

ESA, ESOC and Surface Operations

→ UNITED SPACE IN EUROPE, UNITED EUROPE IN SPACE

Kim Nergaard

ESA/ESOC – Darmstadt

20/08/2019

Intro

WhoAmI

ESA

Missions

Surface Ops

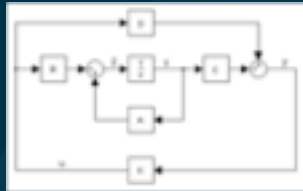
Q&A



~1980



~1981



1985-1991



1991



1992 - now



Today

- Kim Nergaard
- Norwegian / European
- Cand.Scient. University of Oslo 1991 (Cybernetics)
- ESA/ESOC 1992 –
- Head of the Mission Definition Unit, ESA/ESOC
- Main focus: Surface Operations Preparation and Execution

EUROPE'S GATEWAY TO SPACE

WHAT

22 Member States, 5000 staff and contractors

WHY

Exploration and use of space for exclusively peaceful purposes

WHERE

HQ in Paris, 7 sites across Europe and a spaceport in French Guiana

HOW MUCH

€5.72 billion = €12 per European per year



WHAT DOES ESA DO?



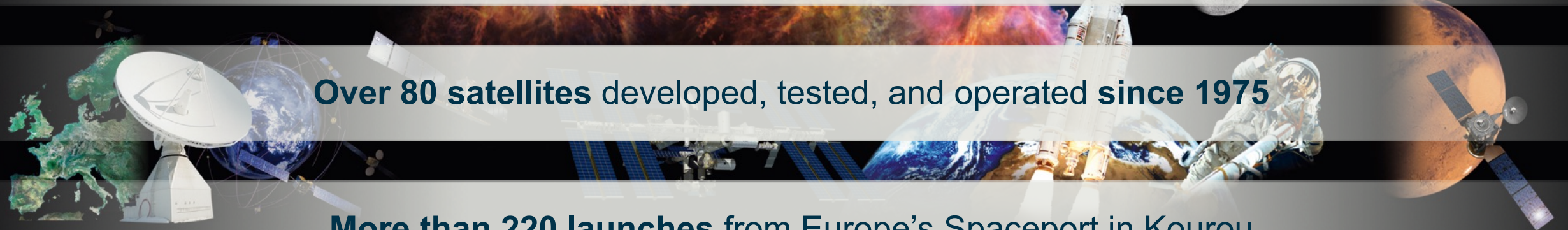
ALL OF THIS IS POSSIBLE THANKS TO THE COLLABORATION OF MEMBER STATES

ESA is active across **every** area of the **space sector**

World leader in science and technology

Over 80 satellites developed, tested, and operated **since 1975**

More than 220 launches from Europe's Spaceport in Kourou



WHO BENEFITS?

YOU



OUR ECONOMY



OUR PLANET



OUR FUTURE



1975 SIGNING OF ESA CONVENTION



10

MEMBER STATES

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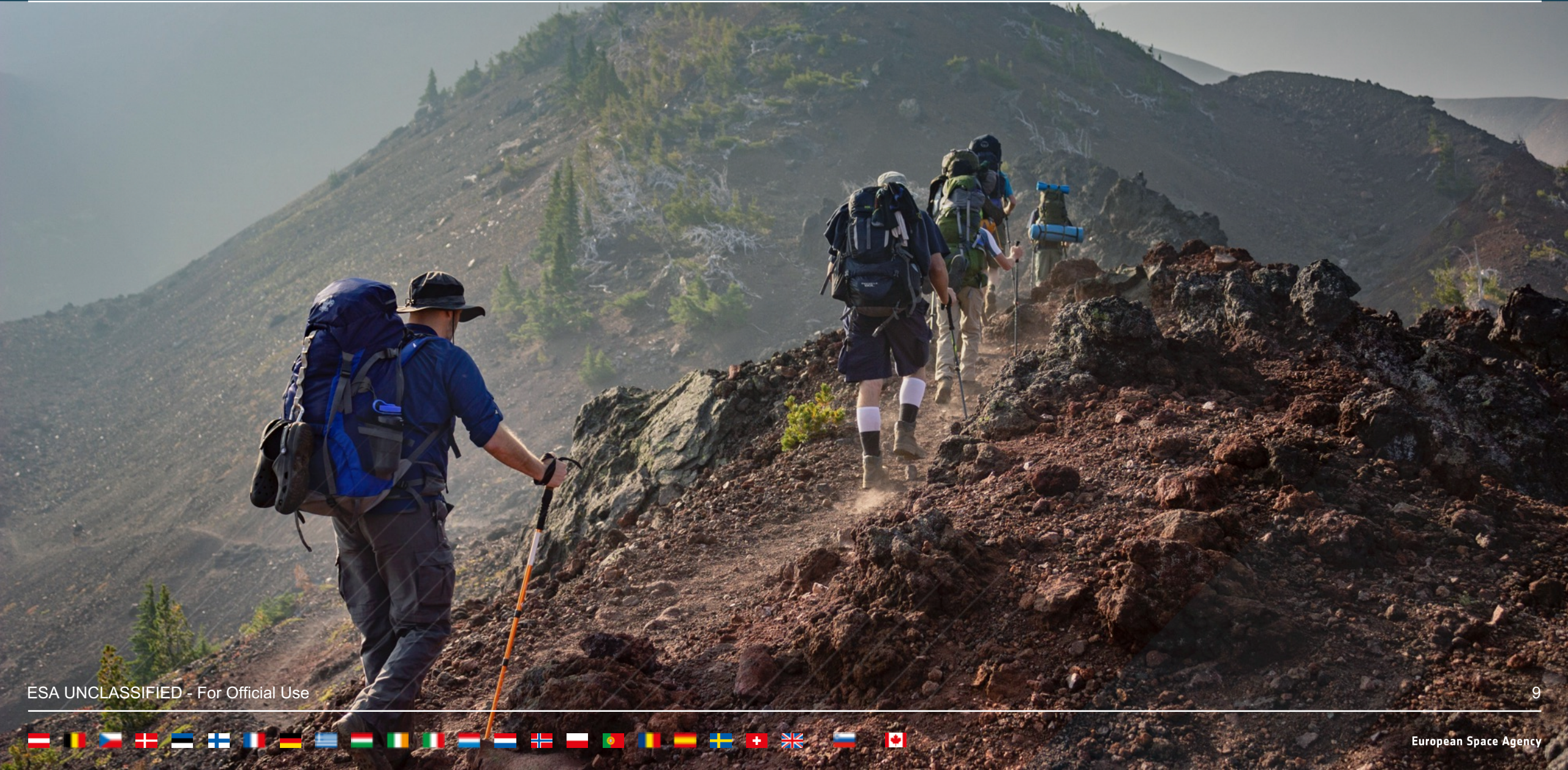


European Space Agency

22
MEMBER STATES



THE EXPLORERS AND THEIR CHALLENGE



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European Space Agency

THE EXPLORERS AND THEIR CHALLENGE



1. EXPLORE THE UNIVERSE

2. IMPROVE LIFE ON EARTH

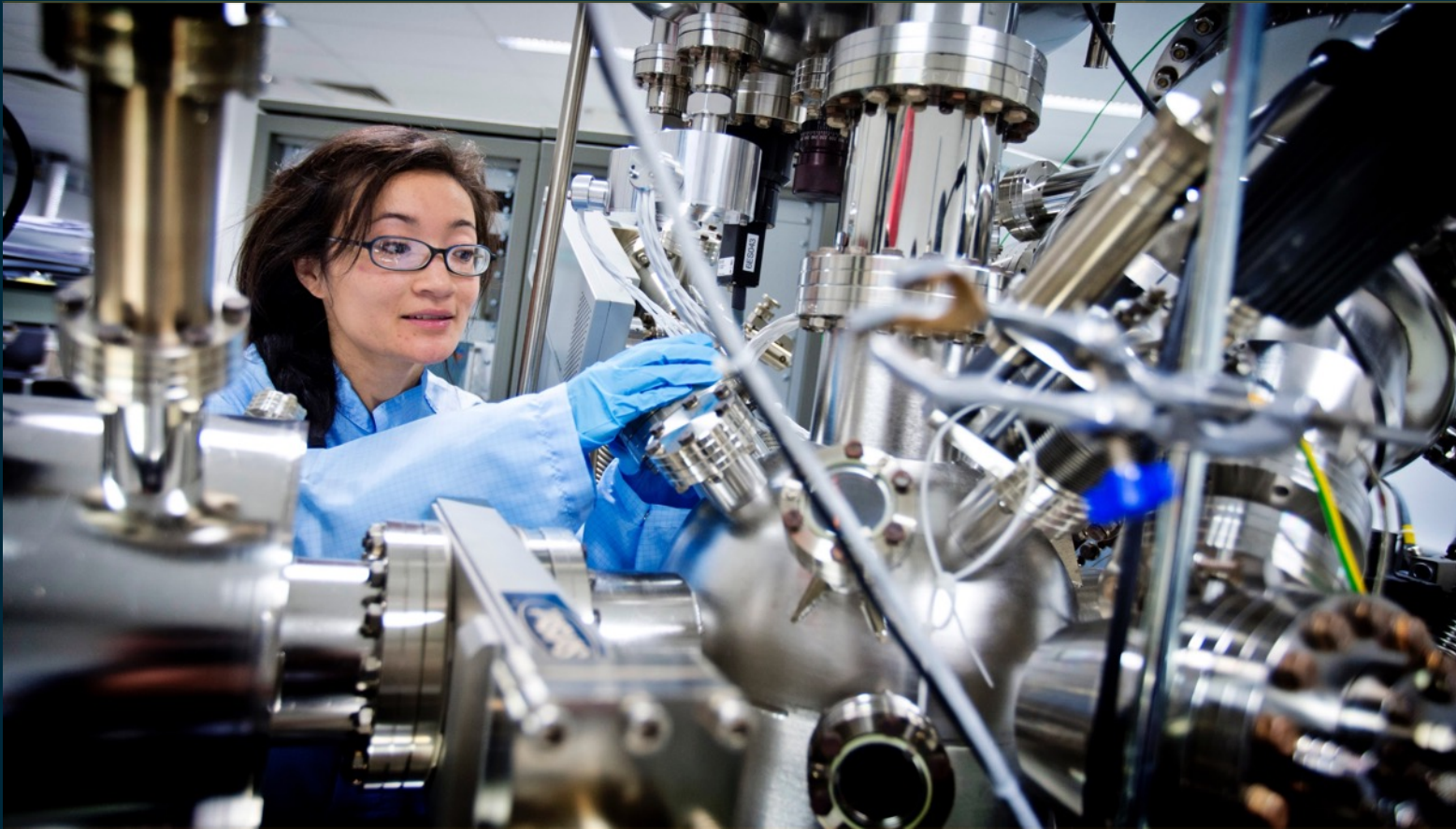


**...WHILE SERVING
PEACEFUL PURPOSES**

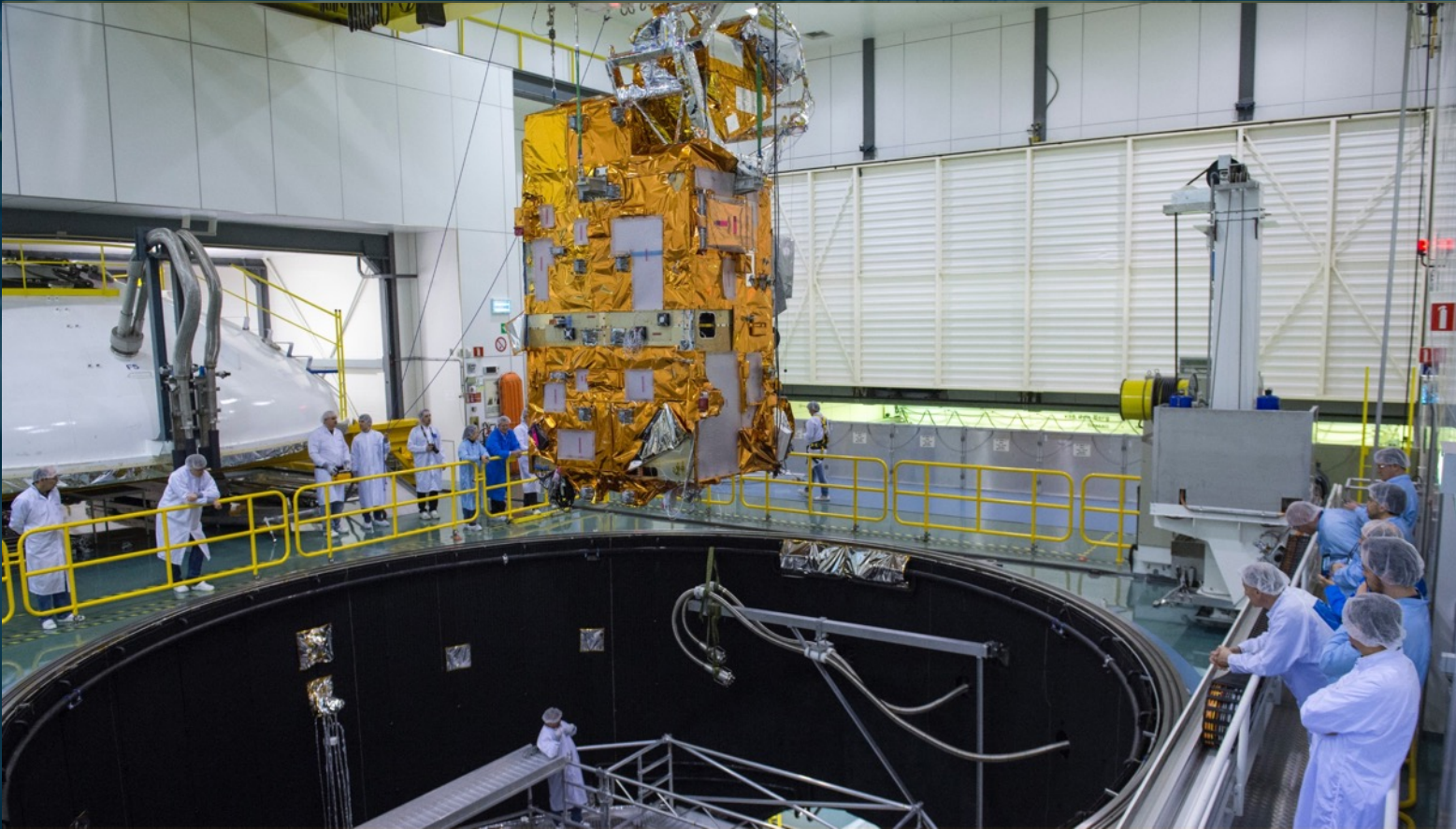
WHERE MISSIONS ARE MADE

ESA'S TECHNICAL HEART

► ESTEC, Netherlands



GUARANTEED FOR FLIGHT



GETTING TO SPACE



TRAVELLING TO SPACE

► Europe's Spaceport, Kourou, French Guiana



OPERATING THE SPACECRAFT



TAKING CONTROL ► ESOC control room



COMMUNICATING WITH THE SPACECRAFT

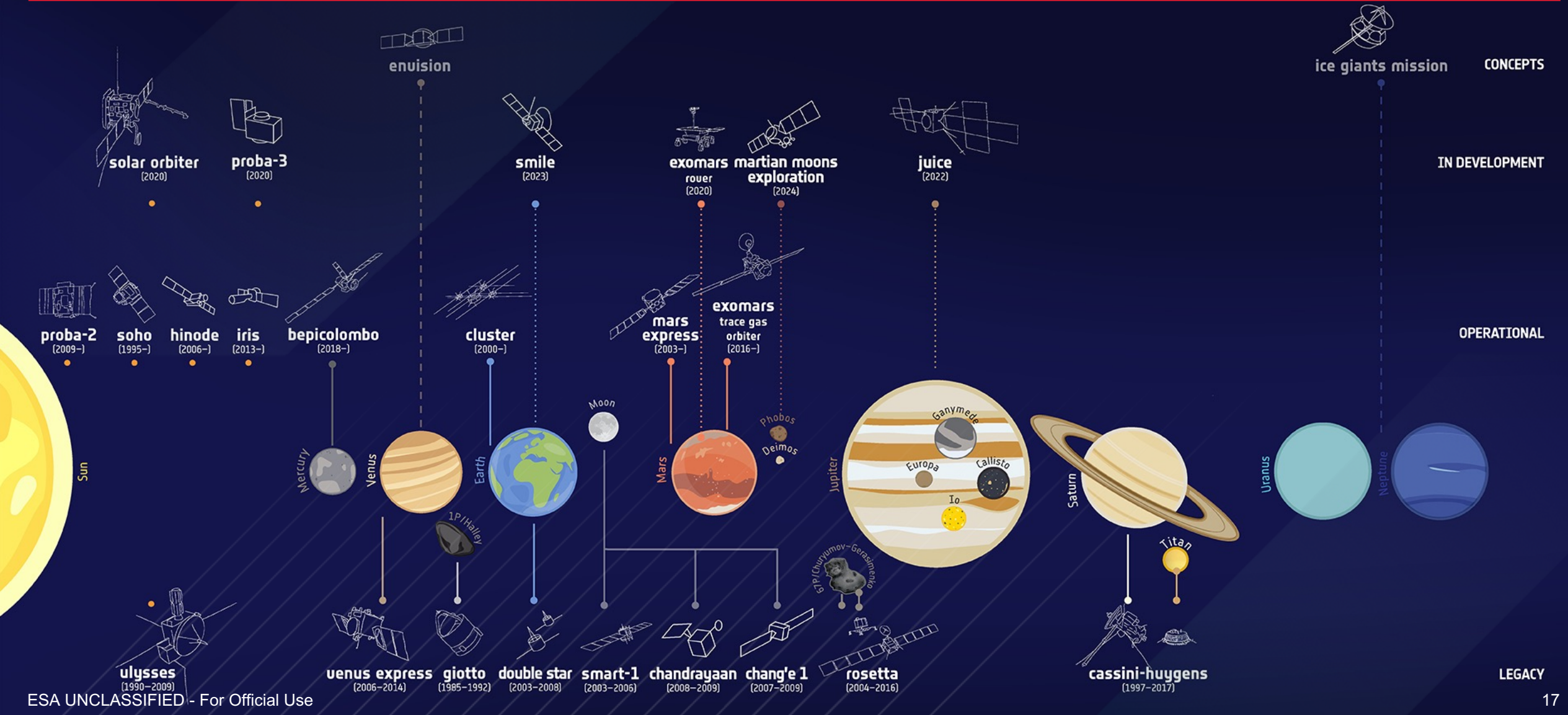


NETWORK OF SPACE ANTENNAS

► Spain, Australia & Argentina

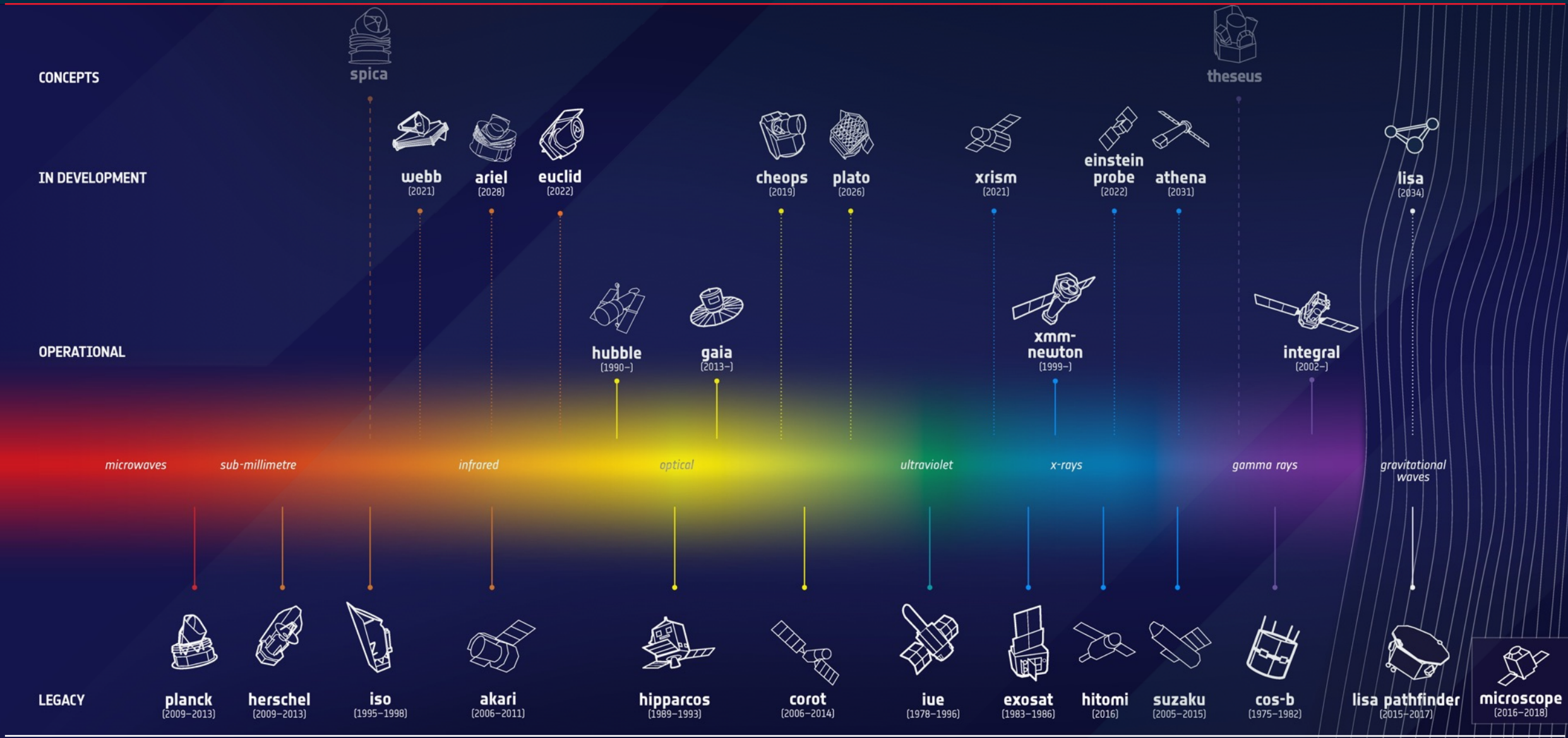


SCIENCE AND EXPLORATION

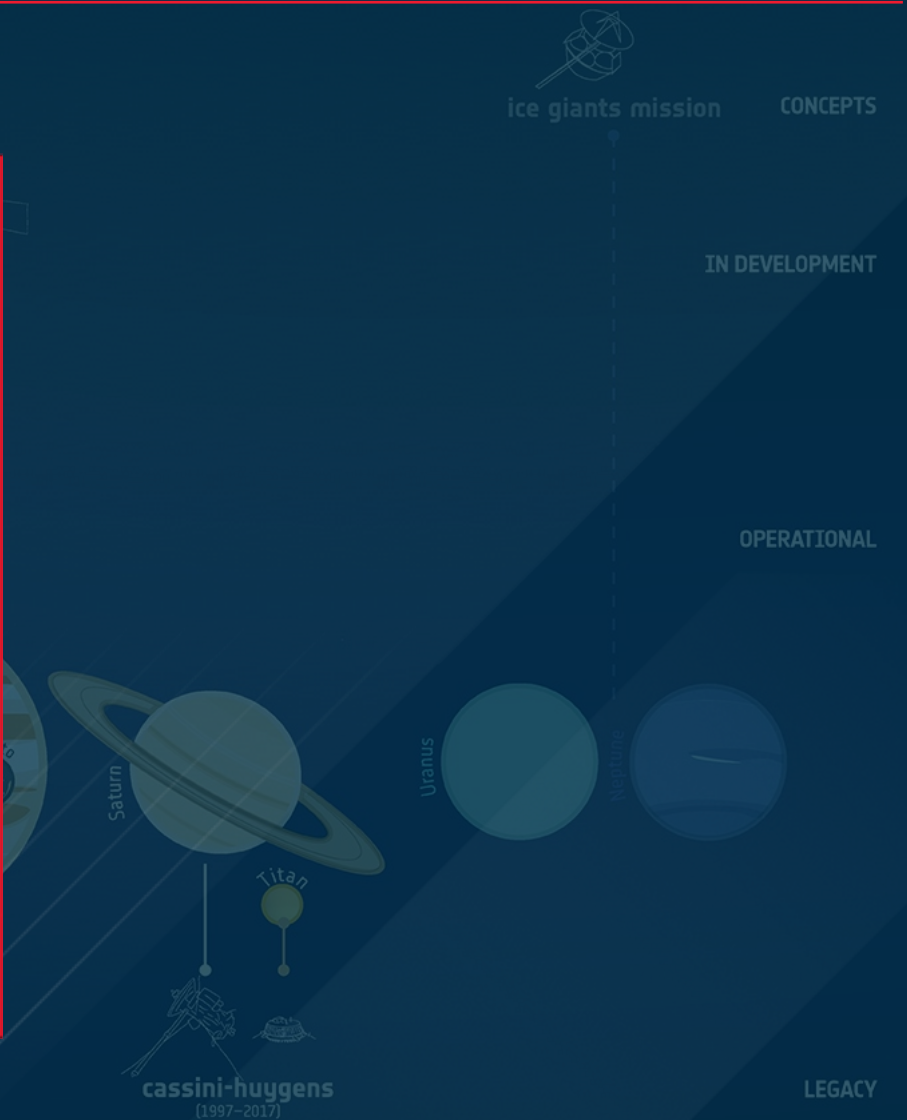
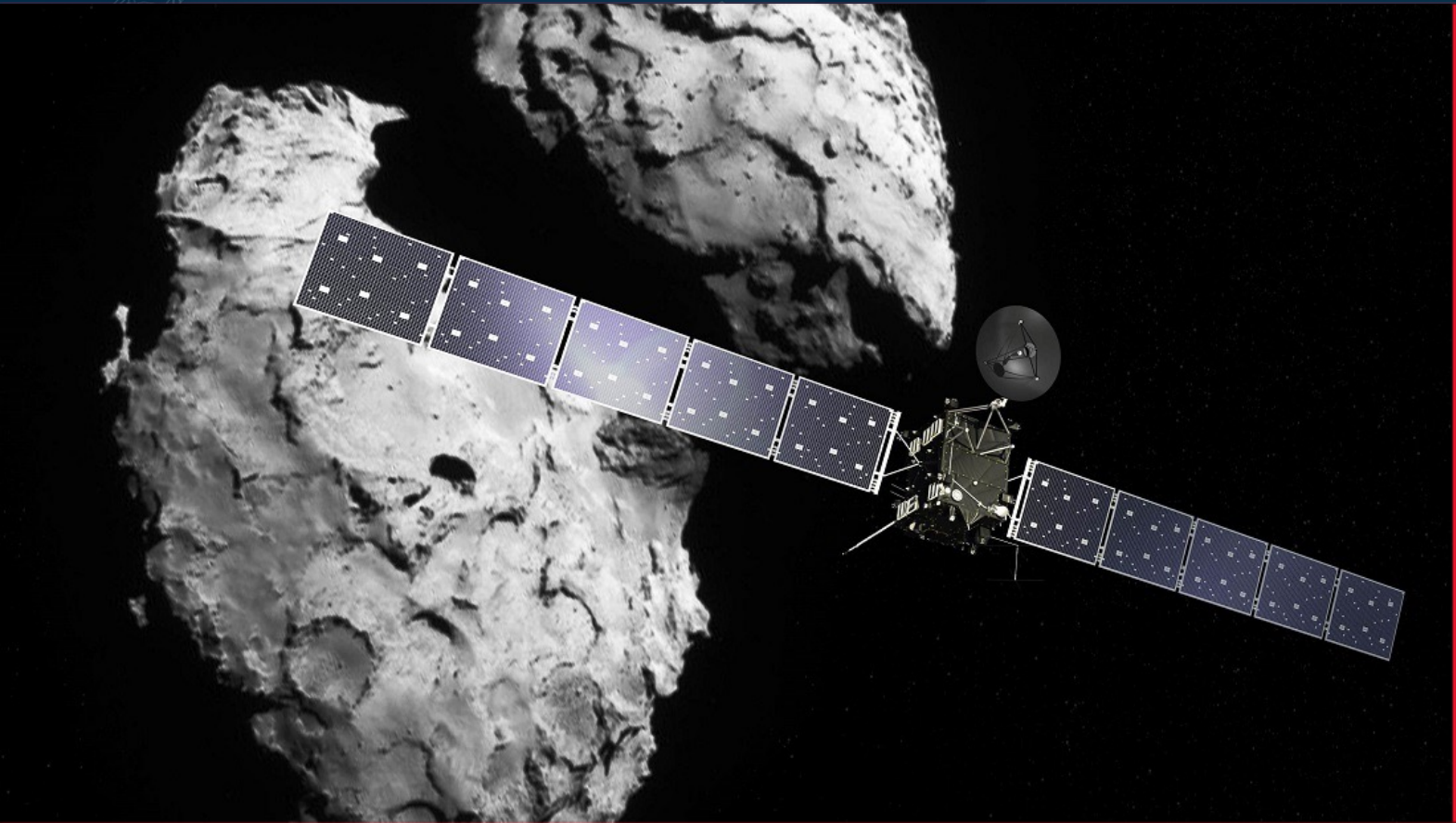


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SCIENCE AND EXPLORATION



AMAZING NEW SCIENCE

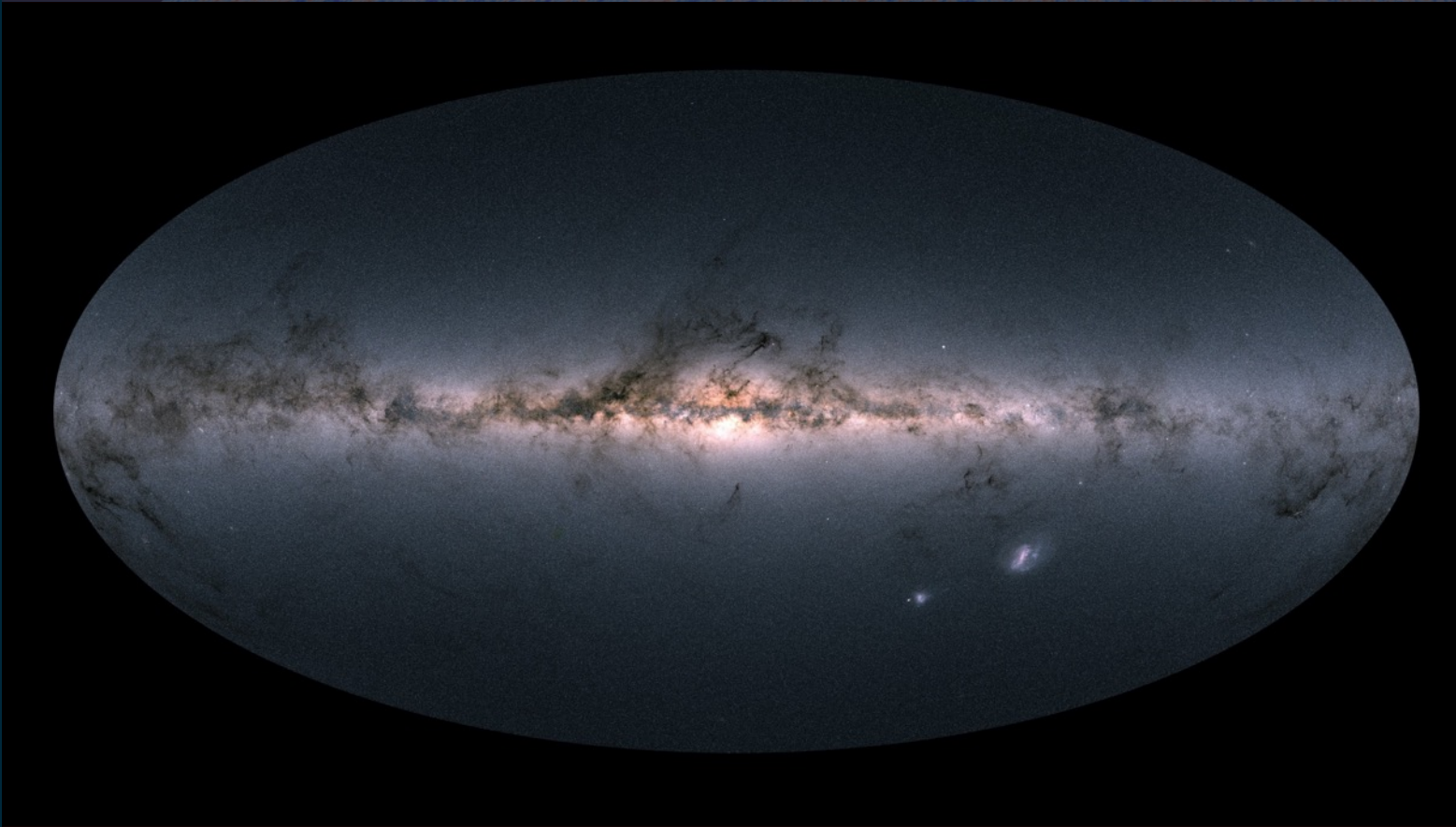
 ▶ Rosetta

ulysses (1990–2009) venus express (2006–2014) giotto (1985–1992) double star (2003–2008) smart-1 (2003–2006) chandrayaan (2008–2009) chang'e 1 (2007–2009) rosetta (2004–2016)

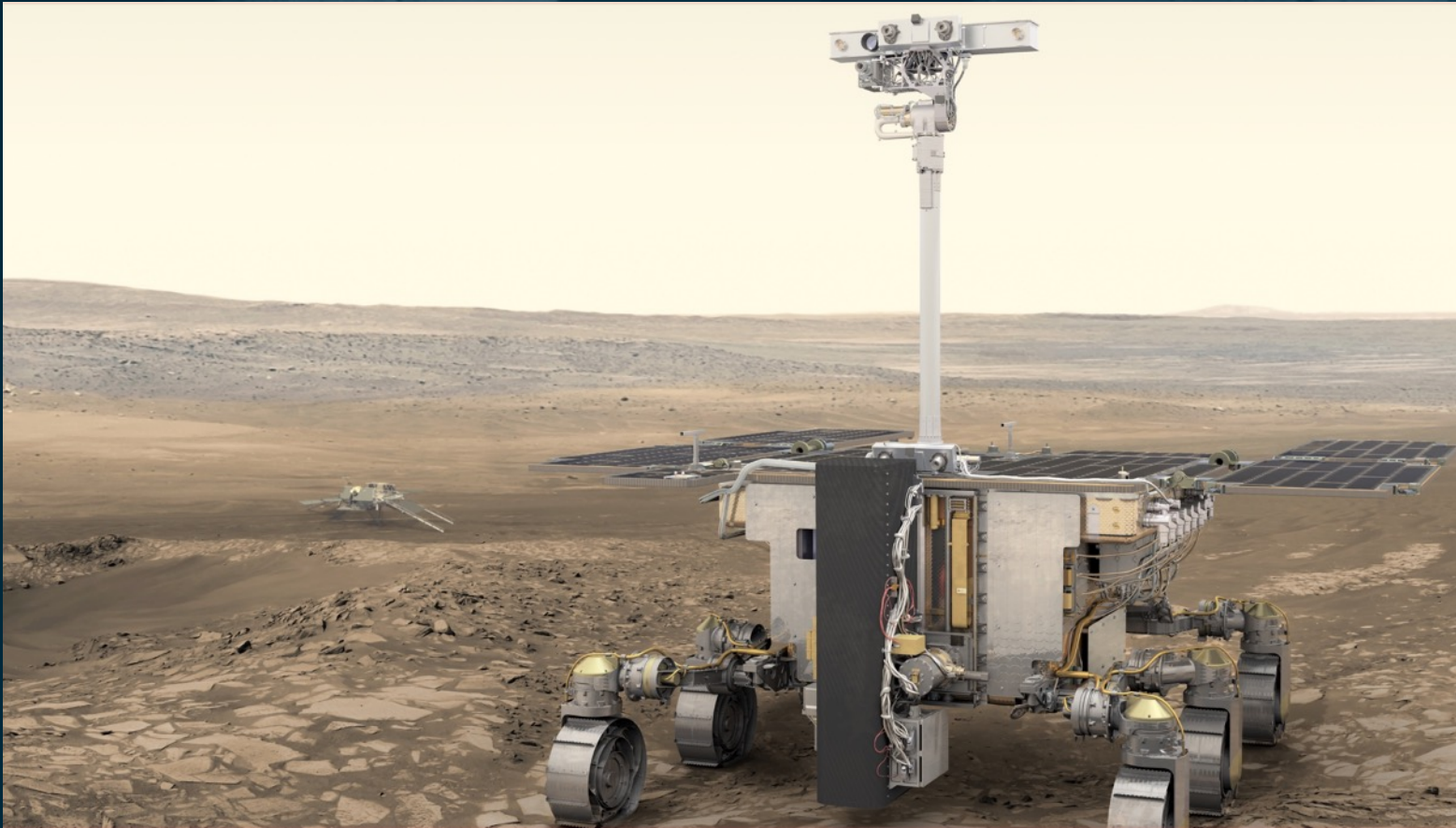
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BEYOND THE SOLAR SYSTEM ► The origins of our universe

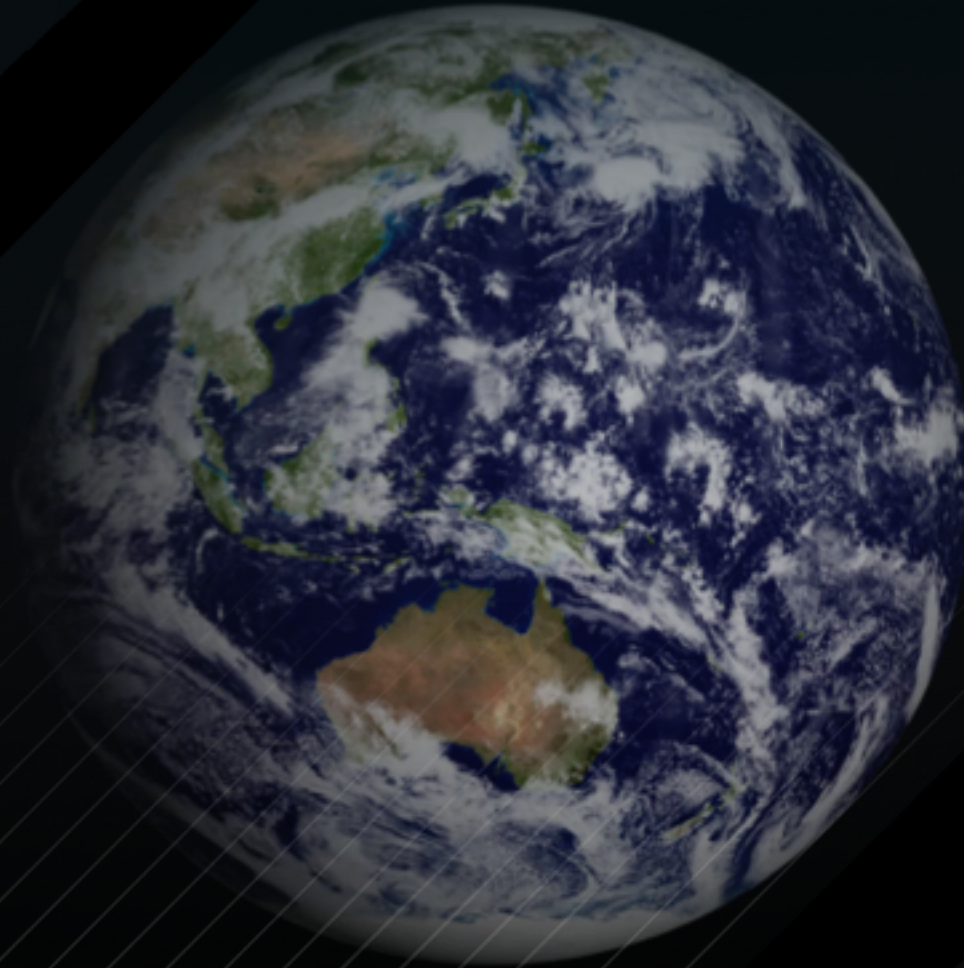


EXPLORING THE UNIVERSE ▶ ExoMars rover

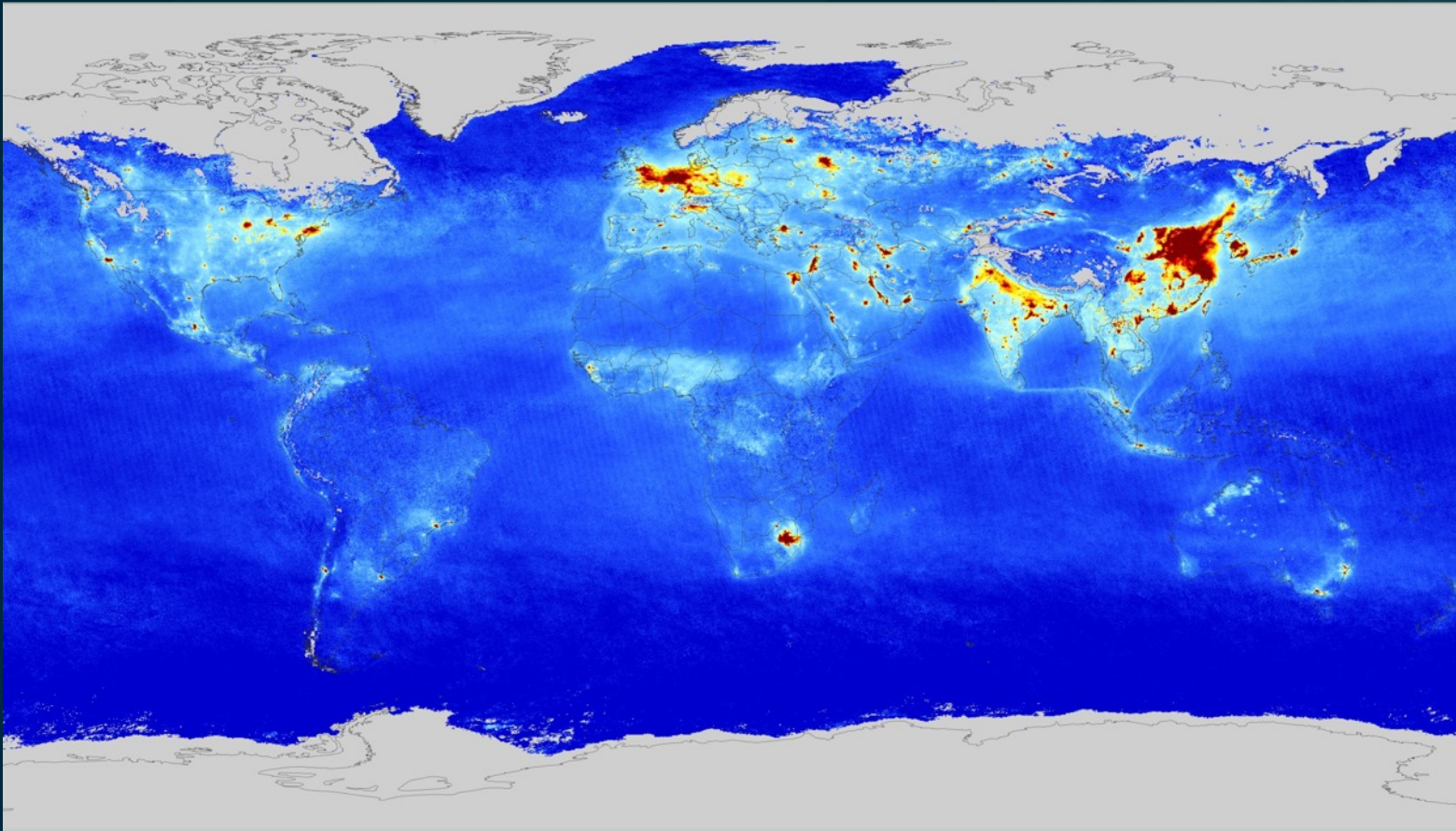


WHERE NEXT ► Human spaceflight



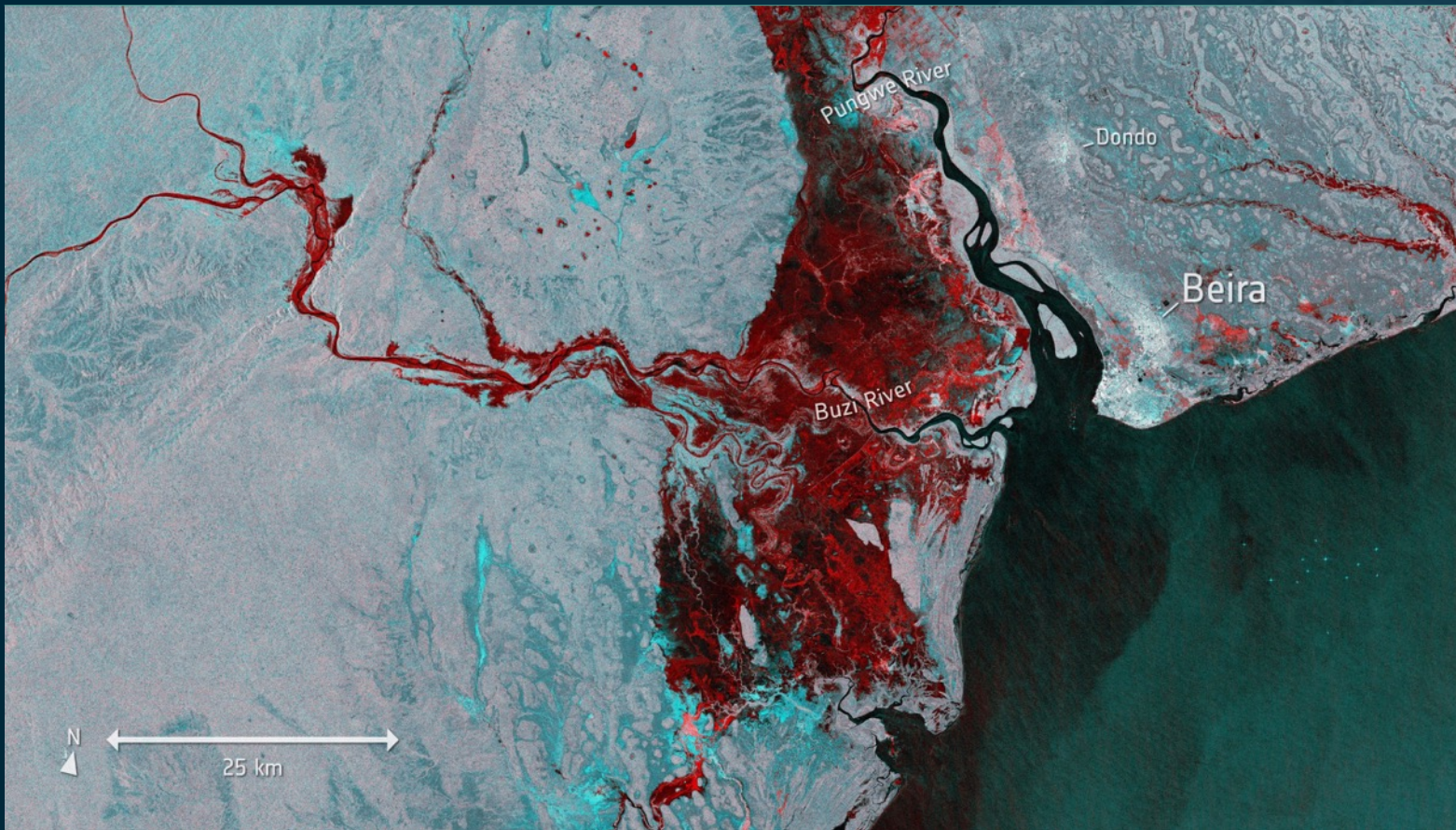


WATCHING OVER OUR EARTH ▶ Air quality map



WATCHING OVER OUR EARTH

► Flooded areas



WATCHING OVER OUR EARTH

► Cyclone Idai and Copernicus Sentinel-3



APPLICATIONS

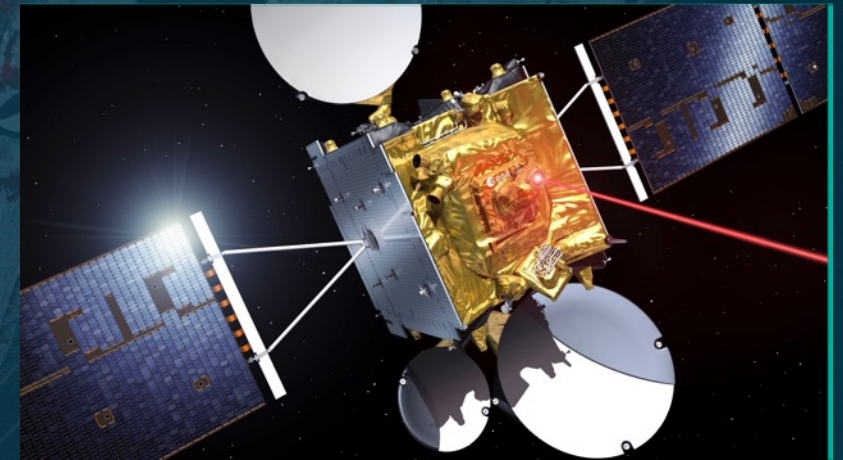
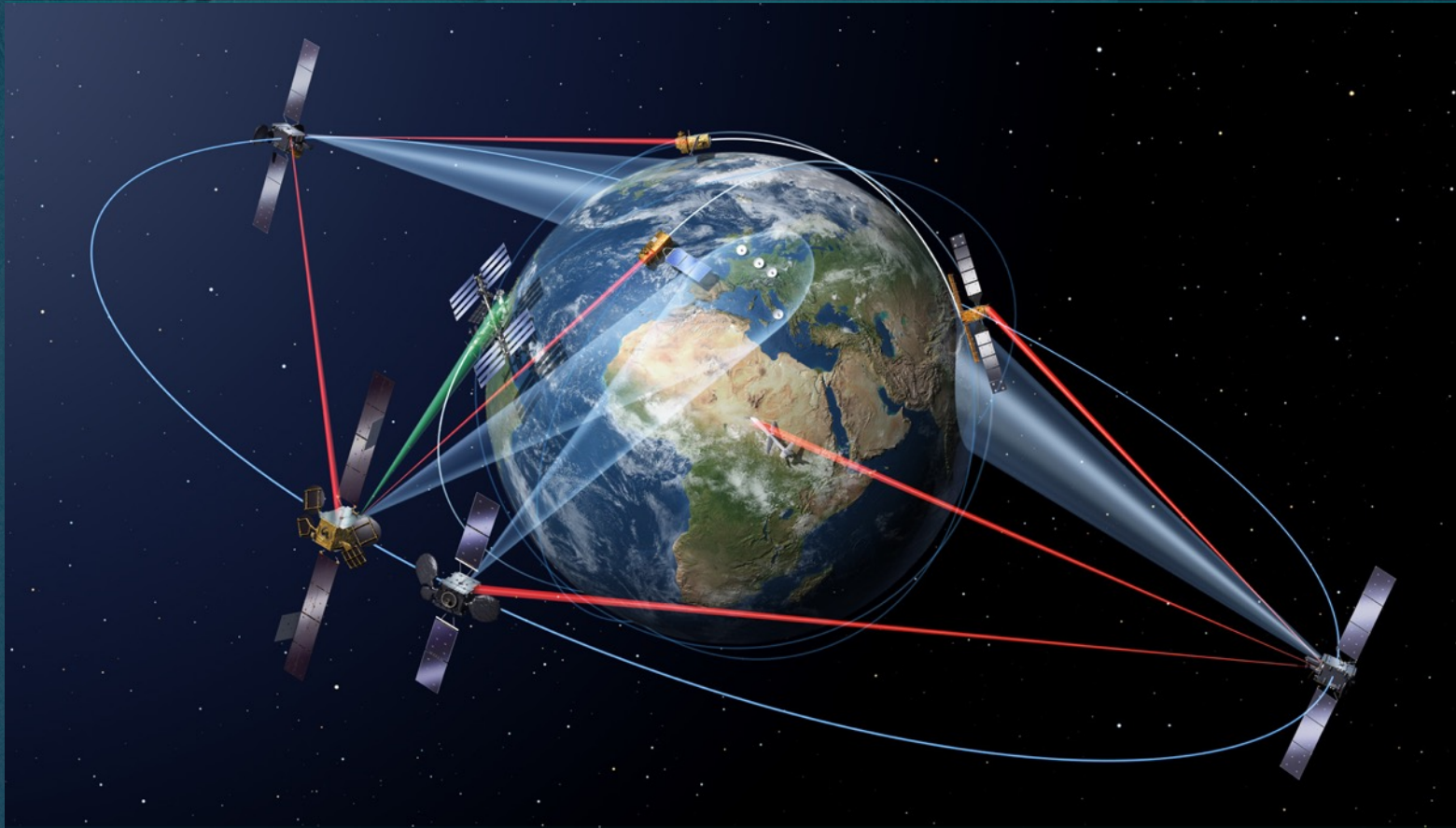
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CONNECTING YOUR WORLD

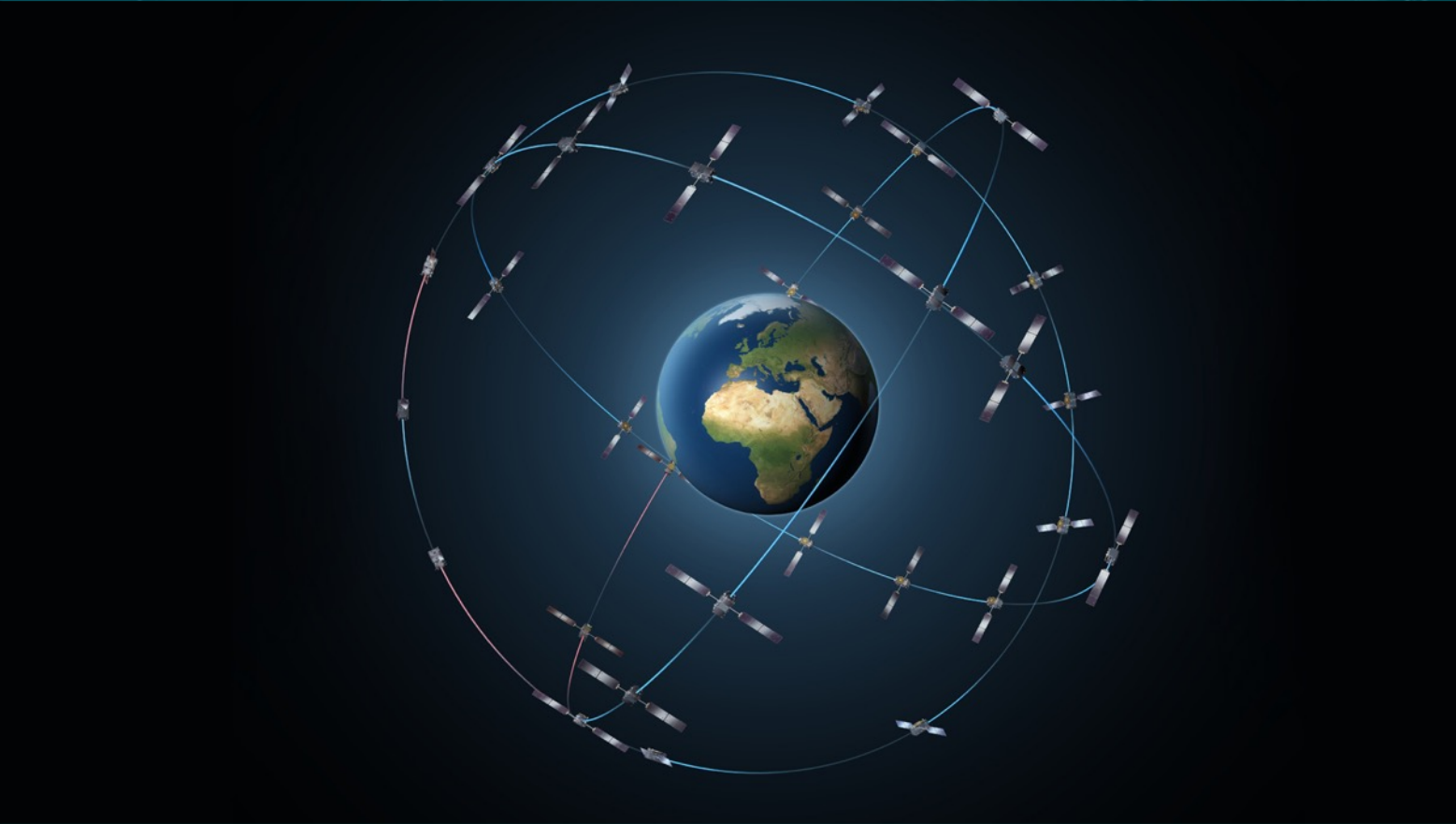
► EDRS

Beira



CONNECTING YOUR WORLD

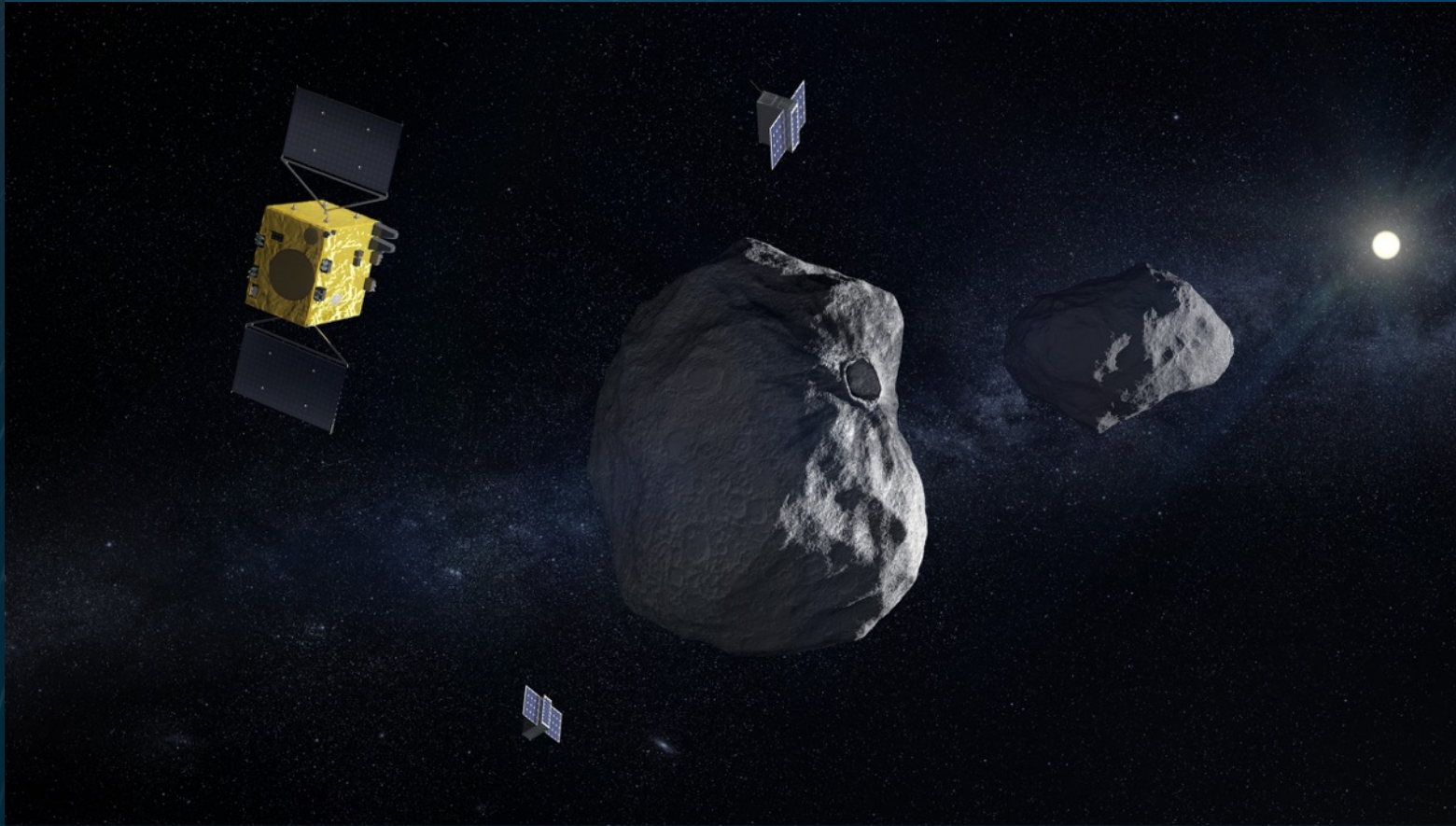
► Galileo constellation






MAKING IT SAFE

► Hera

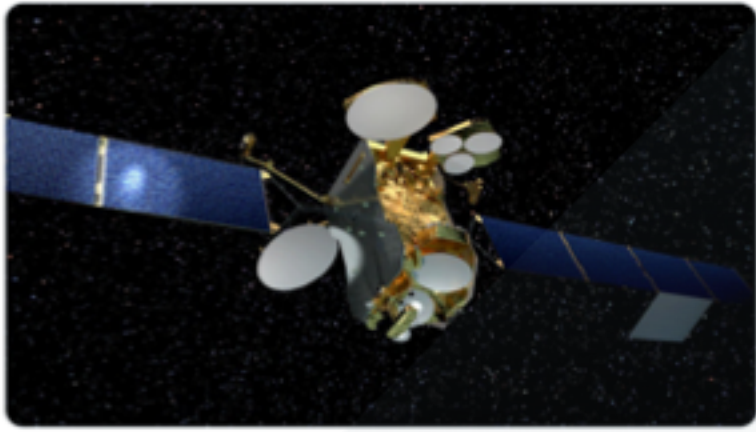


MAKING IT SAFE ▶ Space Weather



Royal Astronomical Society
@RoyalAstroSoc

The use of electric propulsion for raising satellites into geostationary orbit can result in significant solar cell degradation according to a new study by @BAS_News at @rasnam2019 🌞🌞
ras.ac.uk/news-and-press...



The Guardian

Tardigrades may have survived spacecraft crashing on moon

Scientists believe the Beresheet's unusual cargo may be alive and well on the moon

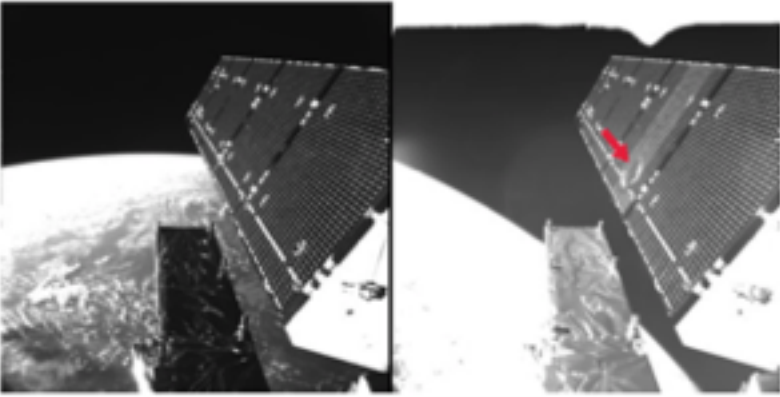


THE CONVERSATION

Academic rigour, journalistic flair

Astronauts' brains are subject to long-lasting damage due to low dose space radiation

Andrew S. 2019 & Simon 2017



Before and after: fragment impact in space

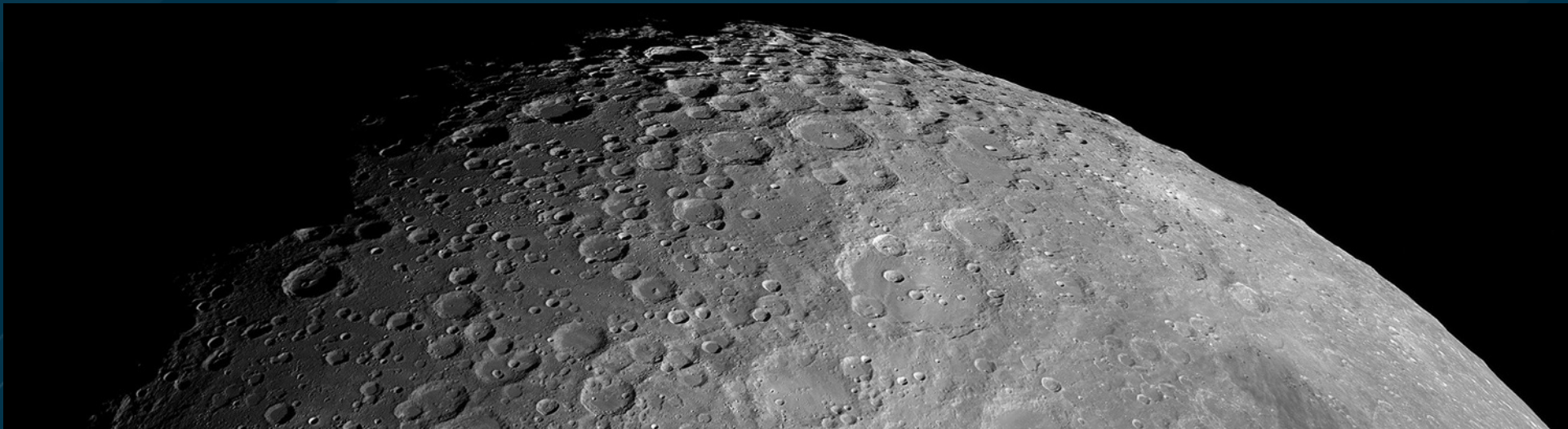
COPERNICUS SENTINEL-1A SATELLITE HIT BY SPACE PARTICLE

Fly me to the Moon...

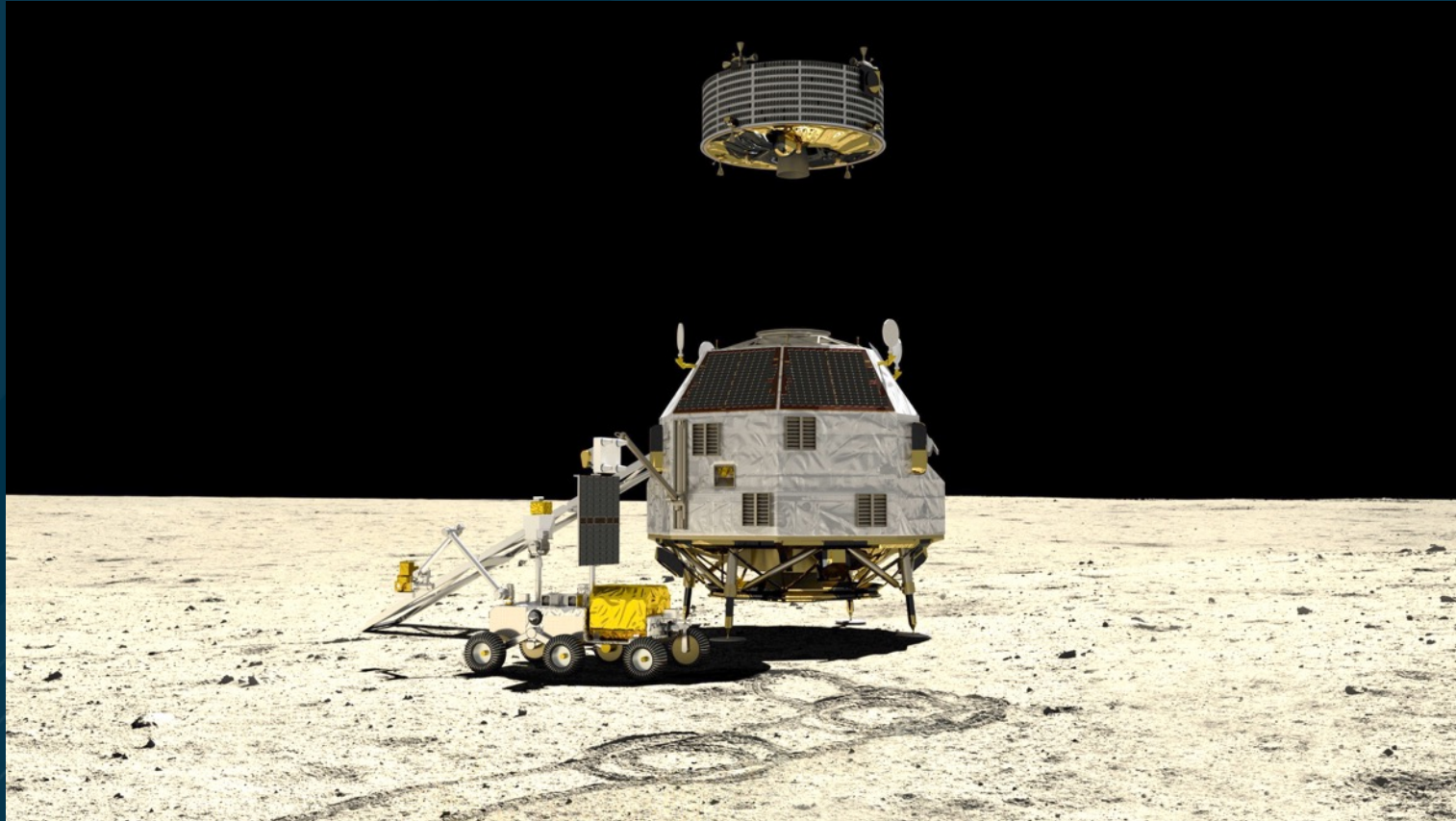
‘Moon Village’: A vision for global cooperation

The paradigm shift in space activities seen today is termed ‘Space 4.0’. ESA Director General Jan Woerner’s Moon Village concept seeks to transform this shift into a set of concrete actions. The ‘Moon Village’ is:

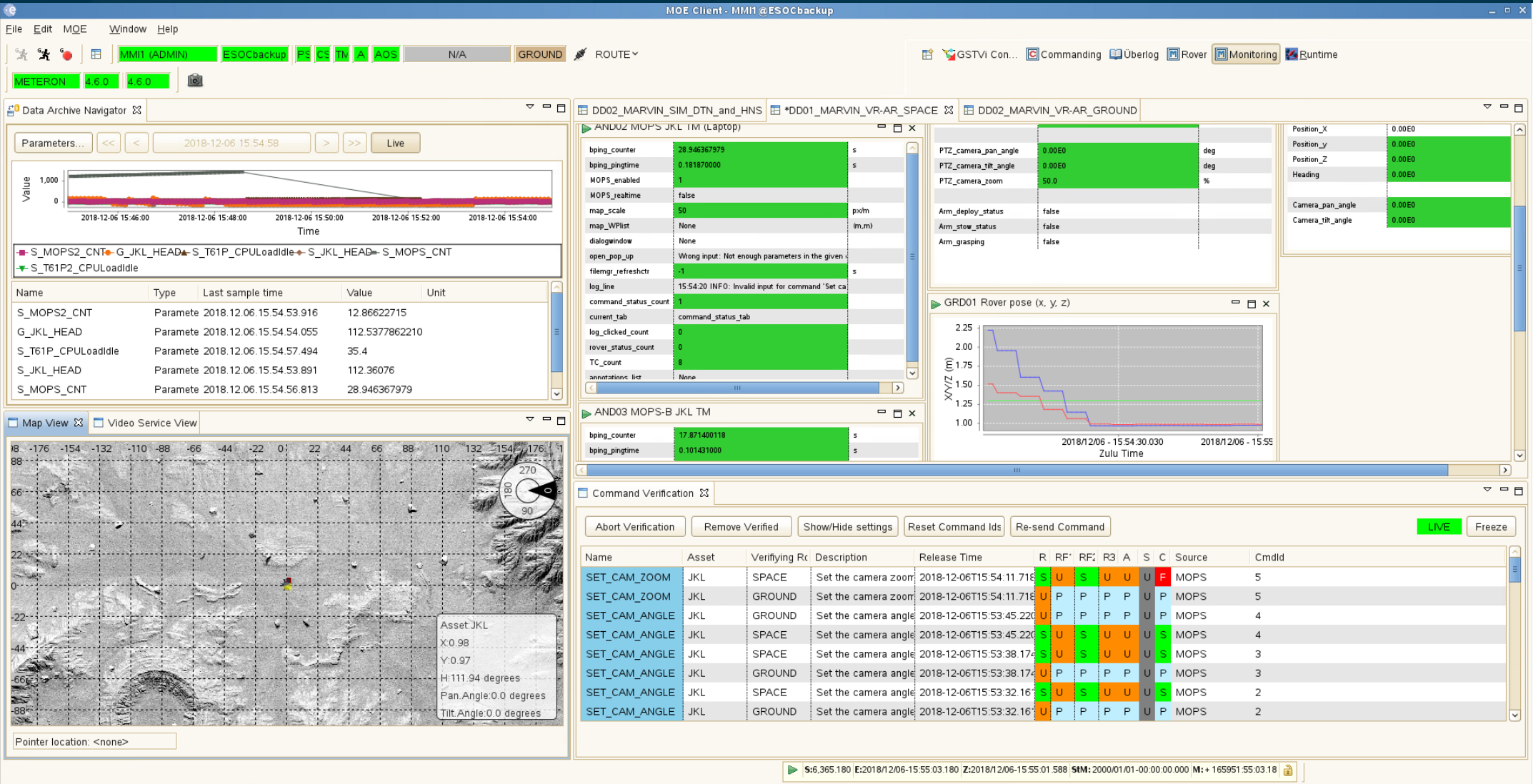
- An open architecture, rather than a single project with a fixed plan or defined timetable;
- A community coming together to share interests and capabilities;
- An environment where both international cooperation and the commercialisation of space can thrive.



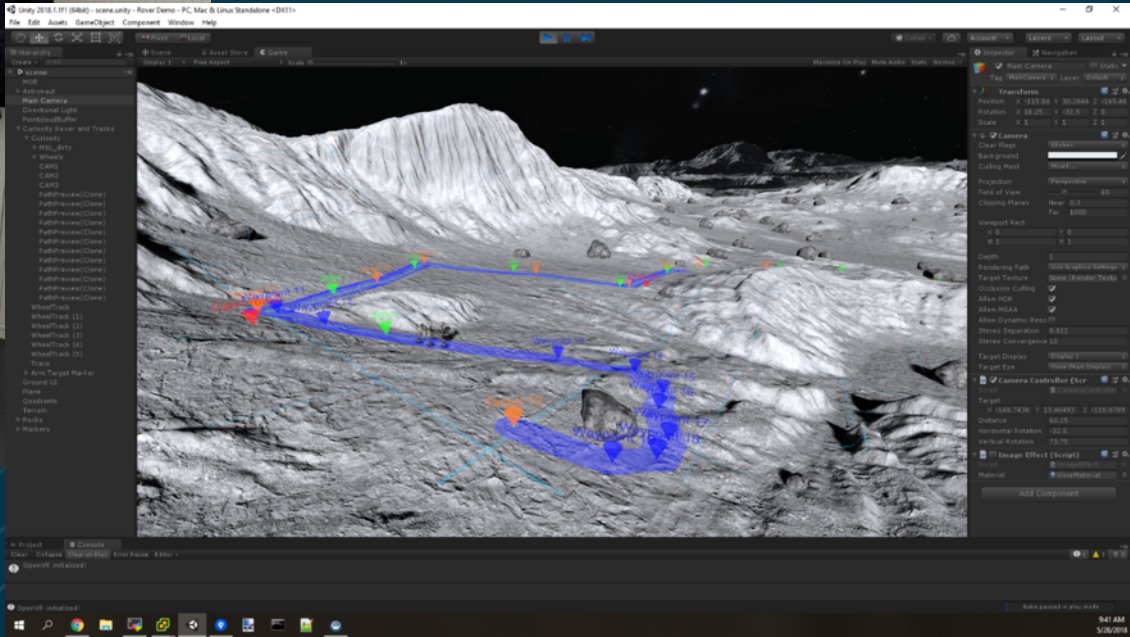
The HERACLES Mission

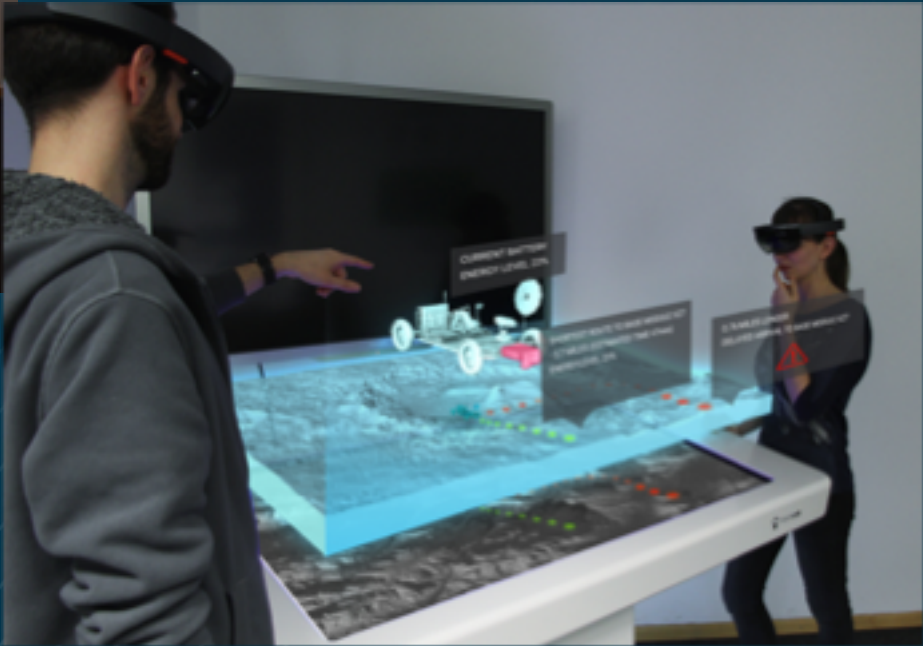
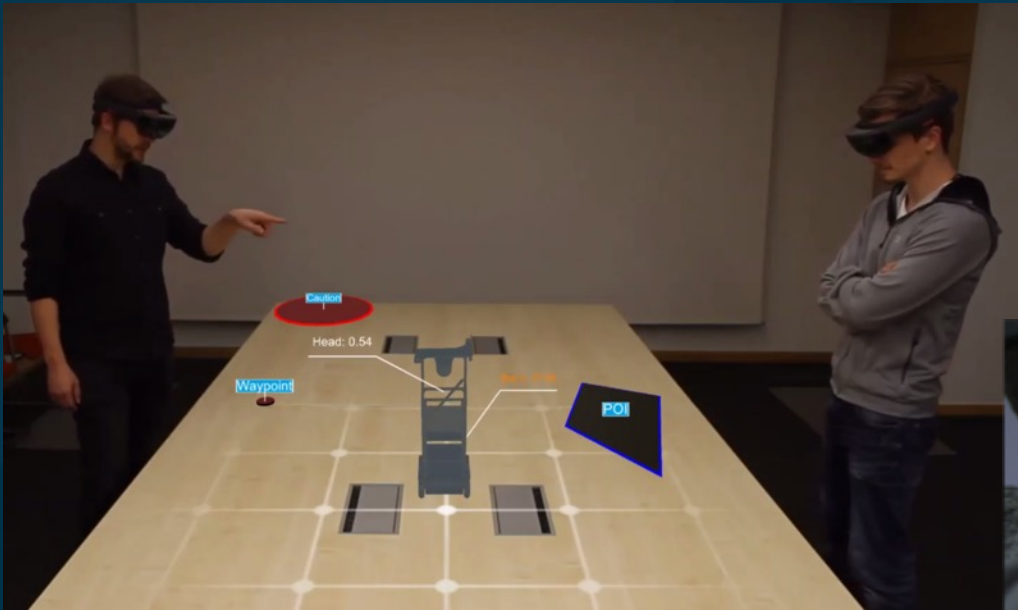


Preparing for presence on the Moon

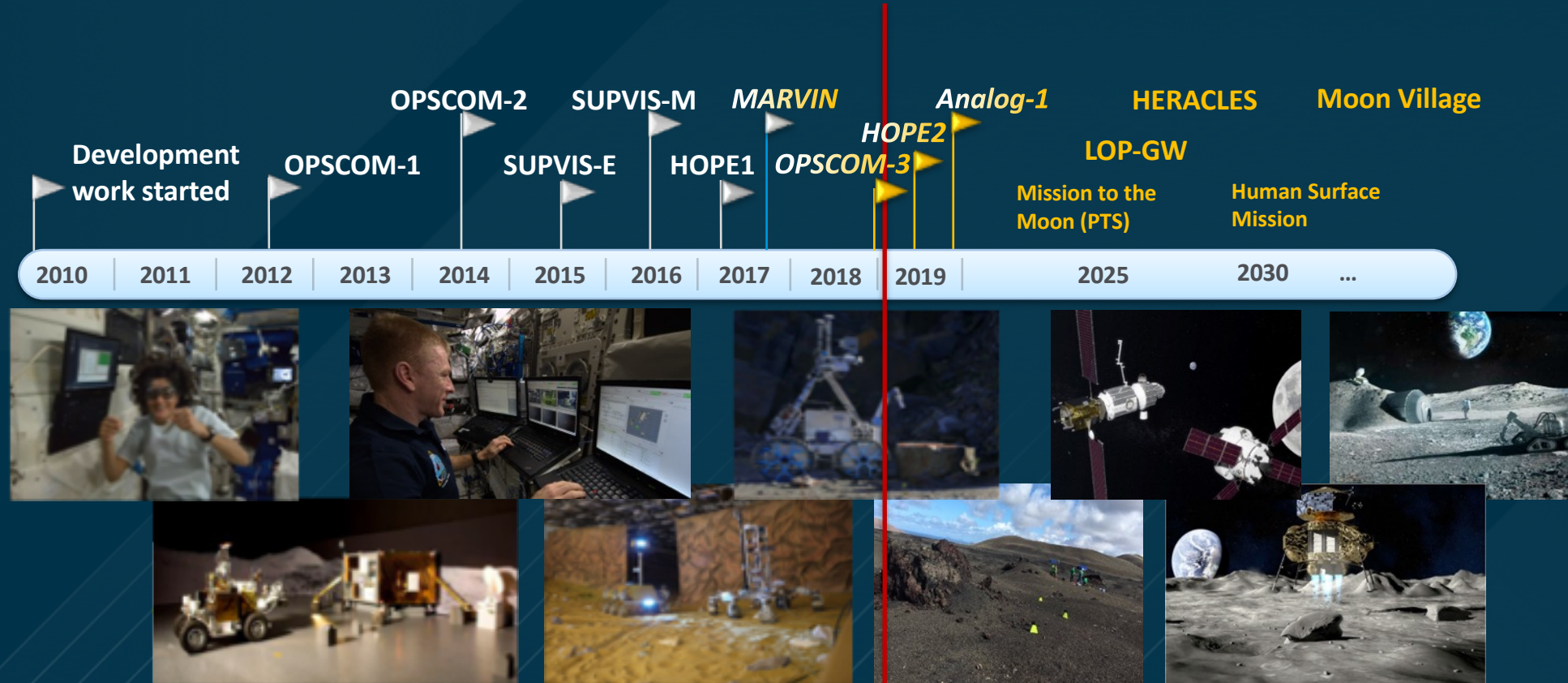


Going to the Moon – sort of...





ESOC's roadmap for Surface Operations on the Moon



Are you ready to discover more?



www.esa.int

