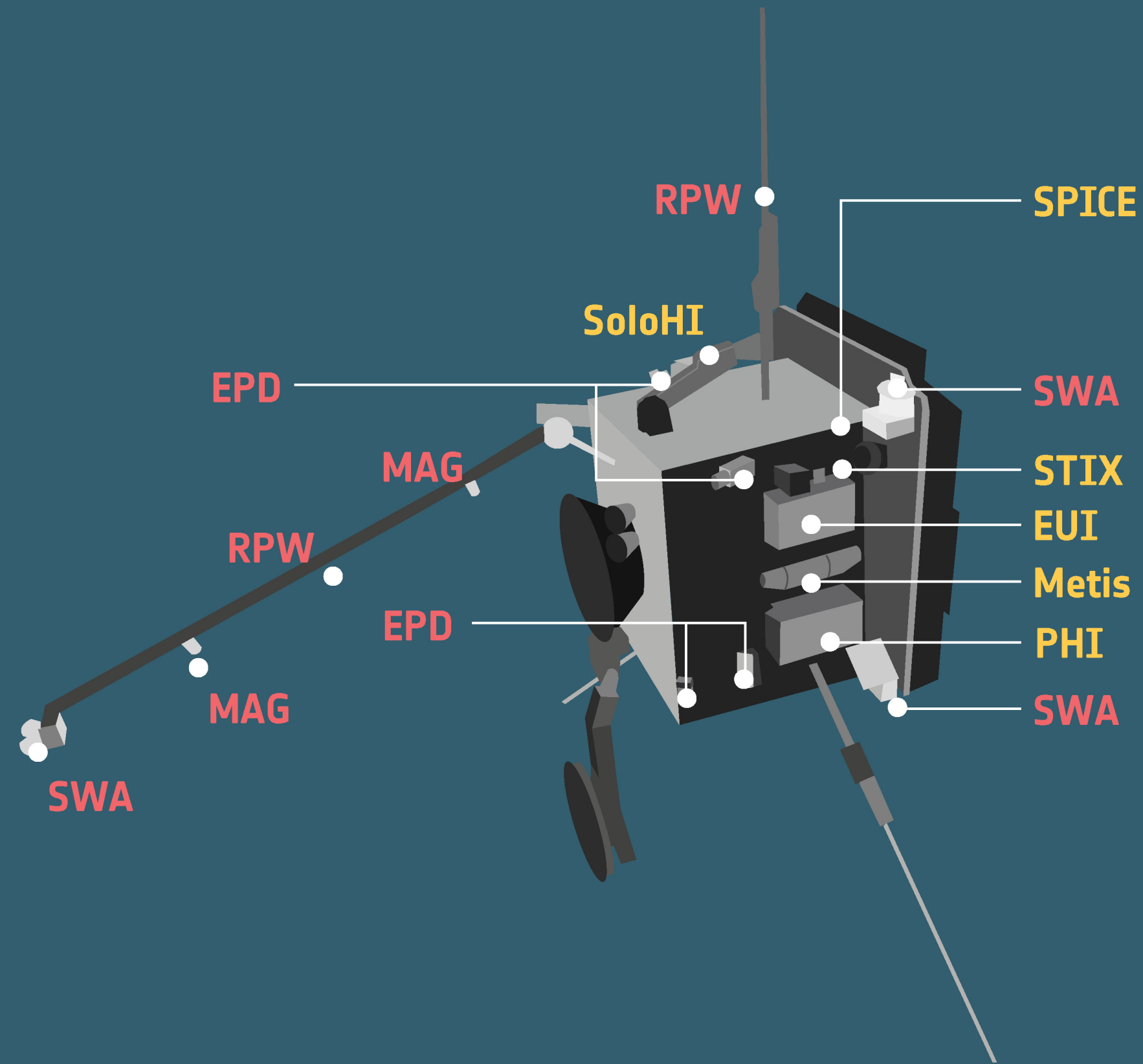
Signs of US recovery desp
Consumer spending and househo
have returned to levels last seen
pandemic as a row-back on reop
states raised fears of a bumpy re

Growth returns to Chin
Data have shown that gross
domestic product rose 3.2 per
cent in the three months to the
end of June, compared with the
same time last year, though th
recovery was mixed.—PAGE 2

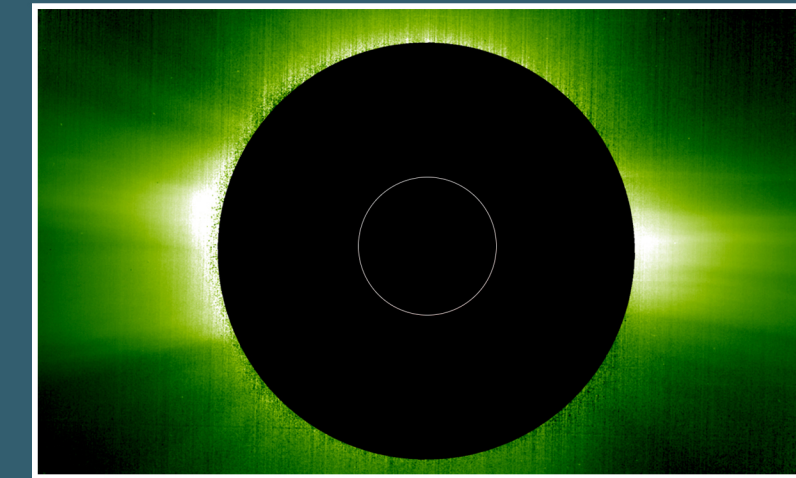
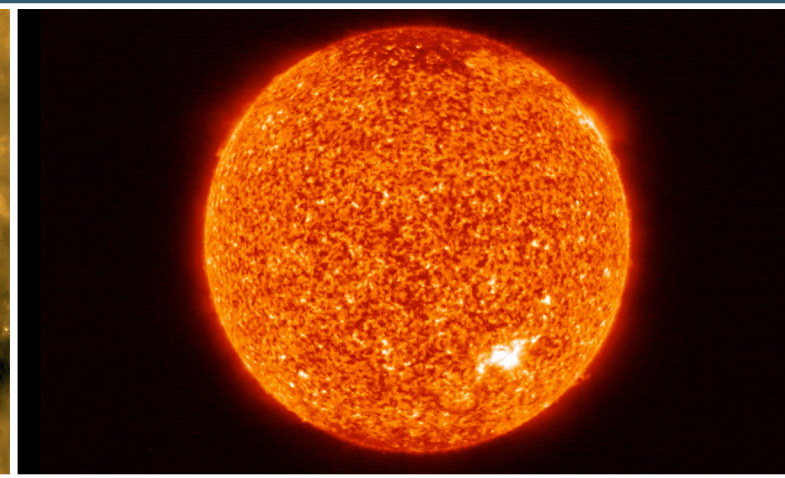
Zelensky appoints new
The Ukrainian president has s
Shevchenko, former head of a
hours after the IMF warned K
contingent on central bank in

Crisis costs set up rec
Britain's debt office has said
in bond sales in the year's fir
London on course to sell mo
pounds of debt this year.—

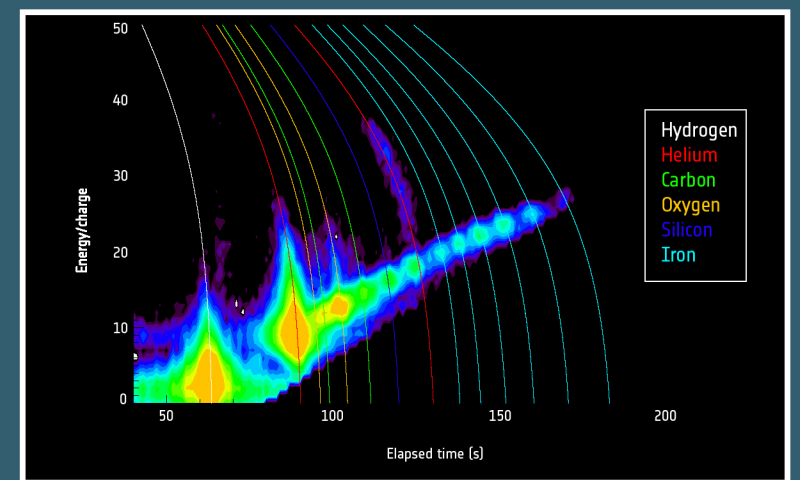
SOLAR ORBITER FIRST IMAGES AND MEASUREMENTS



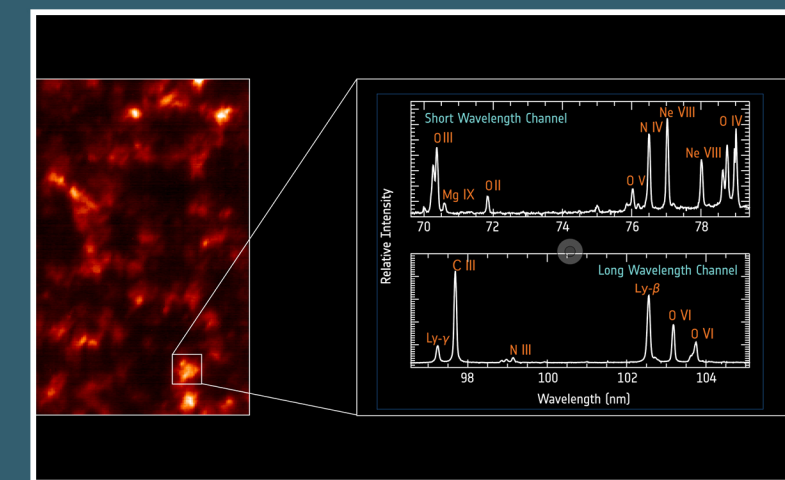
Extreme Ultraviolet Imager (EUI)



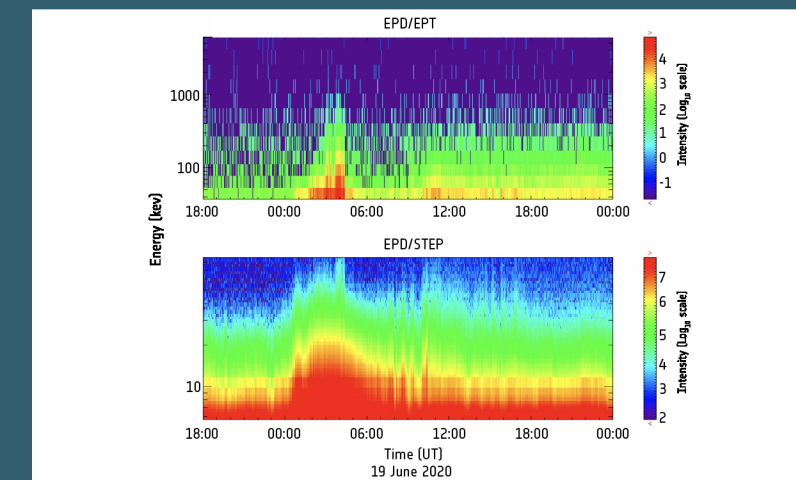
Coronagraph (Metis)



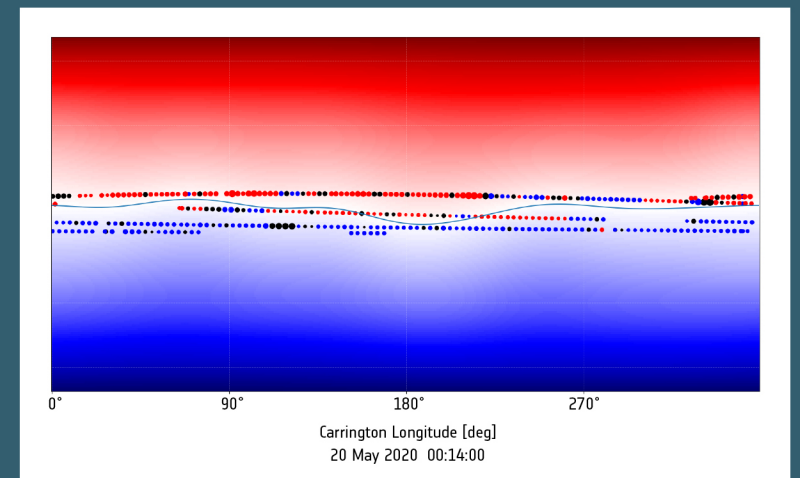
Solar Wind Analyser (SWA)



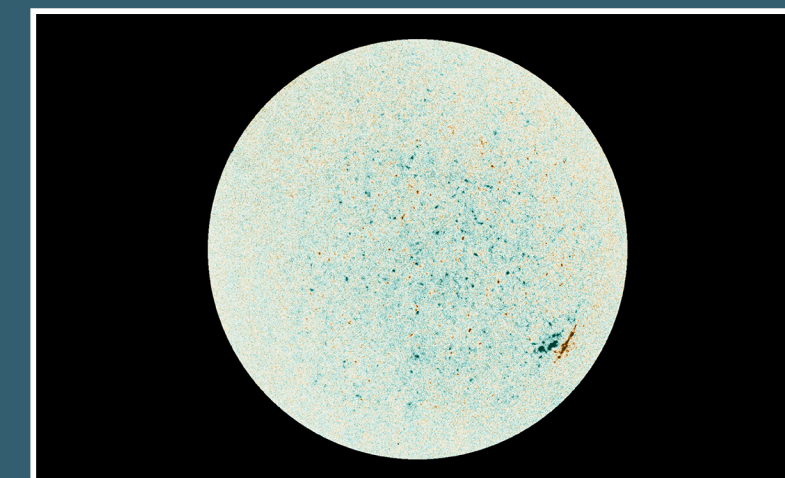
Spectral Imaging of the Coronal Environment (SPICE)



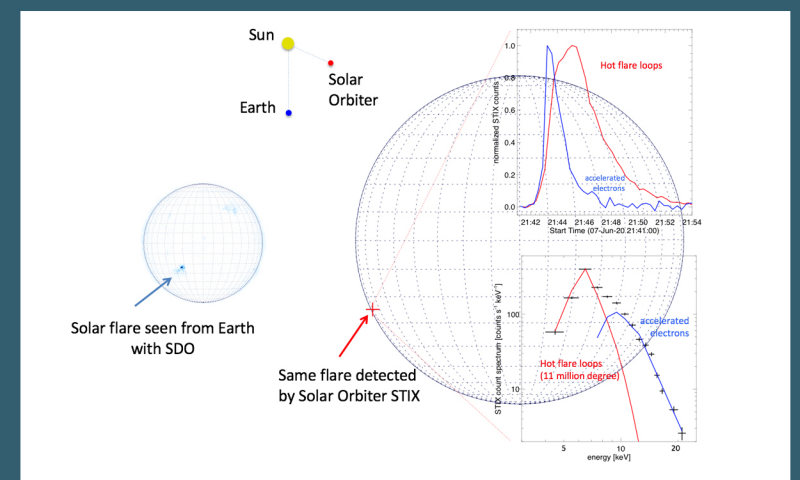
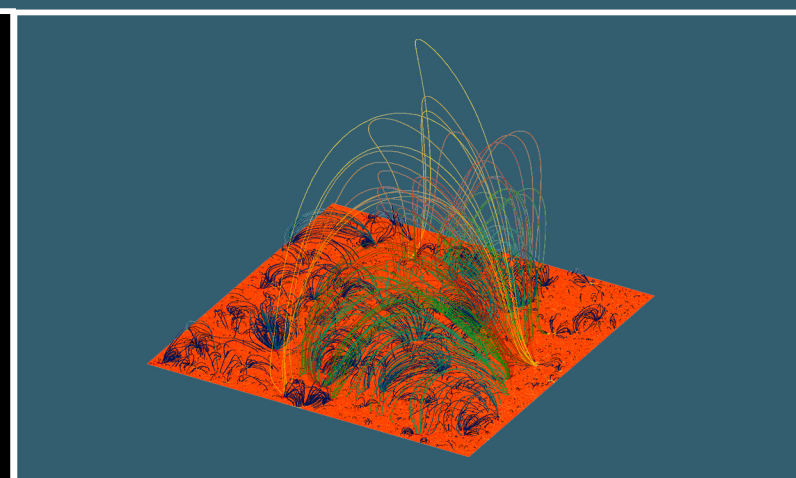
Energetic Particle Detector (EPD)



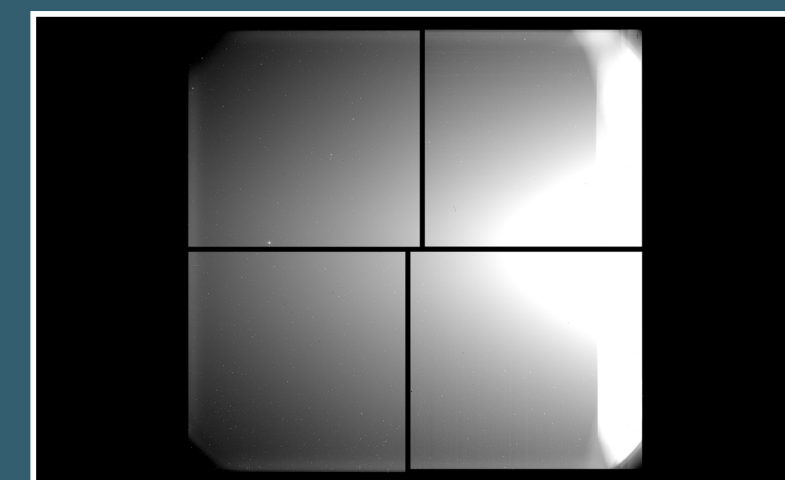
Magnetometer (MAG)



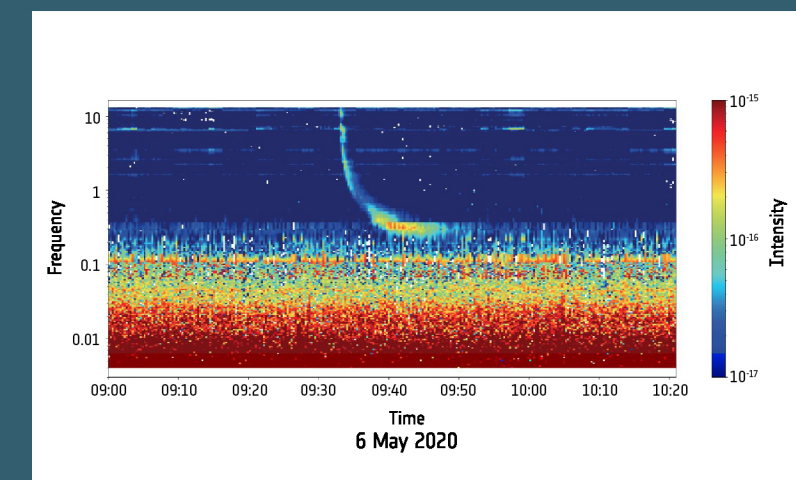
Polarimetric and Helioseismic Imager (PHI)



X-ray Spectrometer/Telescope (STIX)



Heliospheric Imager (SoloHI)

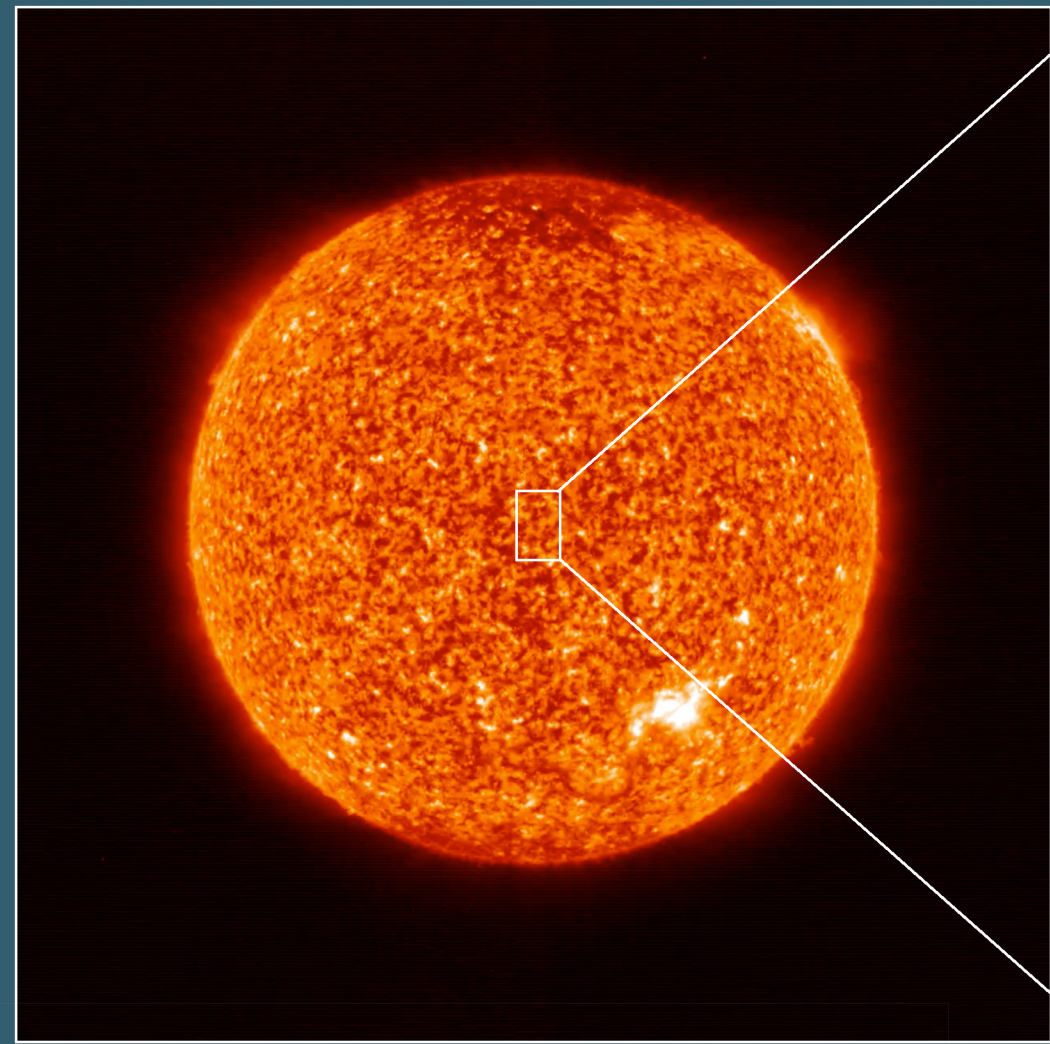


Radio and Plasma Waves (RPW)

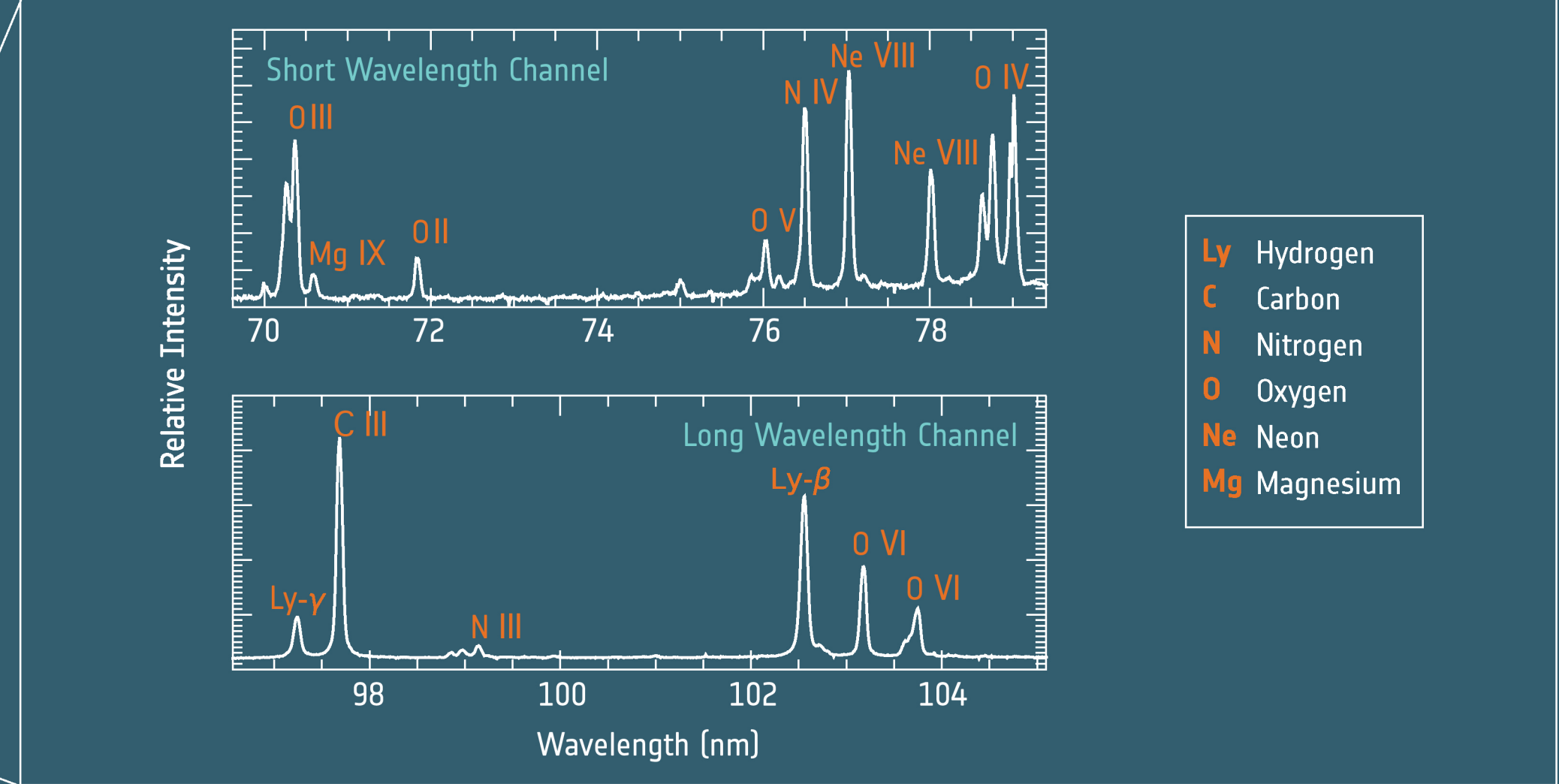
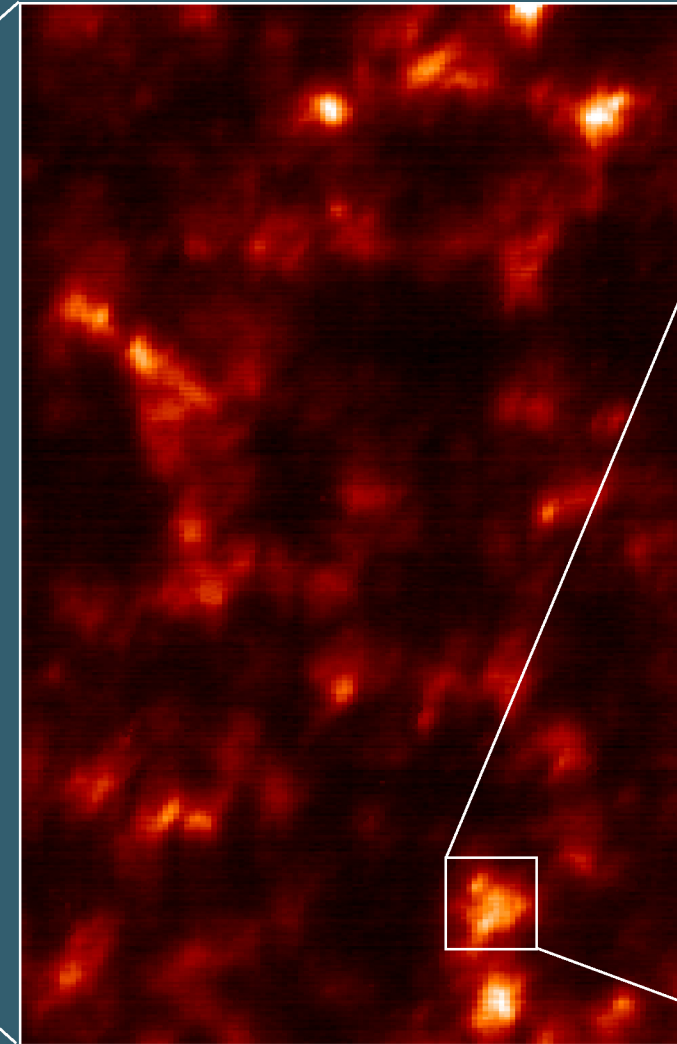
COMBINING REMOTE OBSERVATIONS AND IN SITU MEASUREMENTS

Both sets of data are used to piece together a more complete picture of what is happening on the Sun and in the solar wind, the flow of electrically charged particles that is continuously released by our star.

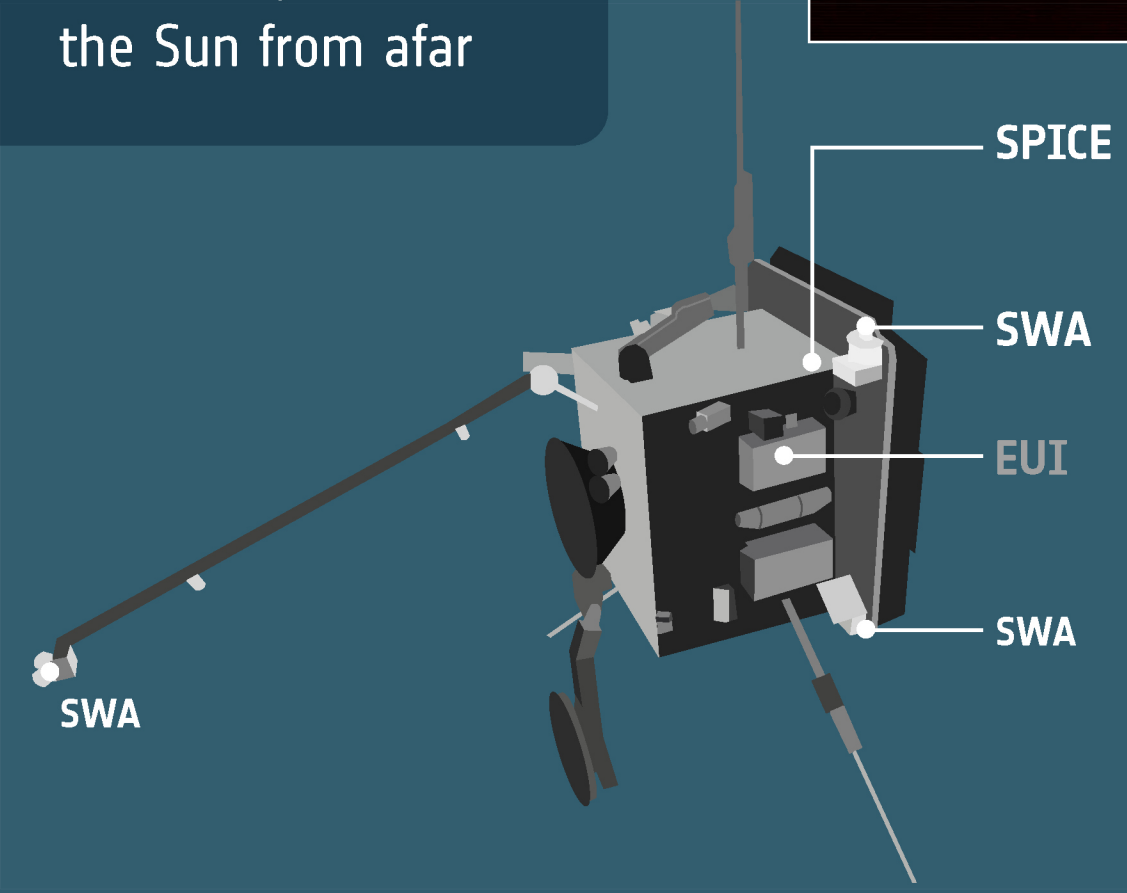
Extreme Ultraviolet Imager (EUI)



Spectral Imaging of the Coronal Environment (SPICE)

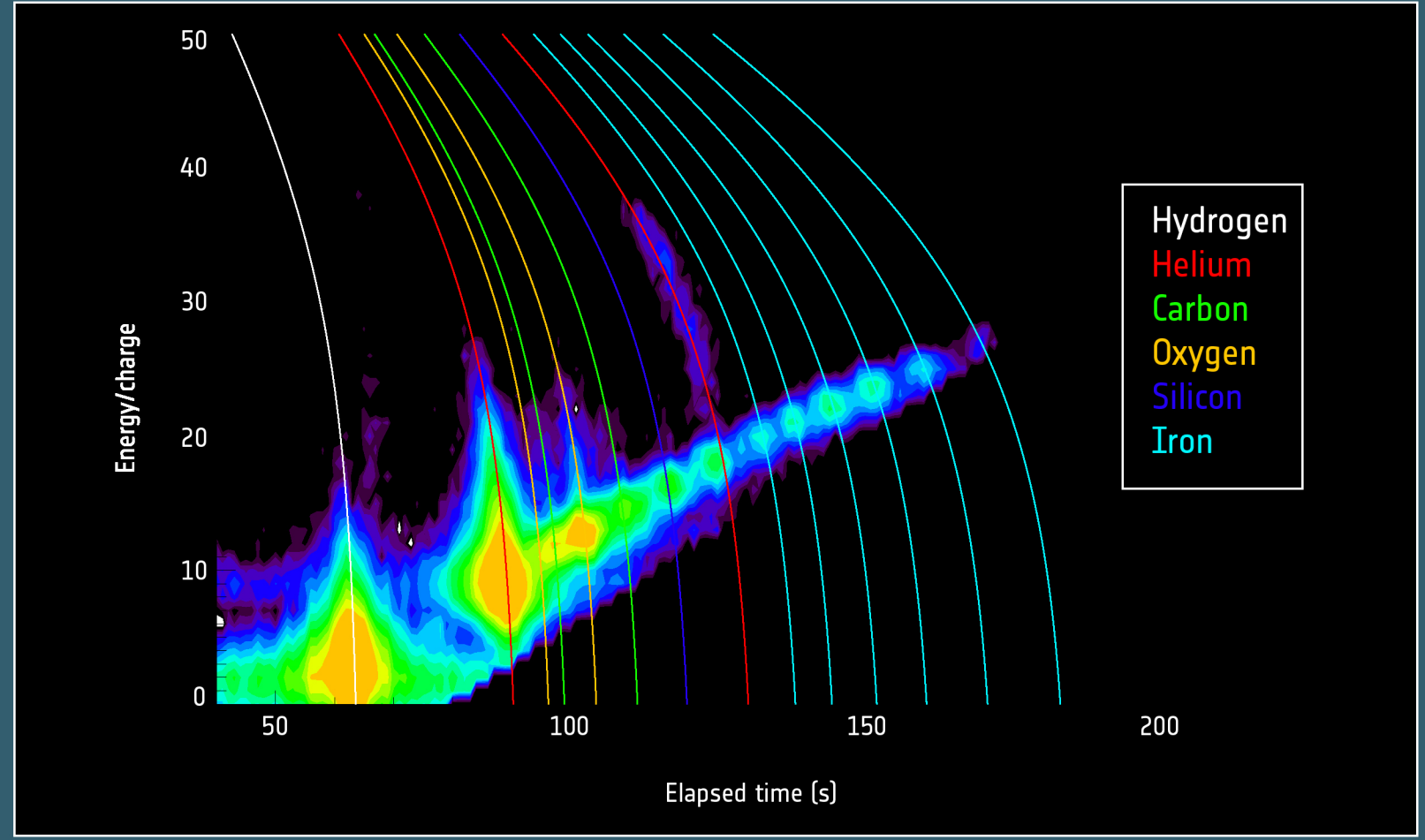


The **remote-sensing instruments** (such as EUI and SPICE) observe the Sun from afar



The **in situ instruments** (such as SWA) measure the electric and magnetic fields, and the particles near the spacecraft

Solar Wind Analyser (SWA)

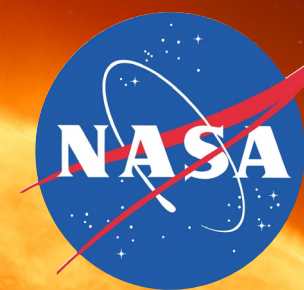


Solar Orbiter

Remote-Sensing Science

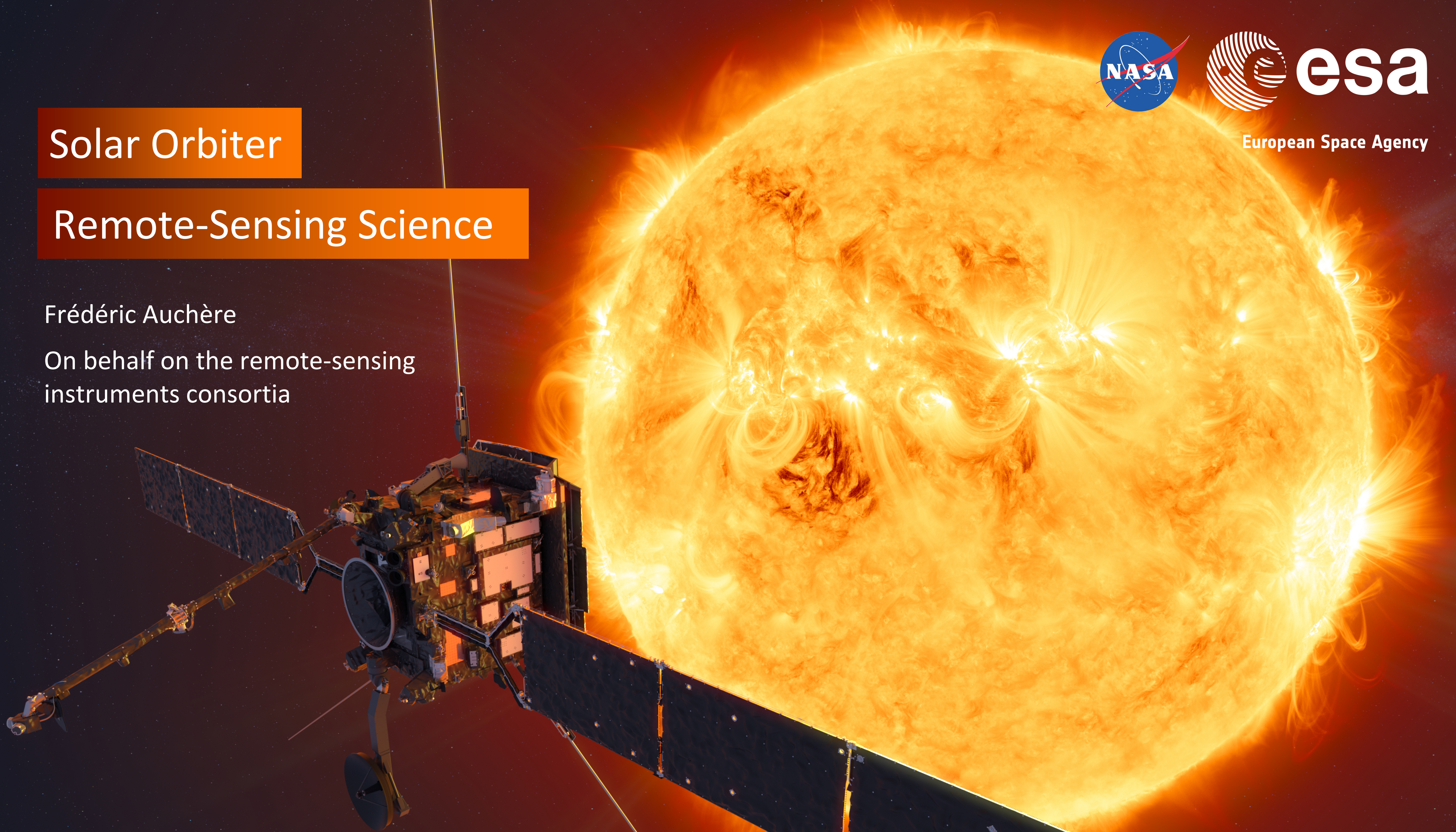
Frédéric Auchère

On behalf on the remote-sensing
instruments consortia



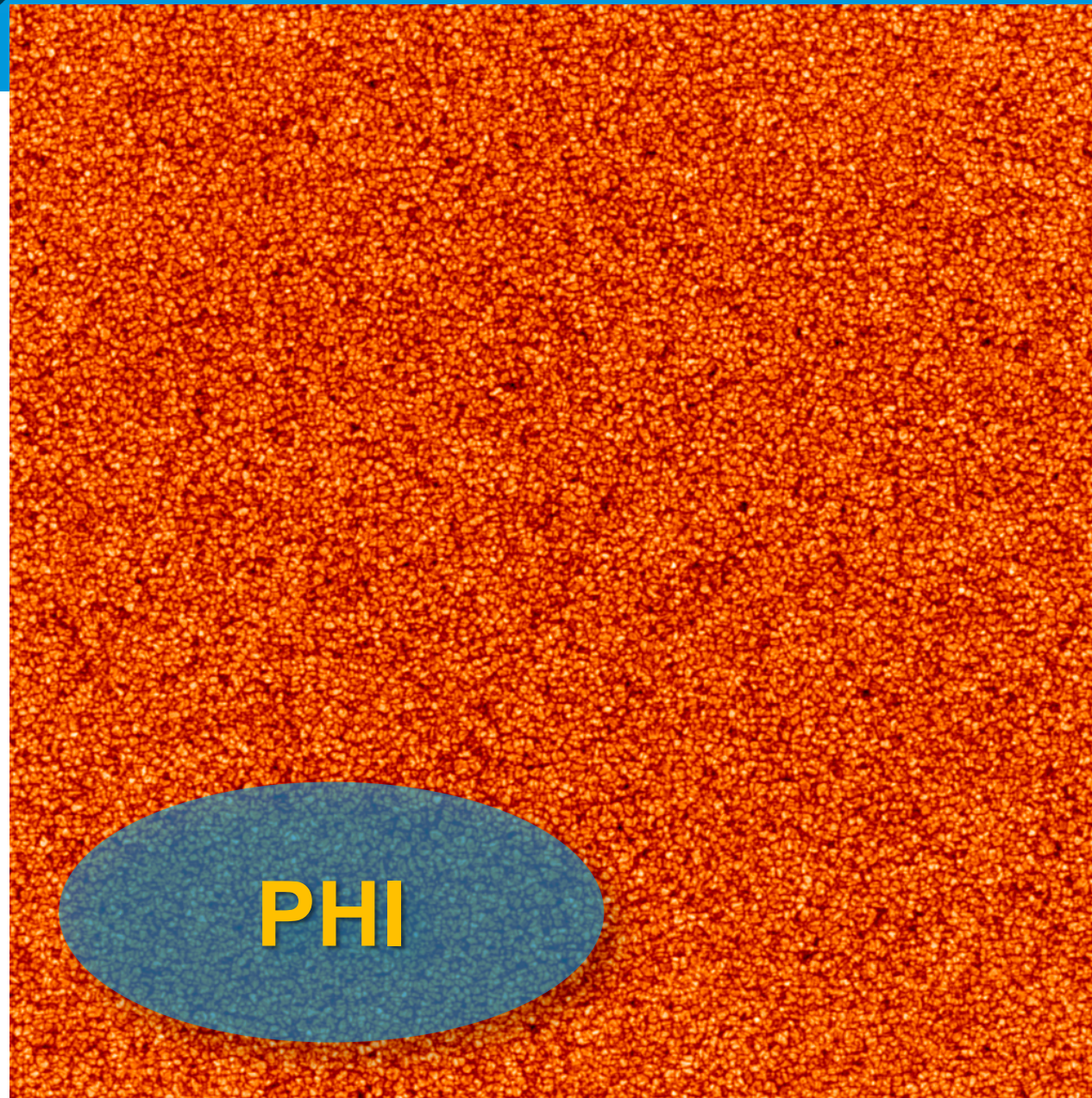
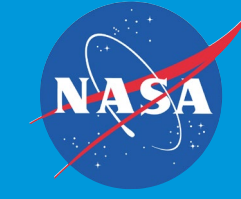
esa

European Space Agency

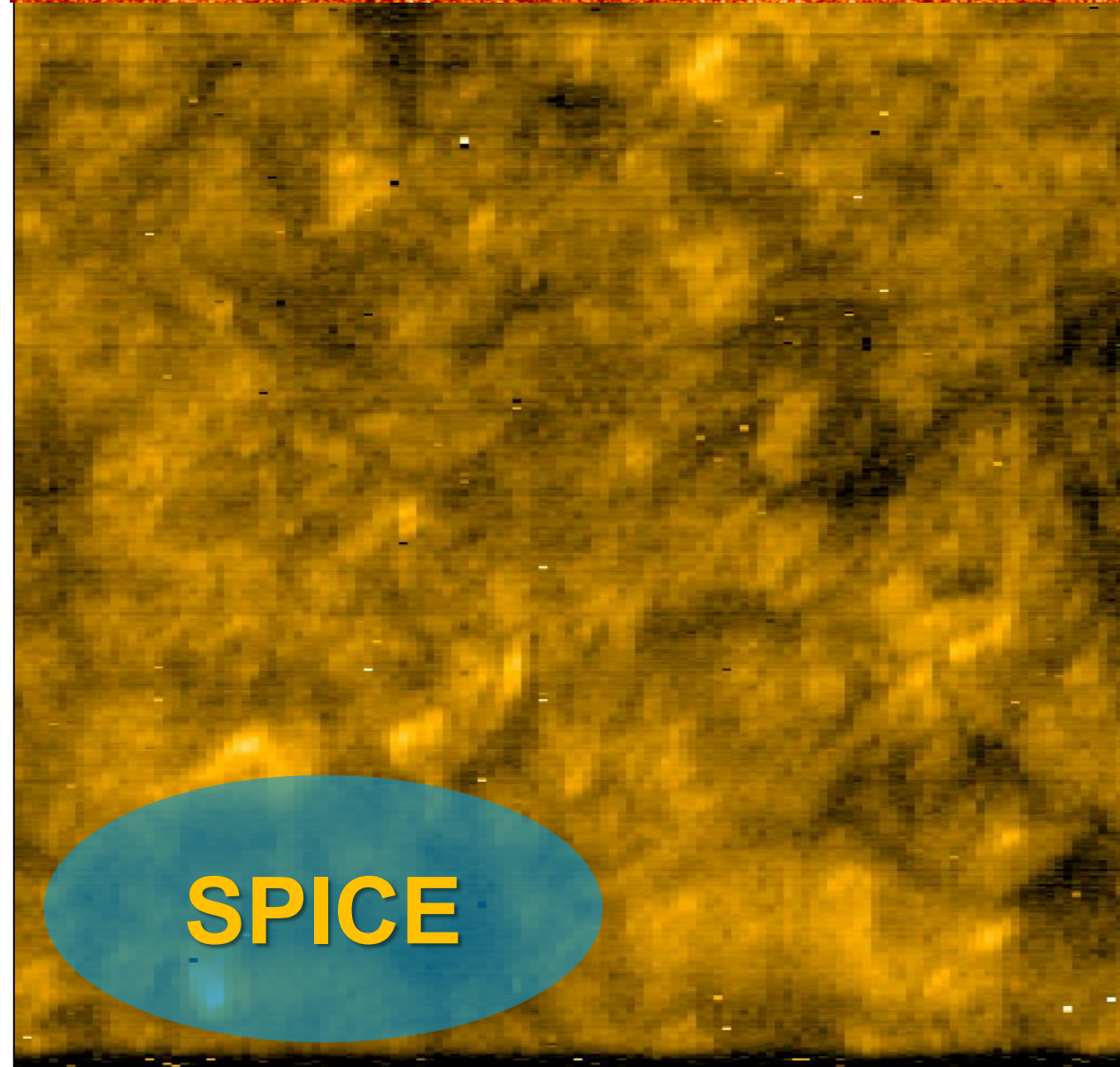
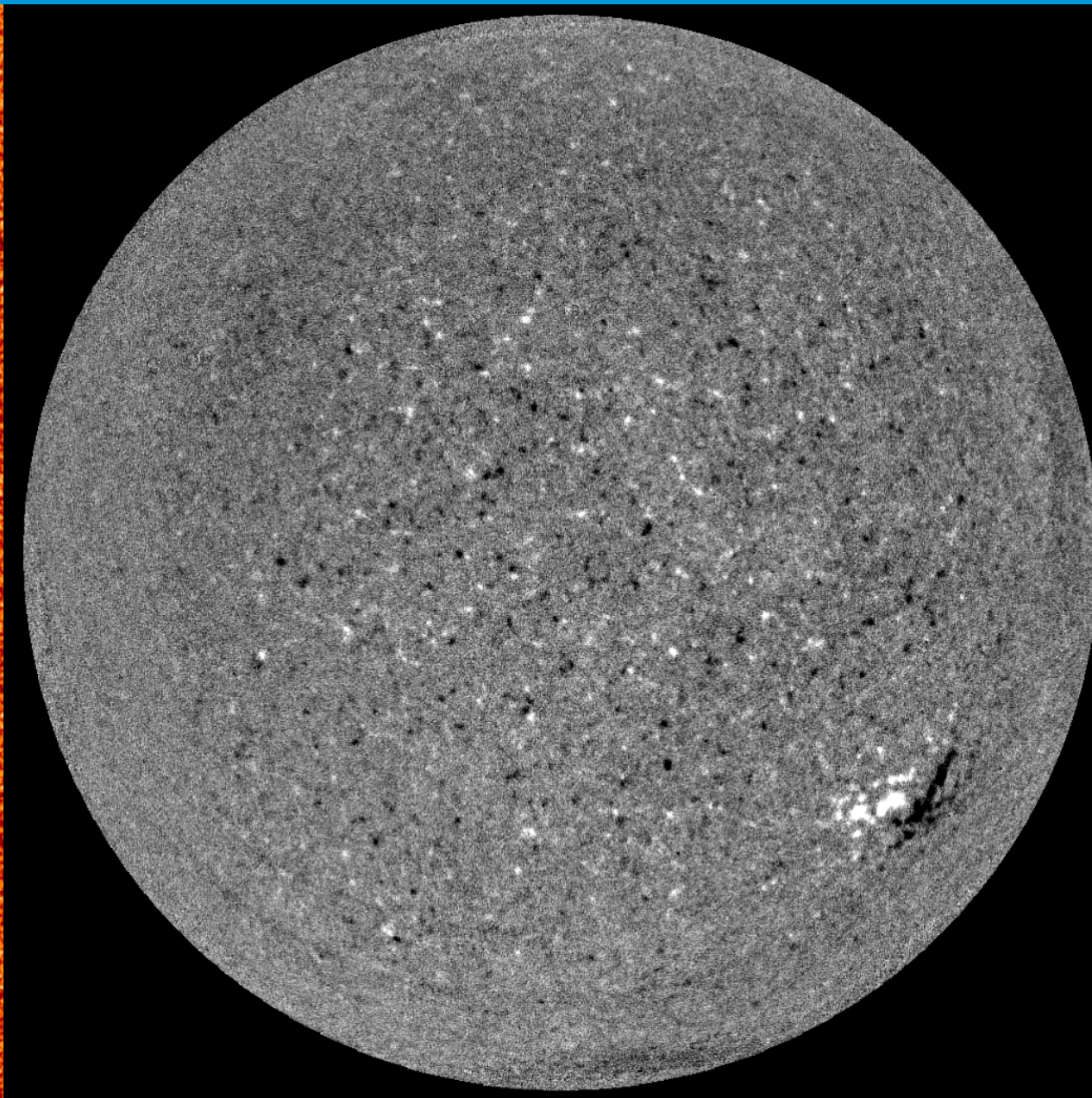




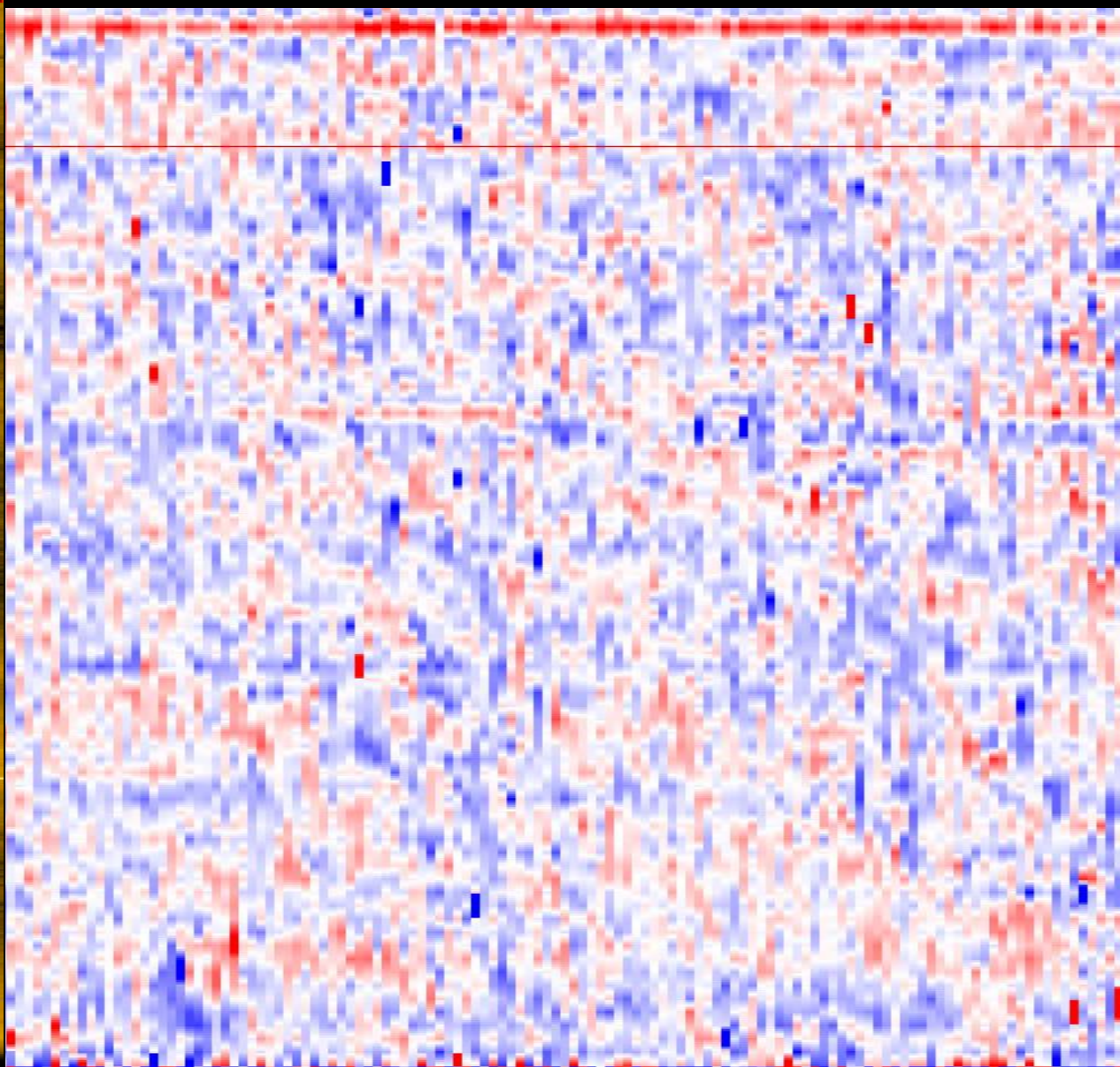
Comprehensive measurements from the surface ...



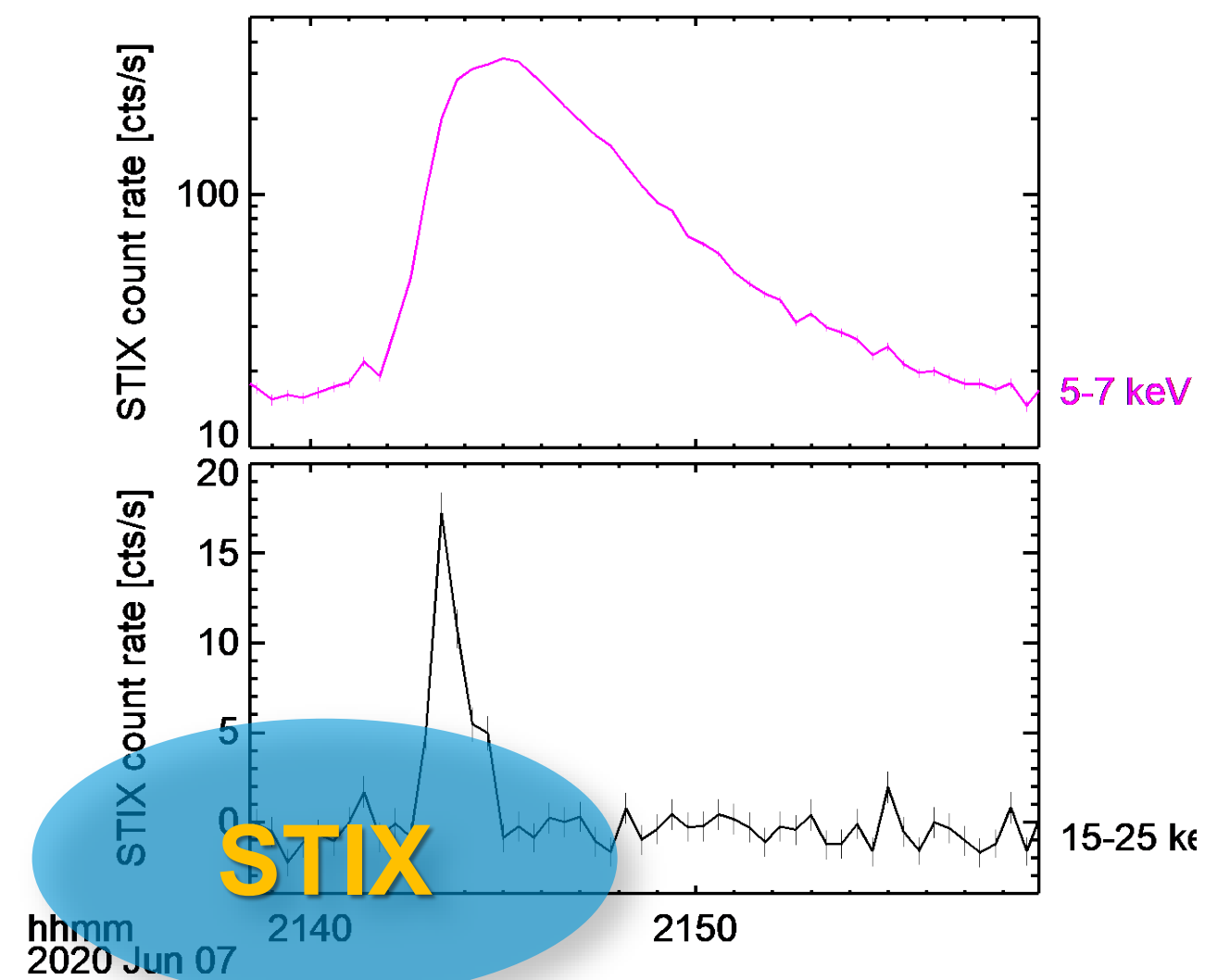
PHI



SPICE

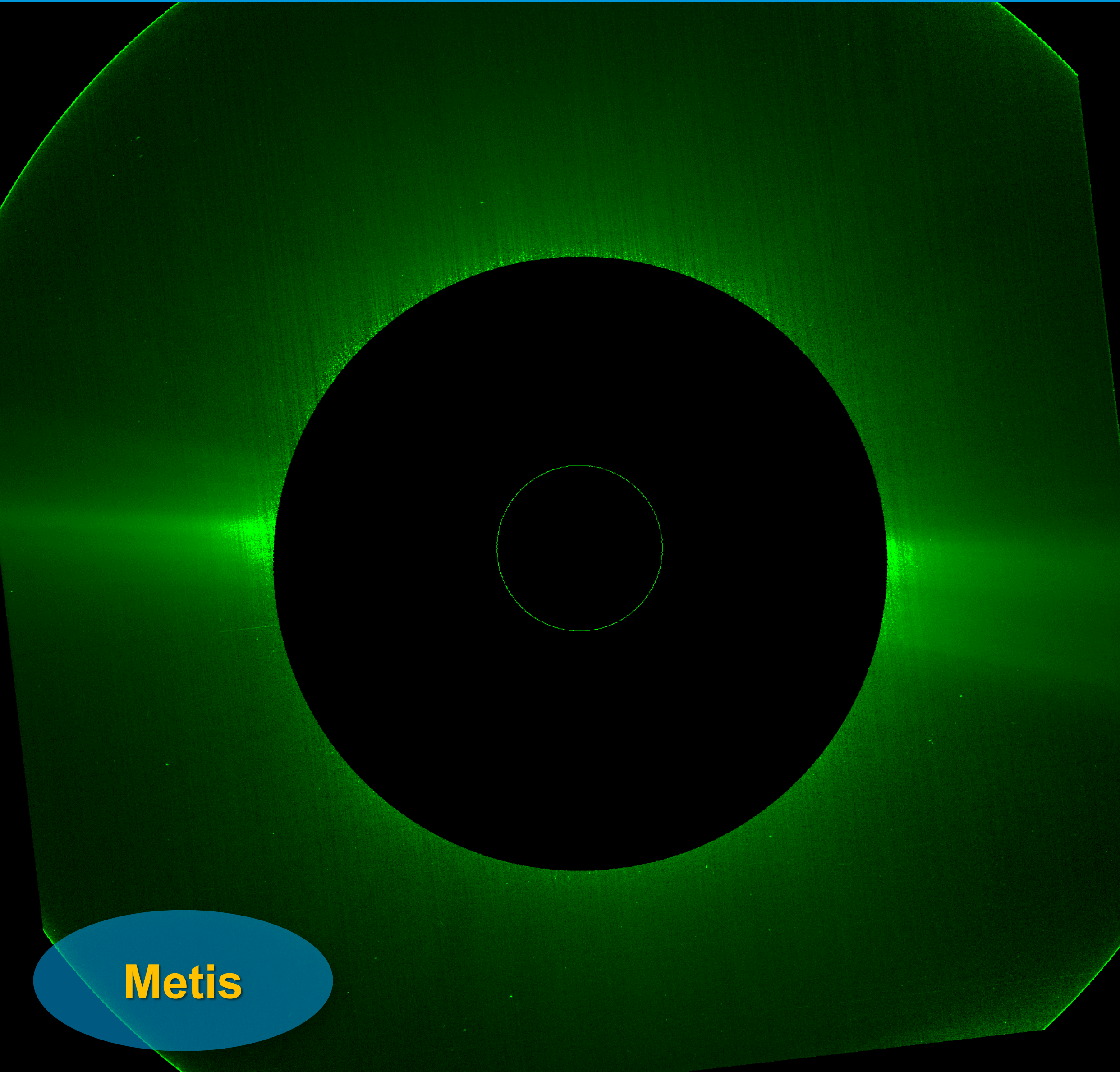
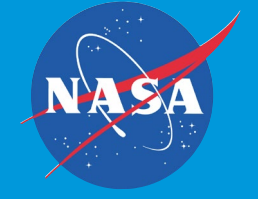


Images & spectra
from the visible to X-rays
Velocity
Density
Temperature
Magnetic field
Chemical composition

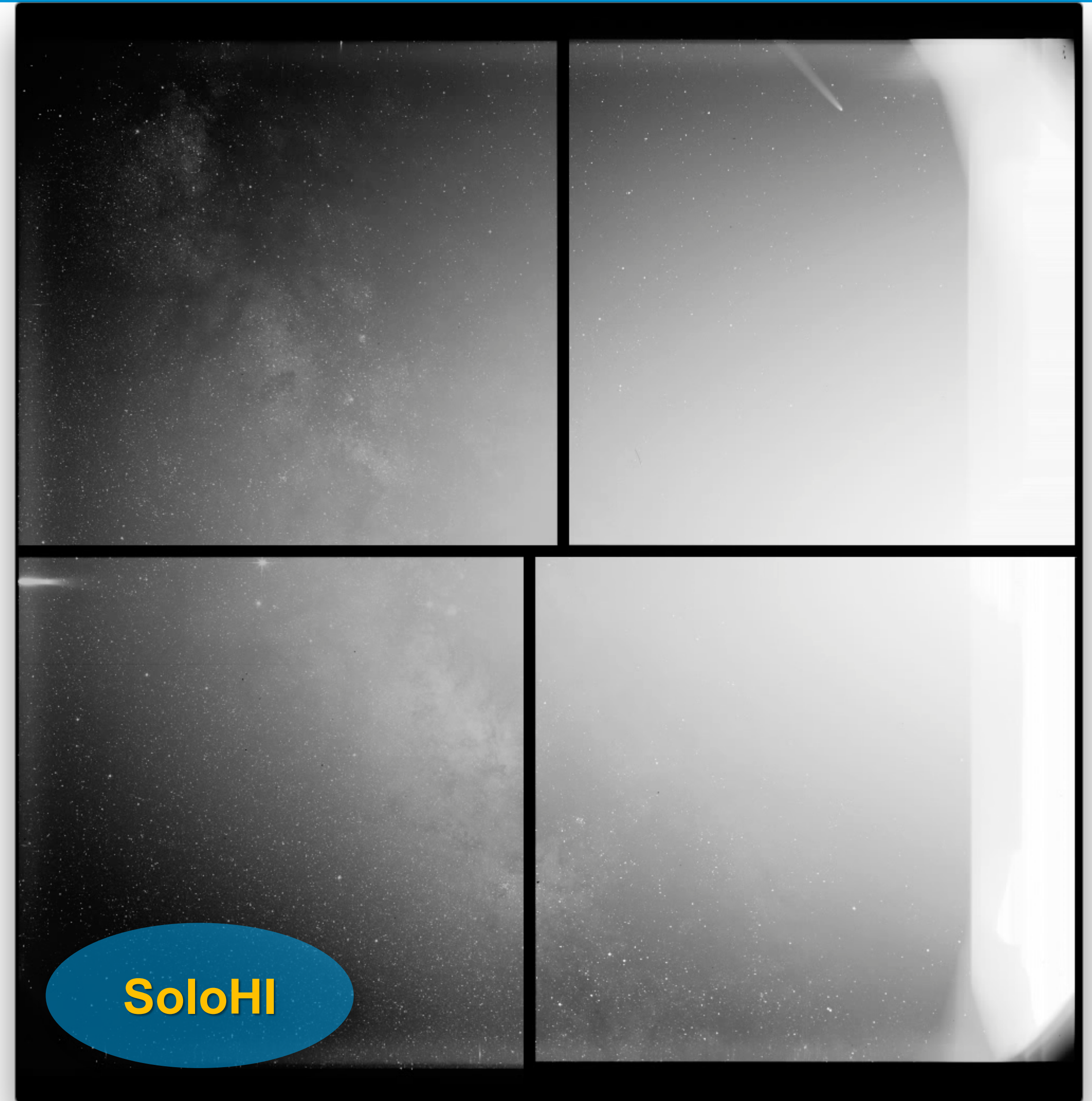




... to the heliosphere



Metis



SoloHI



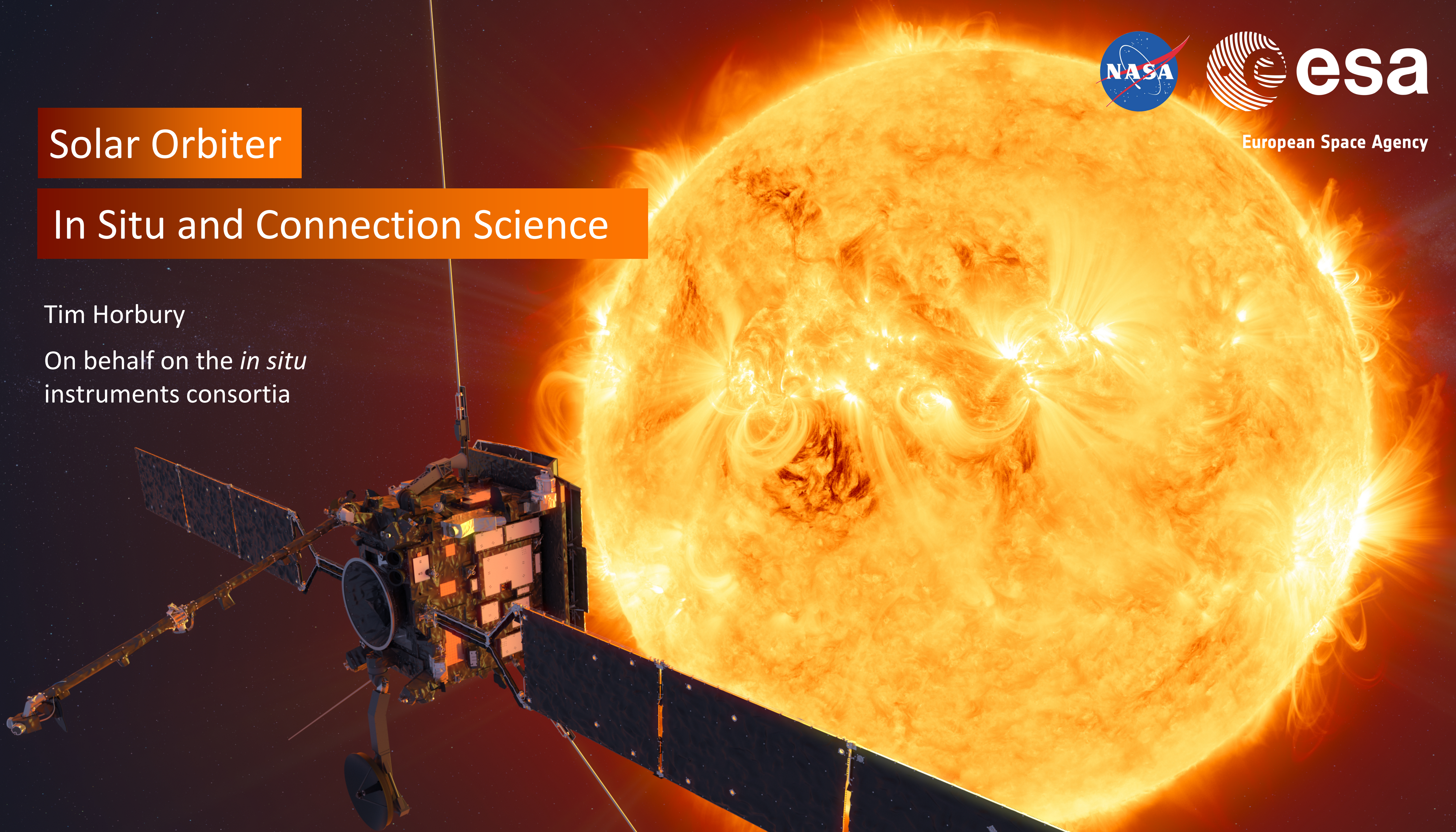
European Space Agency

Solar Orbiter

In Situ and Connection Science

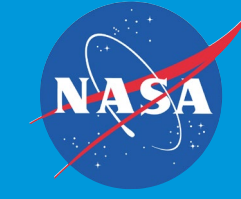
Tim Horbury

On behalf on the *in situ*
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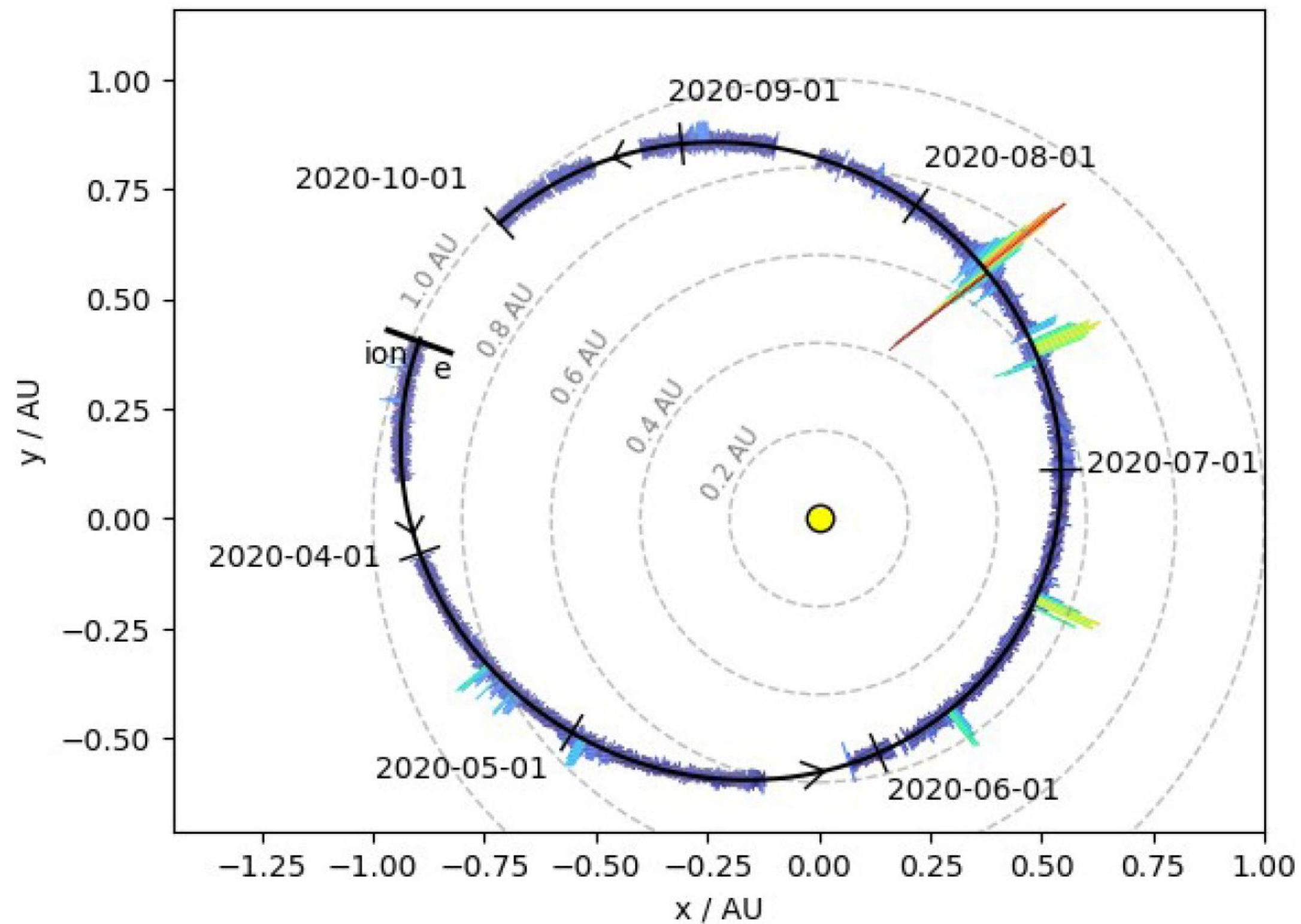




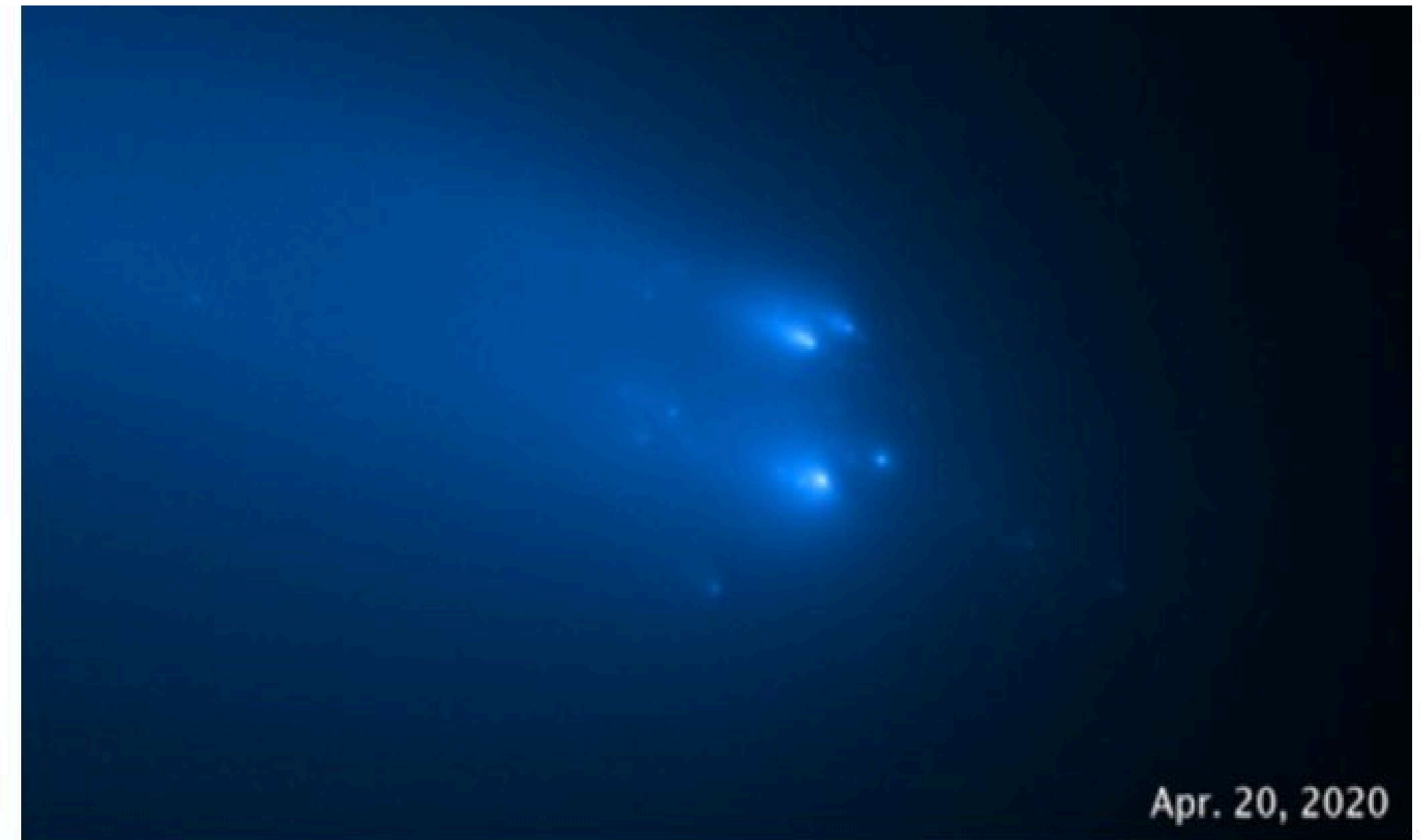
Early science highlights



Particle measurements around the entire orbit



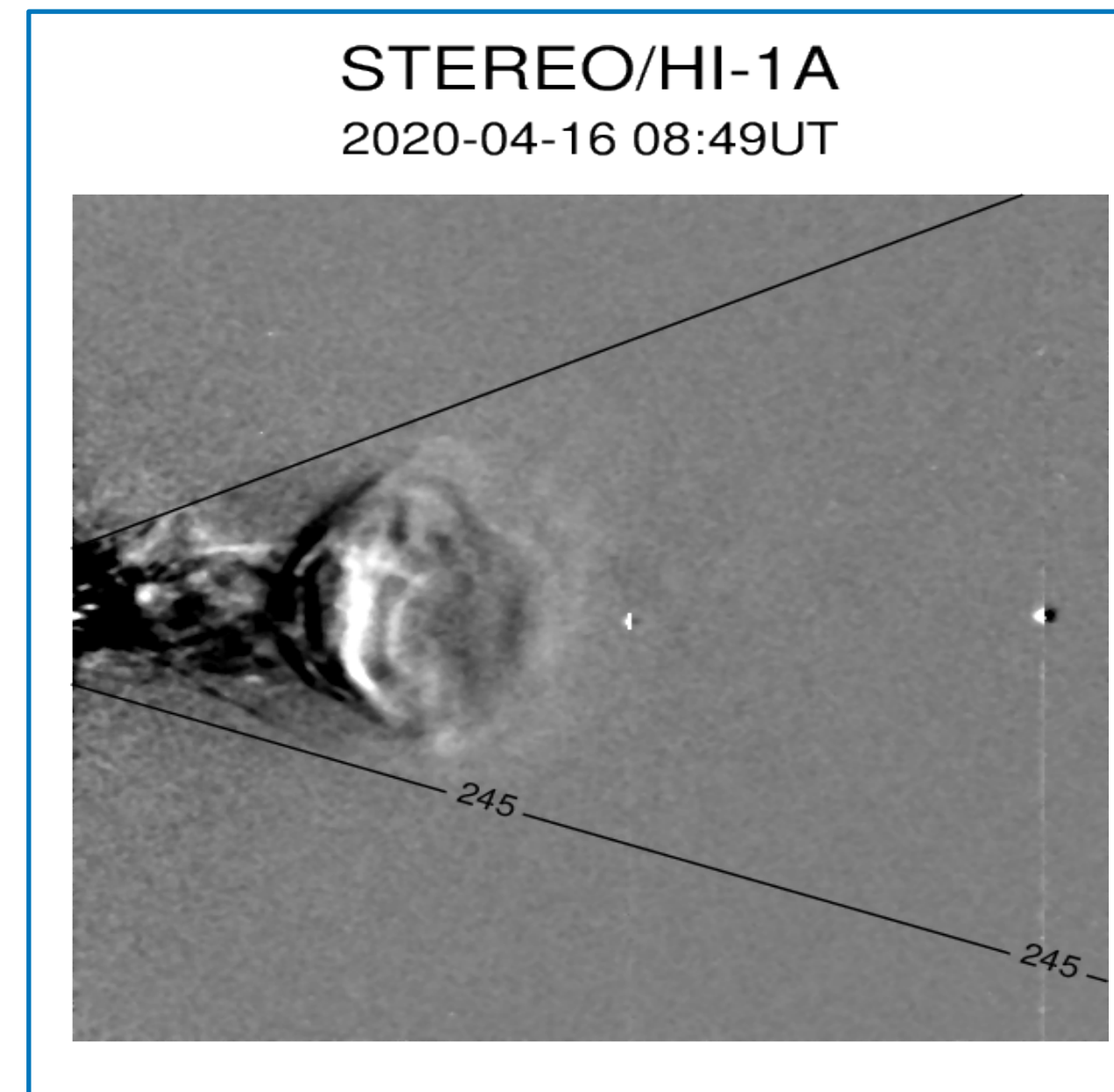
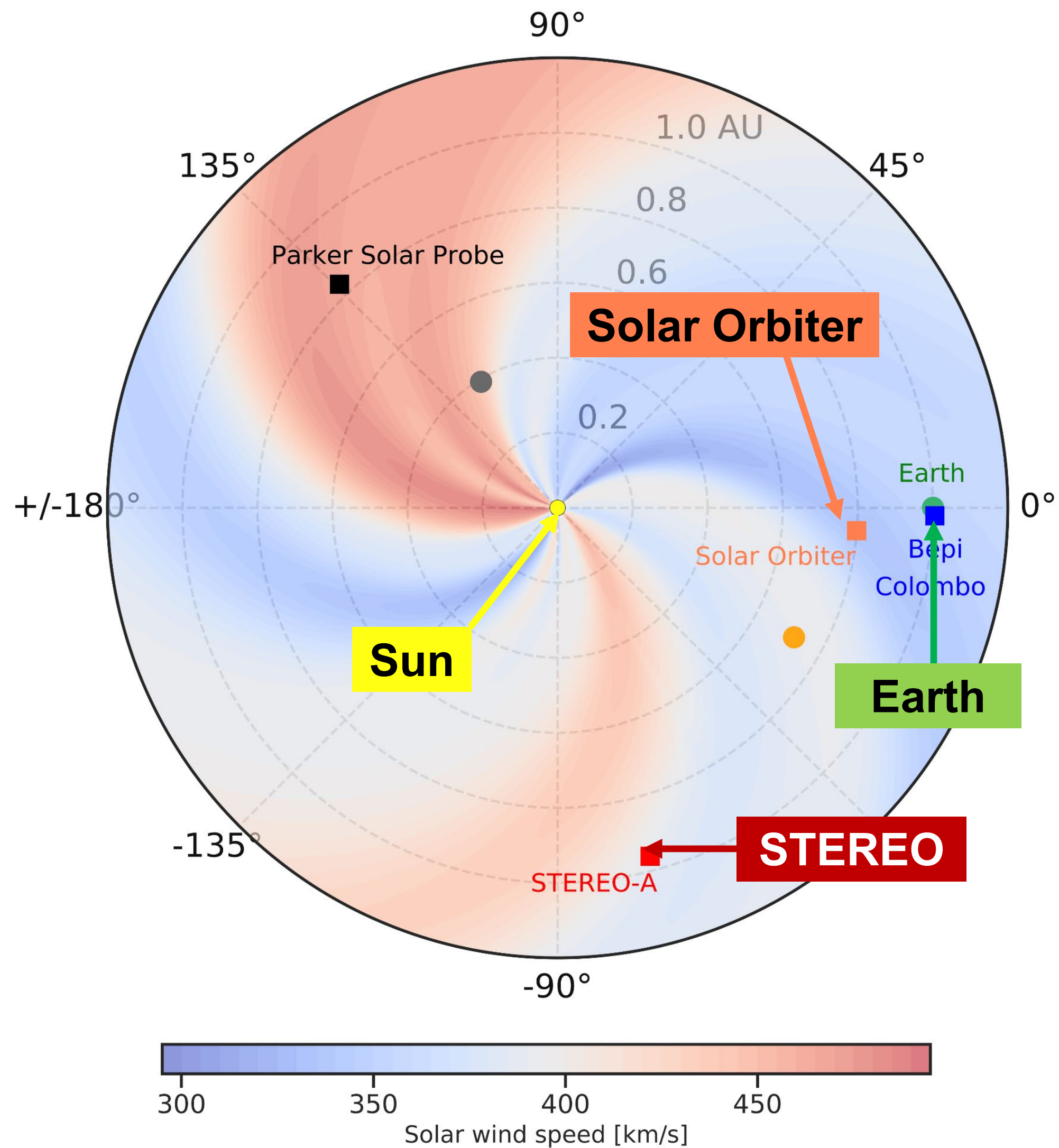
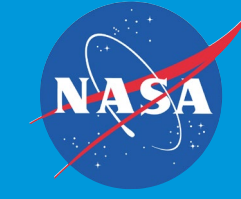
Dust and waves from comet ATLAS



Credits: NASA, ESA, STScI and D. Jewitt (UCLA)

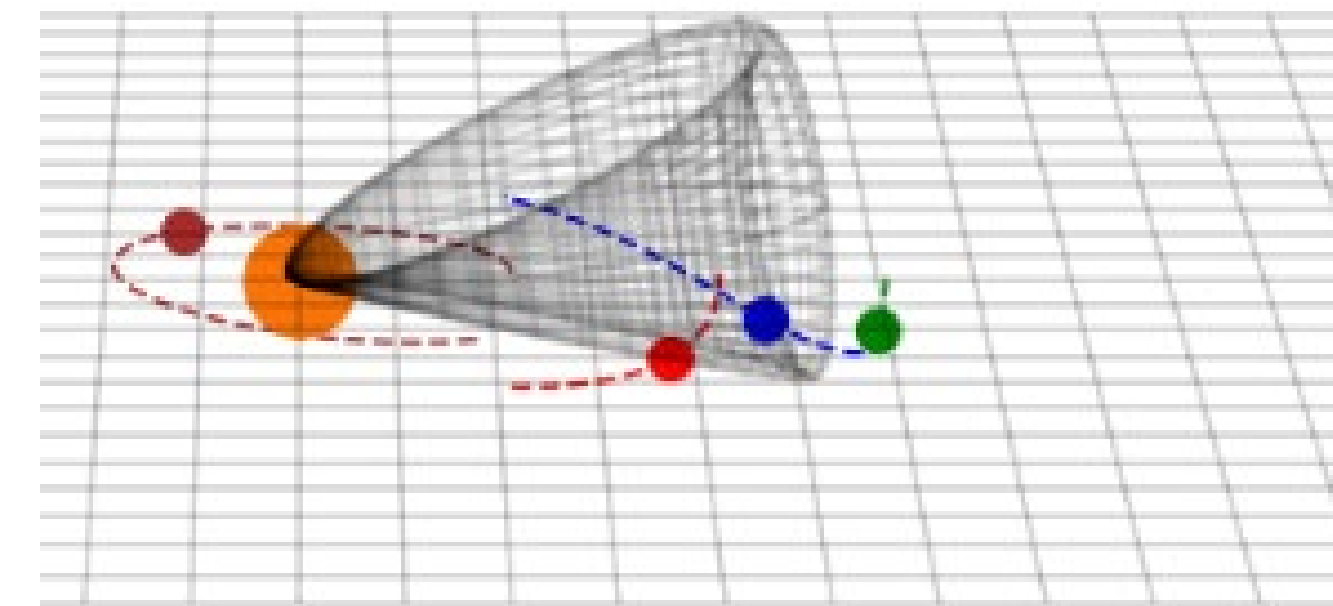


Constellation measurements: 19 April 2020



Coronal mass ejection imaged by STEREO

Models driven by Solar Orbiter measurements





Synergies & Summary



Solar Orbiter provides unique new views of the Sun and heliosphere

- Measures all the way from the Sun's surface into the solar wind
- First-ever images of the Sun's poles

Timeline

- Now: First science results
- 27 December 2020: First Venus fly-by
- November 2021: Start of nominal mission
- March 2022: First close encounter

Fleet of heliophysics missions in orbit
+ New ground-based telescopes
= **Huge potential for joint science**

QUESTIONS

Please write your questions in the Q&A box and AGU will ask it on your behalf.

Reminder: A 30-minute, informal discussion will commence in Zoom after this event ends.