The European Space Agency
and its Establishments

Body Level One
- Body Level Two

Markus Kissler-Patig, Head of Science and Operations Department

ESA CESAR / Galileo Teacher Training Programme 2022

What is the

European Space Agency ?

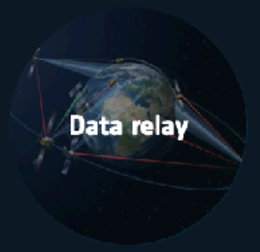
SCIENCE & EXPLORATION

MORE

SAFETY & SECURITY

MORE

APPLICATIONS



MORE

ENABLING & SUPPORT

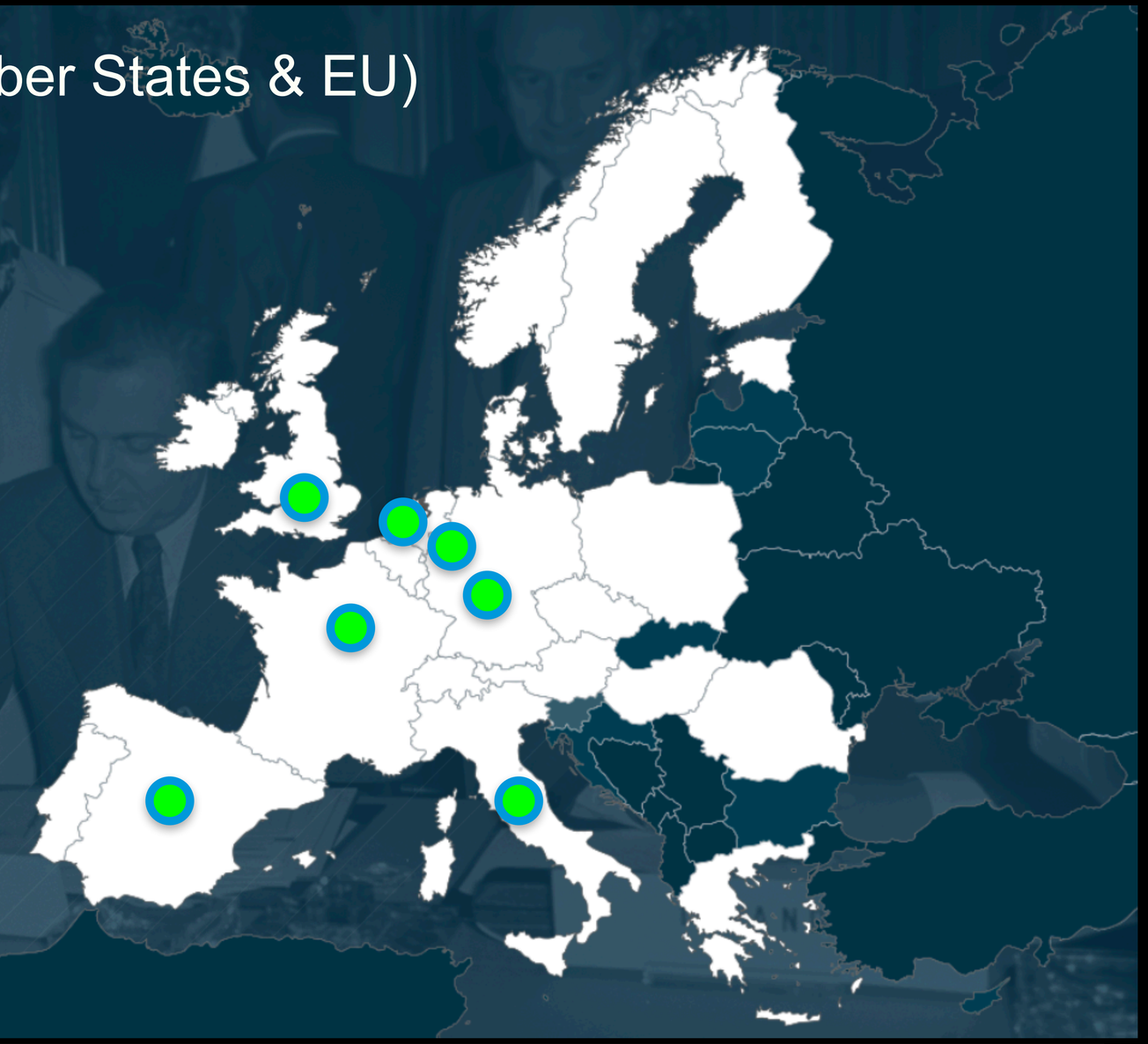
MORE

HQ in Paris, 7 sites in Europe, 2200 employees + ~3000 contractors

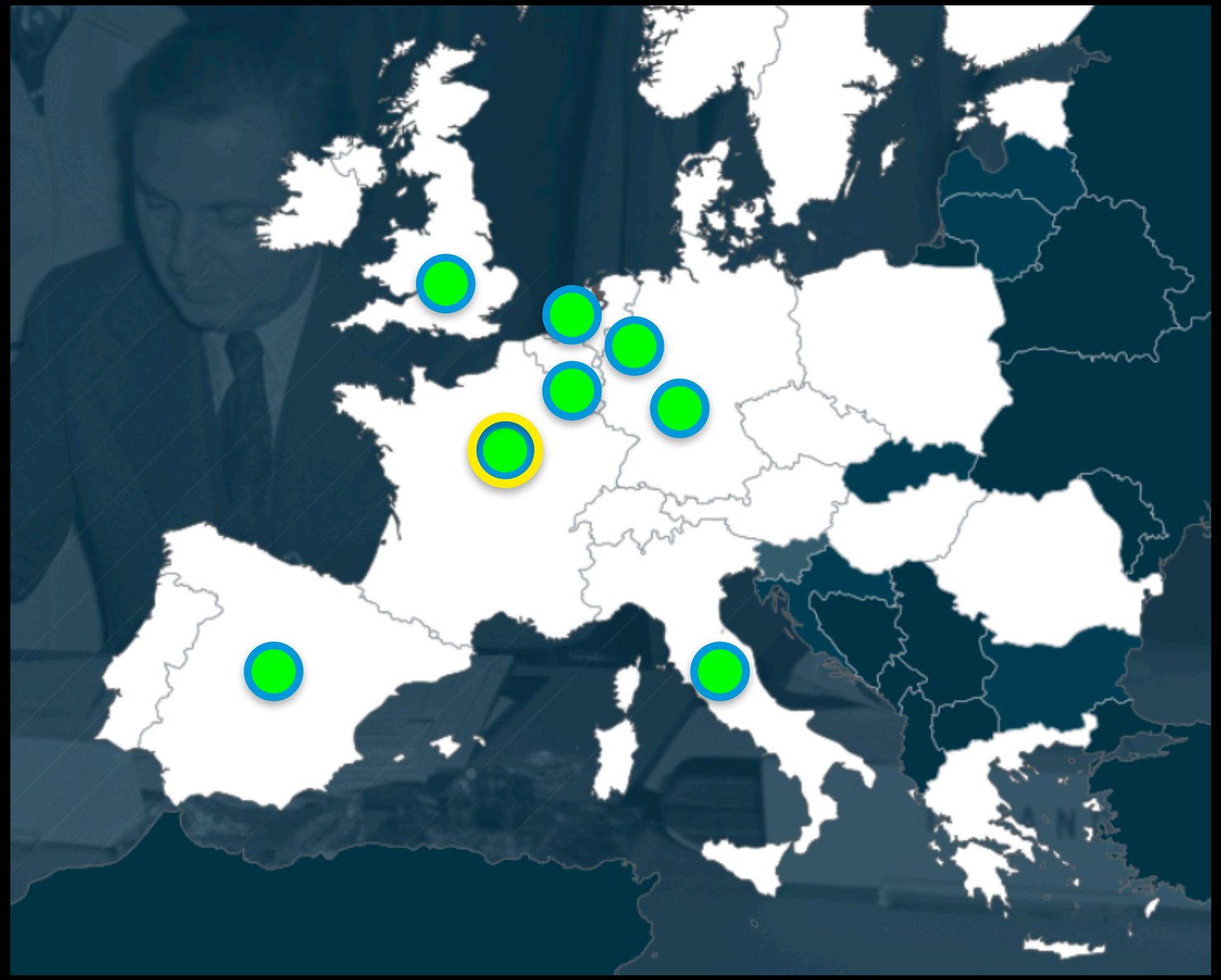
Budget ~ 6,000 M€ / year (from Member States & EU)

22

MEMBER STATES

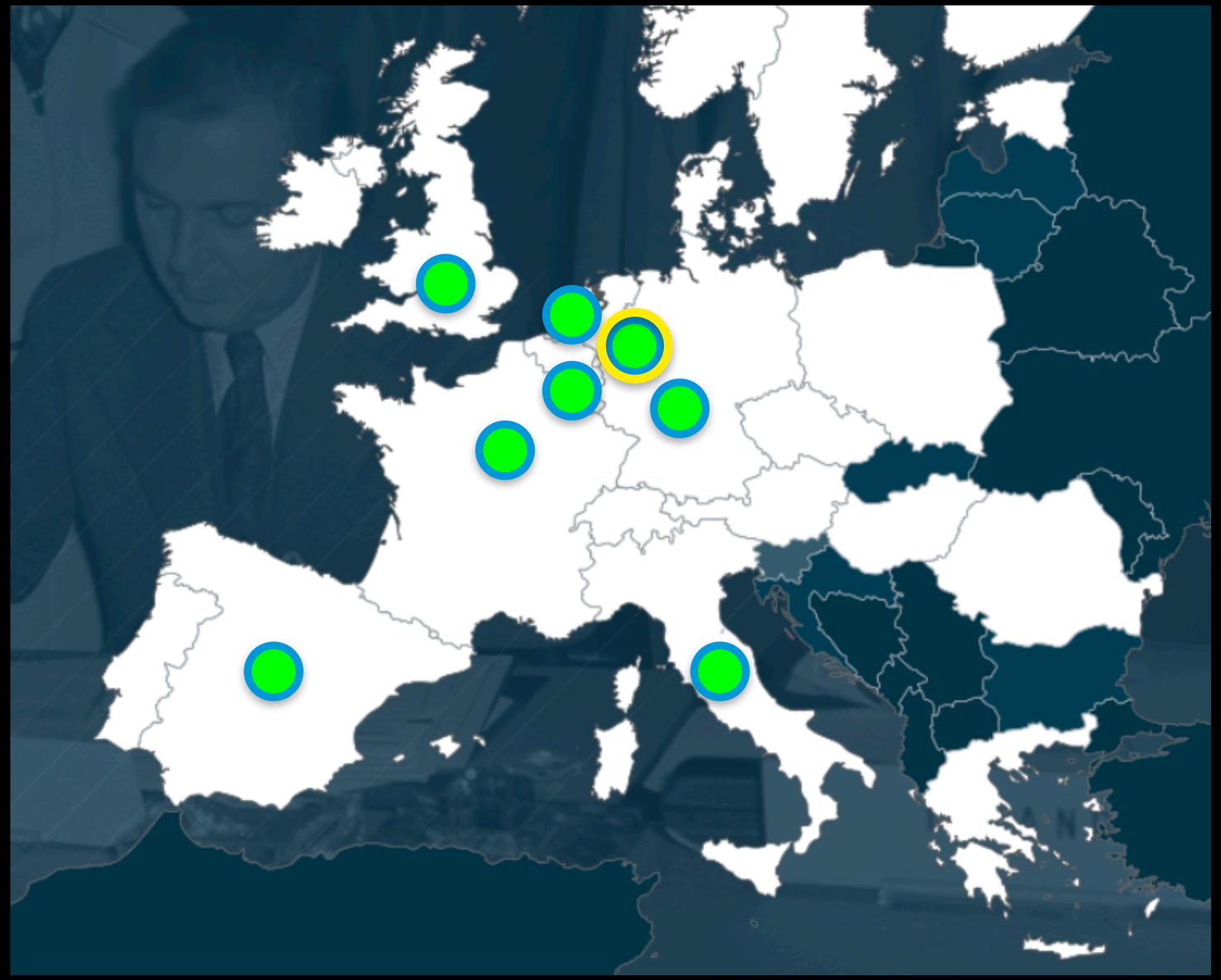


+ Kourou, French Guyana

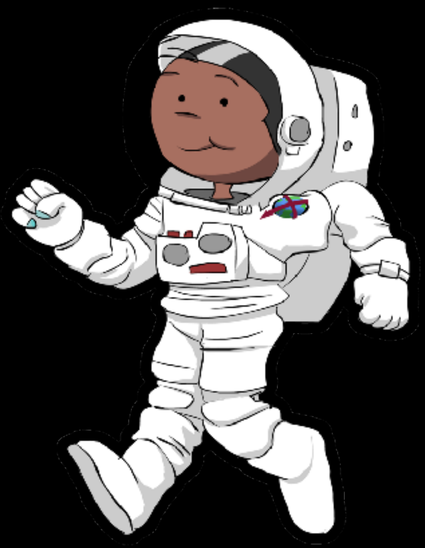


ESA Headquarters, Paris

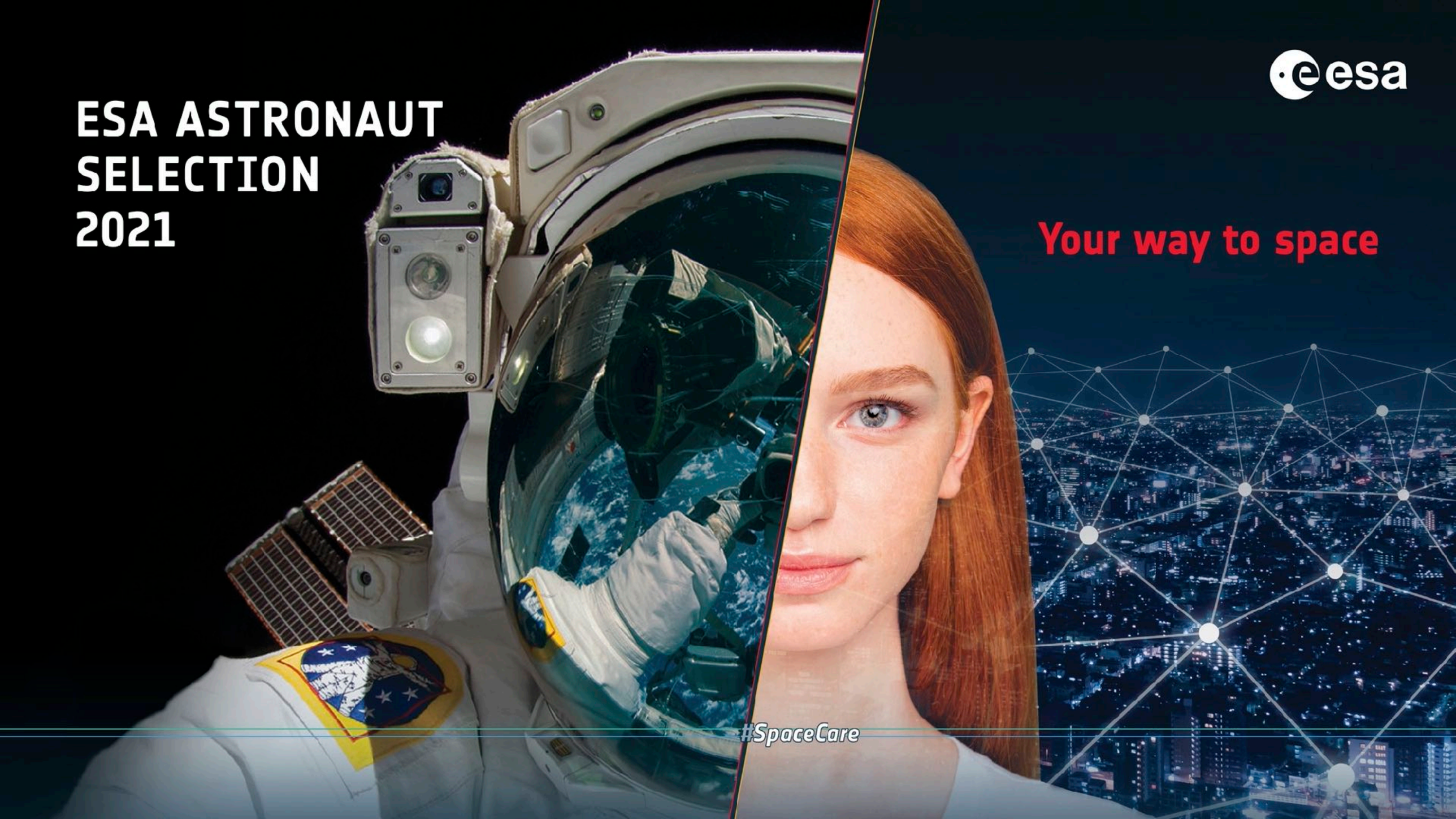
- Directorate General
- International relations
- Space Transportation Directorate



EAC - Cologne
European Astronauts Center

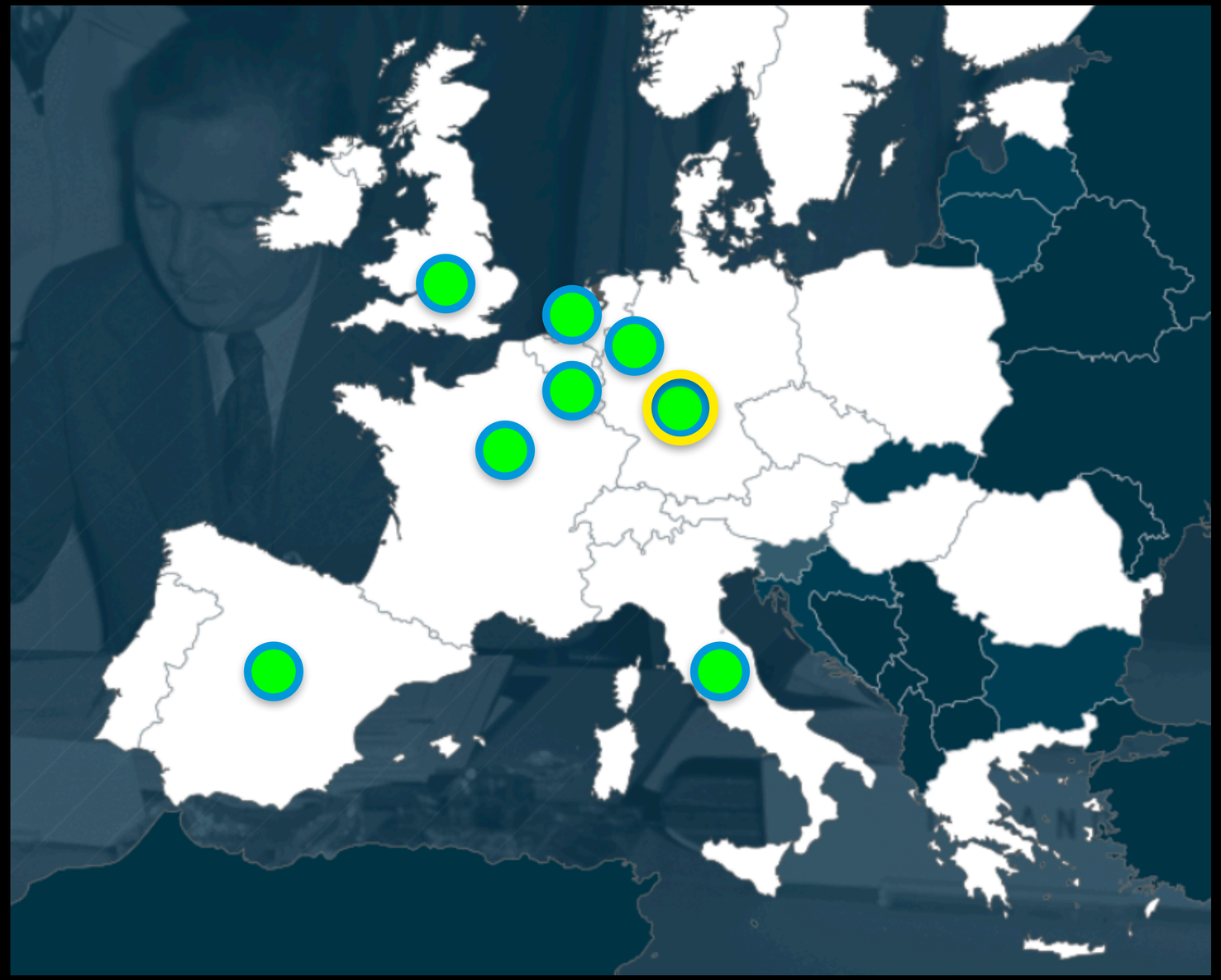


ESA ASTRONAUT SELECTION 2021



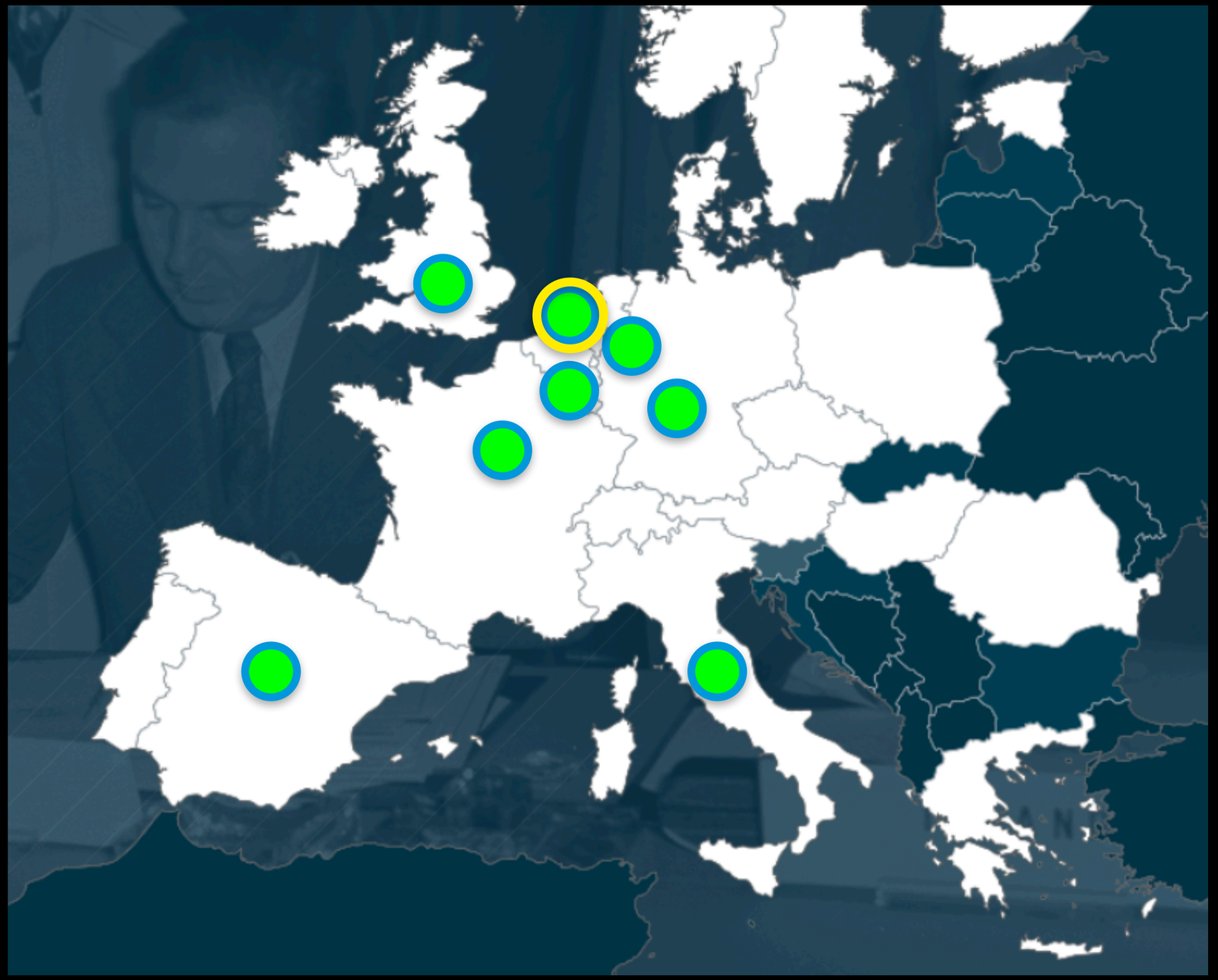
Your way to space

#SpaceCare



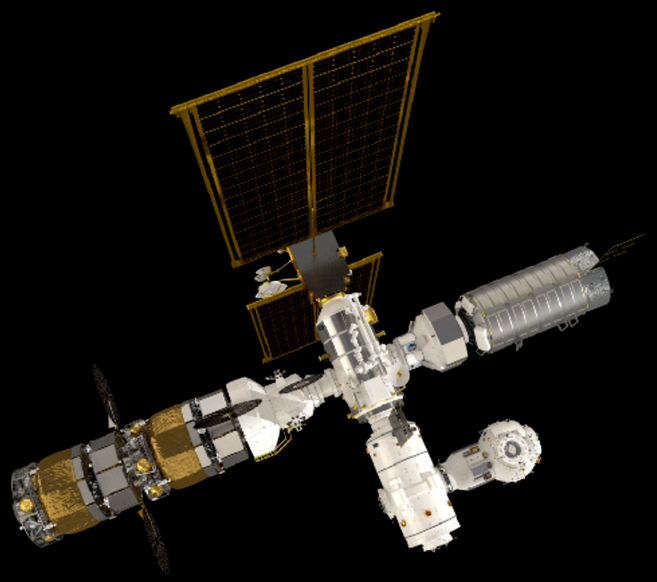
ESOC - Darmstadt
Europe Space Operations Center

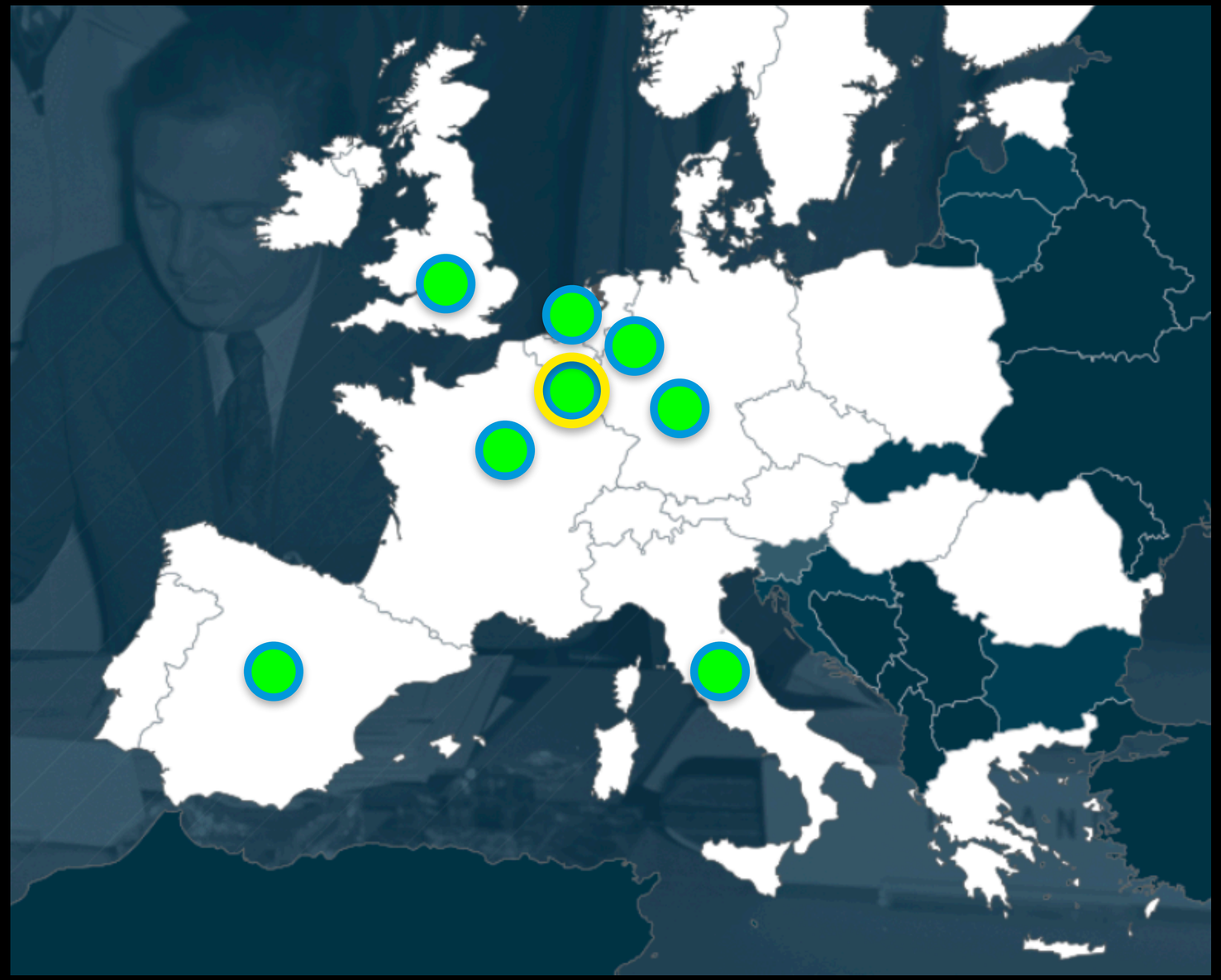
- Control center
- Worldwide antennae network



ESTEC - Noordwijk
European Space Research
and Technology Centre

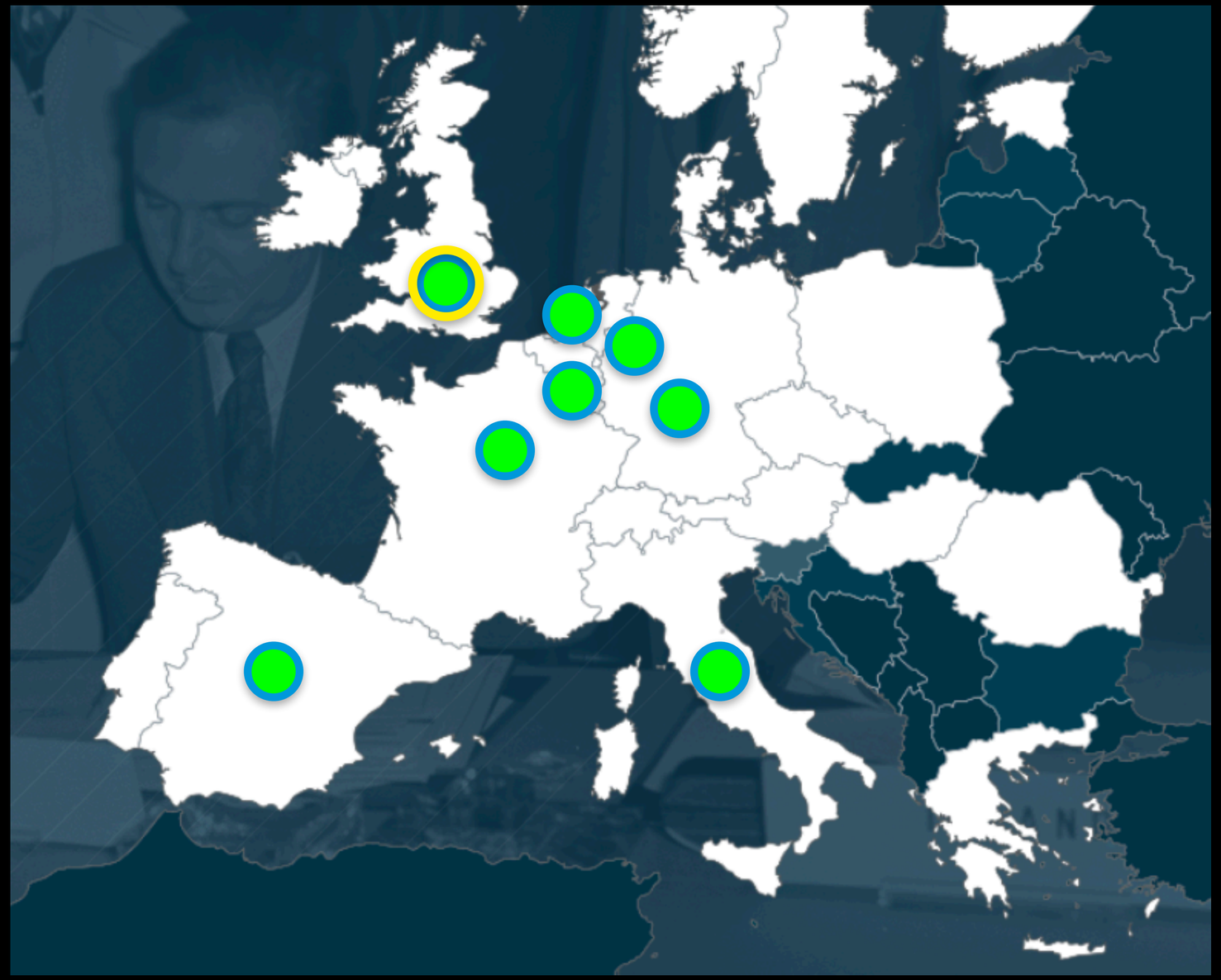
- Space technology
- Human and Robotic exploration



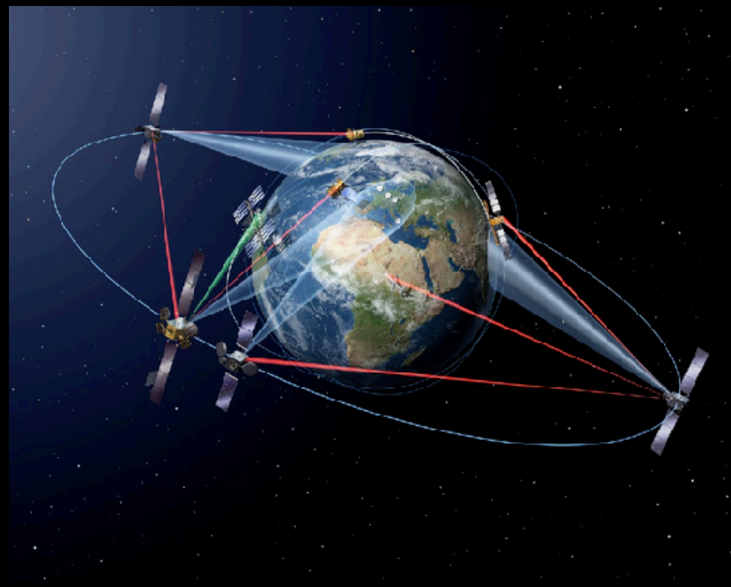


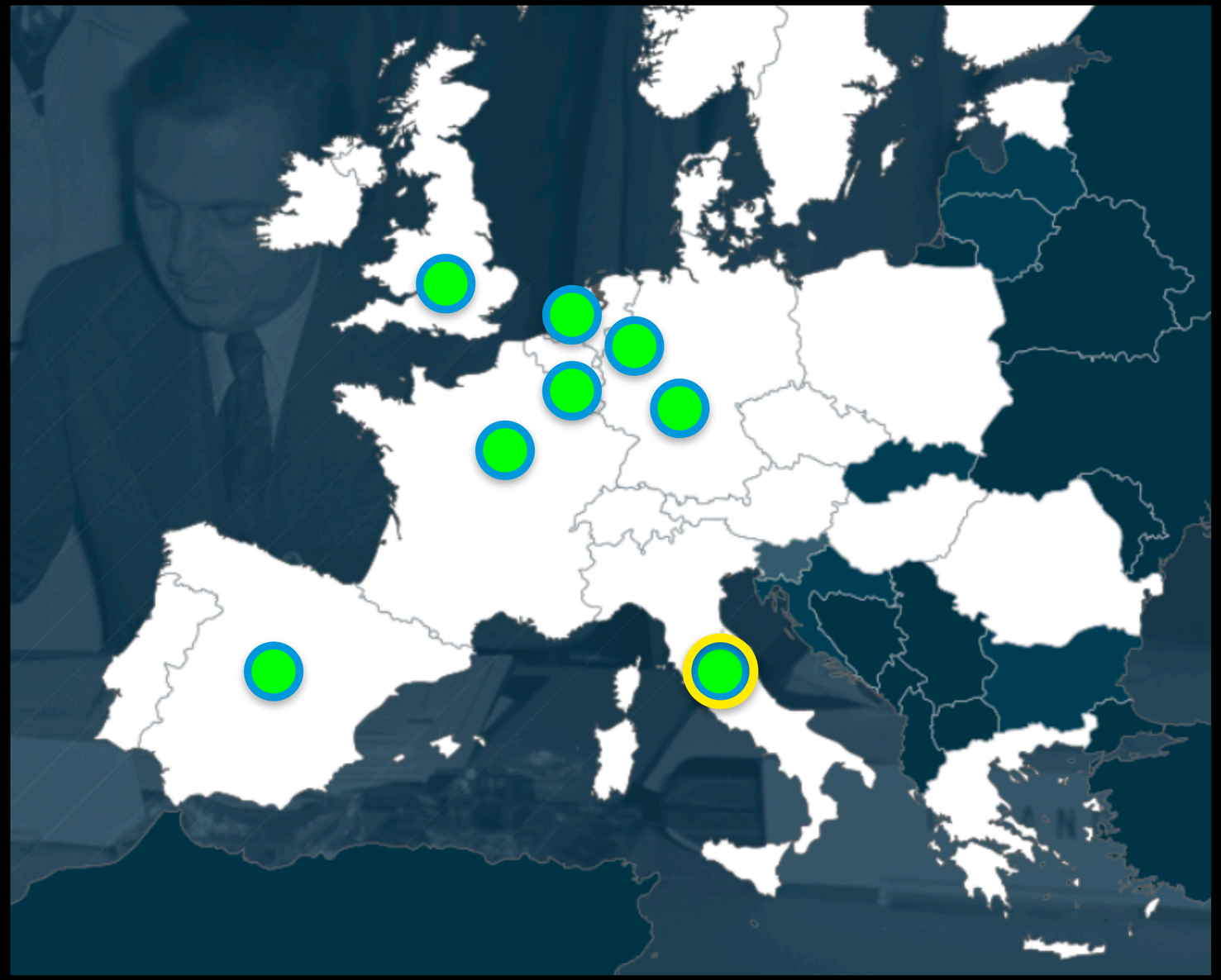
ESEC - Redu
European space Security
and Education Centre

- Space Security
- Communication and Education



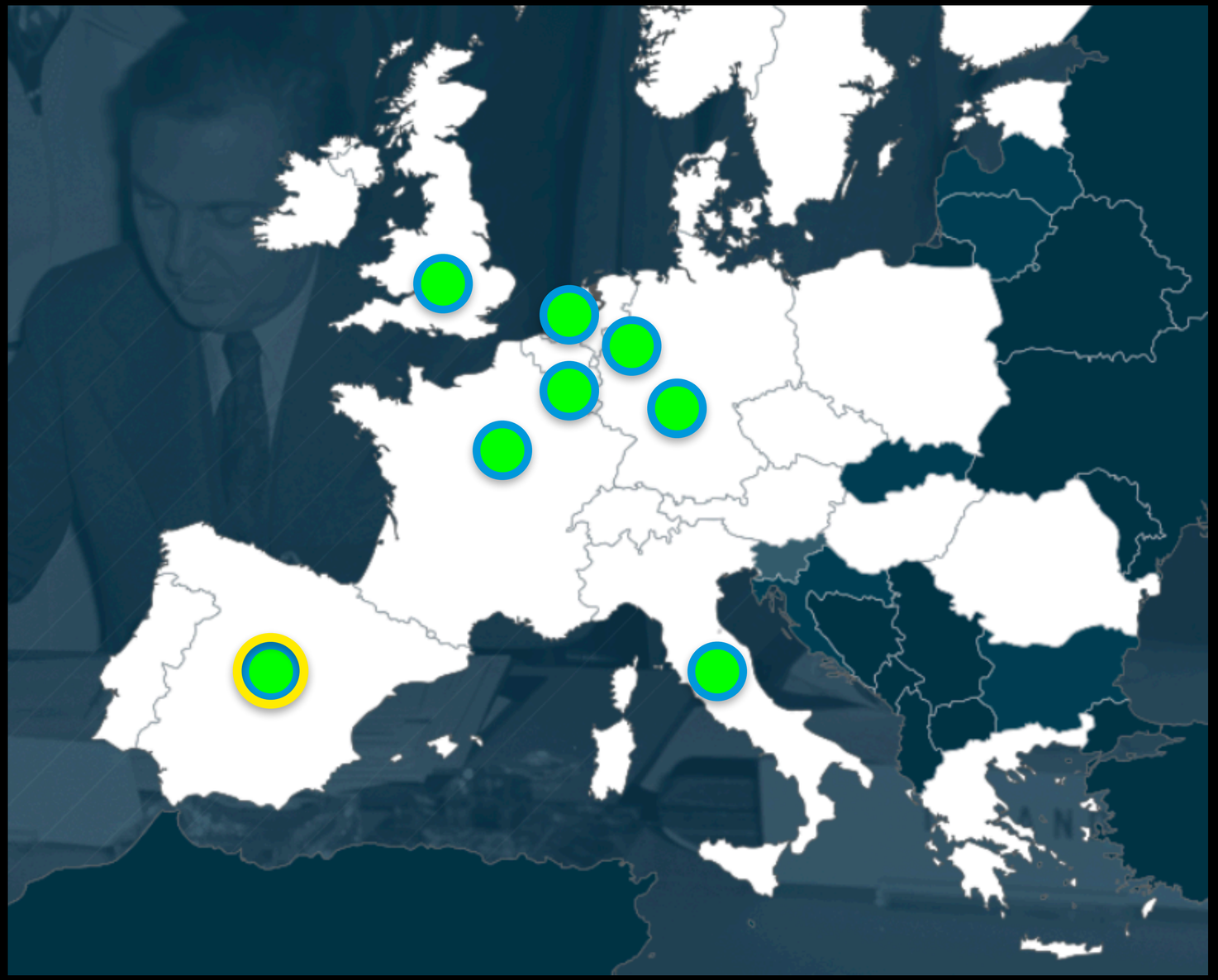
ECSAT - Harwell
European Centre for Space Applications and Telecommunications





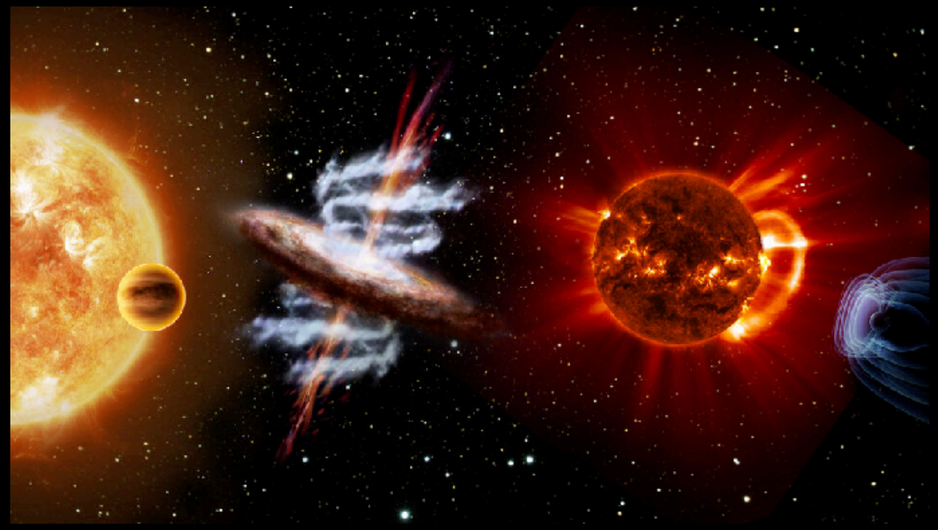
ESRIN - Frascati
ESA Centre for Earth Observation

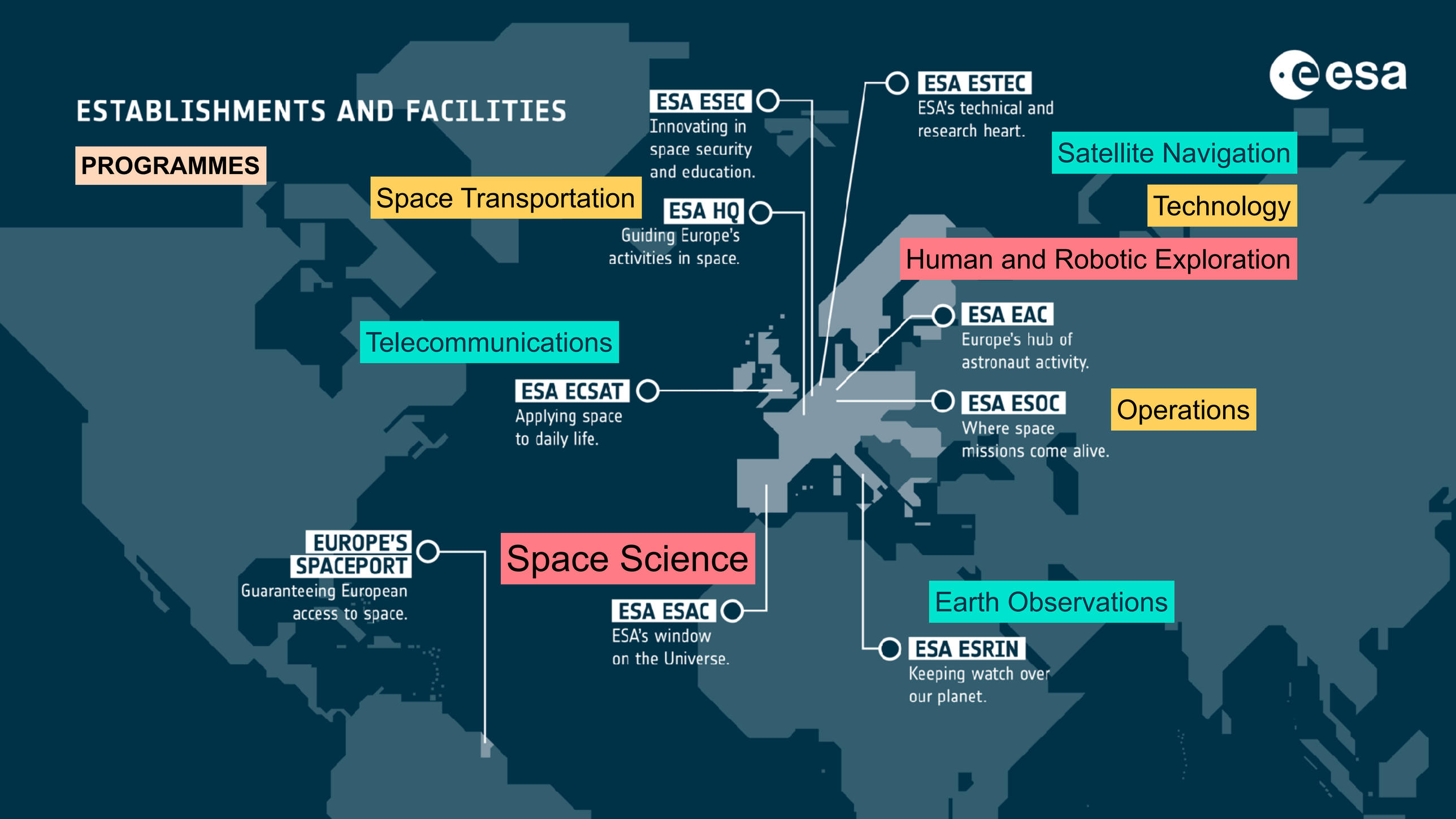
- Earth Observations
- Earth Monitoring



ESAC - Madrid
European Space Astronomy Centre

- Astronomy
- Heliophysics
- Planetary Science




ESTABLISHMENTS AND FACILITIES
PROGRAMMES
Space Transportation
Telecommunications
Space Science
Satellite Navigation
Technology
Human and Robotic Exploration
Operations
Earth Observations
ESA ESEC
Innovating in space security and education.
ESA HQ
Guiding Europe's activities in space.
ESA ESTEC
ESA's technical and research heart.
ESA EAC
Europe's hub of astronaut activity.
ESA ESOC
Where space missions come alive.
ESA ECSAT
Applying space to daily life.
EUROPE'S SPACEPORT
Guaranteeing European access to space.
ESA ESAC
ESA's window on the Universe.
ESA ESRIN
Keeping watch over our planet.

Space Science

Directorate for Science

(Director of Science: Günther Hasinger - until March 2023; Currently searching for a new Director)

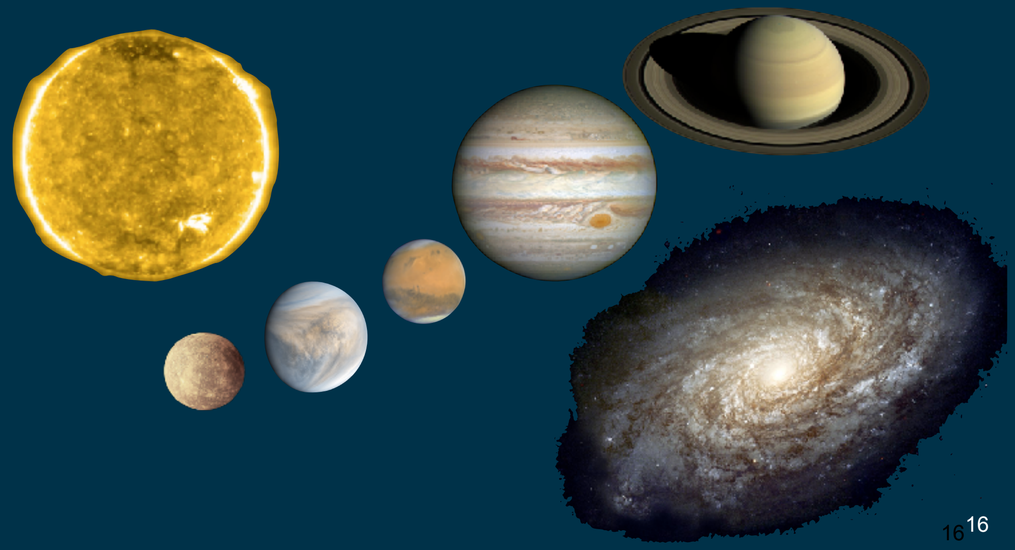
Budget: ~600 M€ yearly

defined at ESA's Ministerial Conference every three years

Staff: ~250 staff + ~250 contractors at ESTEC, ESAC, STScI and GSFC

A programme covering space missions in

- Heliophysics
- Planetary Science
- Astronomy and Fundamental Physics



ESA Science Missions

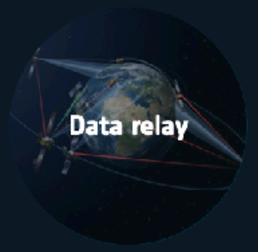
SCIENCE & EXPLORATION

MORE

SAFETY & SECURITY

MORE

APPLICATIONS



MORE

ENABLING & SUPPORT

MORE

Launchers

SCIENCE & EXPLORATION

Exoplanets

Moon

MORE

SAFETY & SECURITY

Space Debris

Asteroids

MORE

APPLICATIONS

Data relay

Earth science

MORE

ABLING & SUPPORT

Access to space

Ground stations

MORE

ESA's Launcher Family

Tracking Stations

SCIENCE & EXPLORATION

Exoplanets

Moon

MORE

SAFETY & SECURITY

Space Debris

Asteroids

MORE

APPLICATIONS

Data relay

Earth science

MORE

ENABLING & SUPPO

Access to space

Ground stations

MORE

ESA's Tracking Station Network

COOPERATIVE NETWORK

1 Poker Flat
2 Goldstone
3 Madrid
4 Weilheim
5 Esrange
6 Hartebeesthoek
7 Malindi
8 Kerguelen
9 Usuda
10 Masuda
11 Canberra

CORE ESA NETWORK

1 Kourou
2 Kiruna
3 Redu
4 Cebreros (Deep Space)
5 New Norcia (Deep Space)
6 Santa Maria
7 Malargüe (Deep Space)

AUGMENTED NETWORK

1 South Point
2 Santiago
3 Troll
4 Svalbard
5 Dongara

Earth Observations

SCIENCE & EXPLORATION

Exoplanets

Moon

MORE

SAFETY & SECURITY

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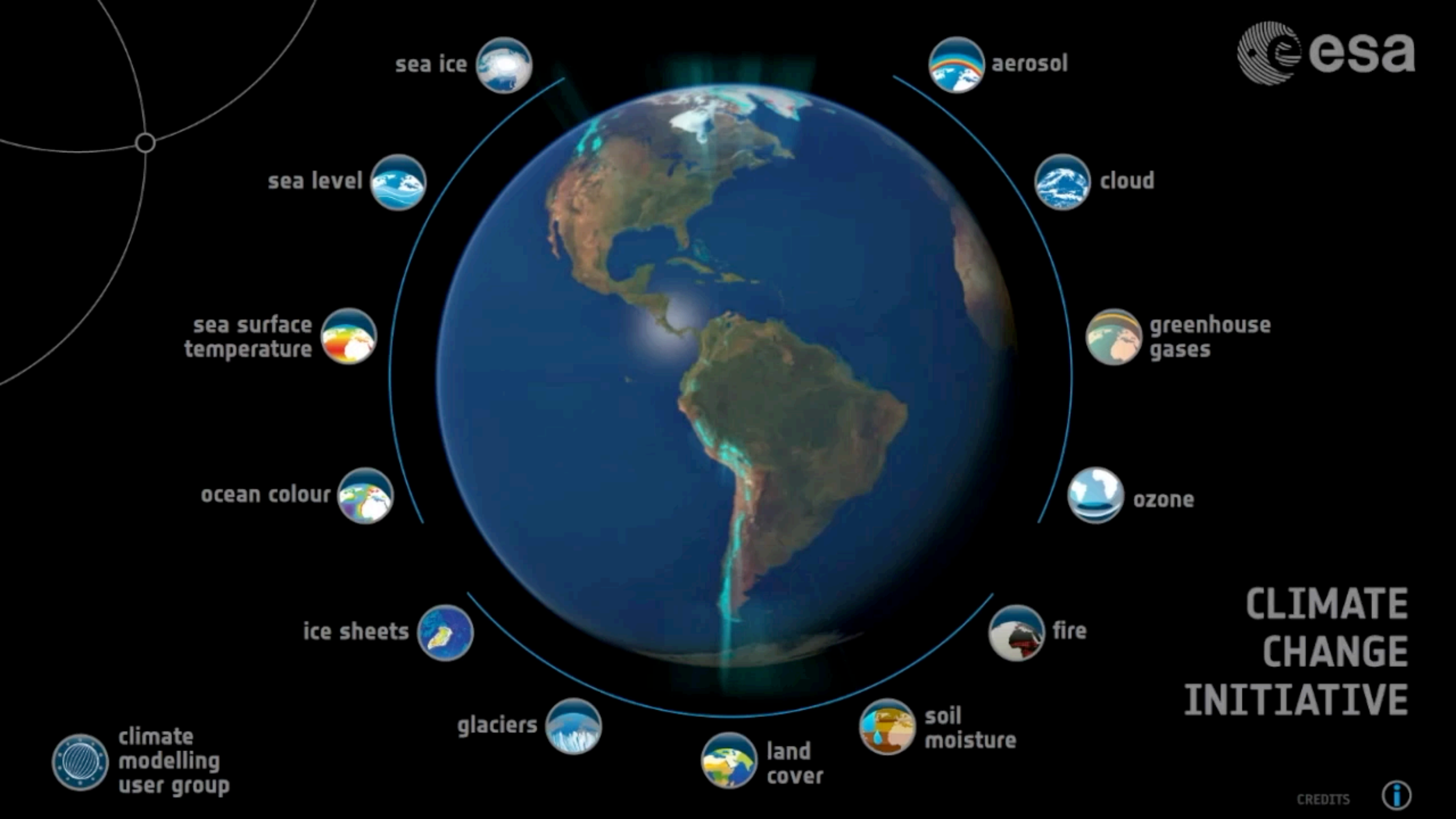
esa
sea ice
aerosol
sea level
cloud
sea surface temperature
greenhouse gases
ocean colour
ozone
ice sheets
fire
glaciers
soil moisture
land cover
climate modelling user group
CLIMATE CHANGE INITIATIVE
CREDITS

Exploration

SCIENCE & EXPLORAT

Exoplanets

Moon

MORE

SAFETY & SECURITY

Space Debris

Asteroids

MORE

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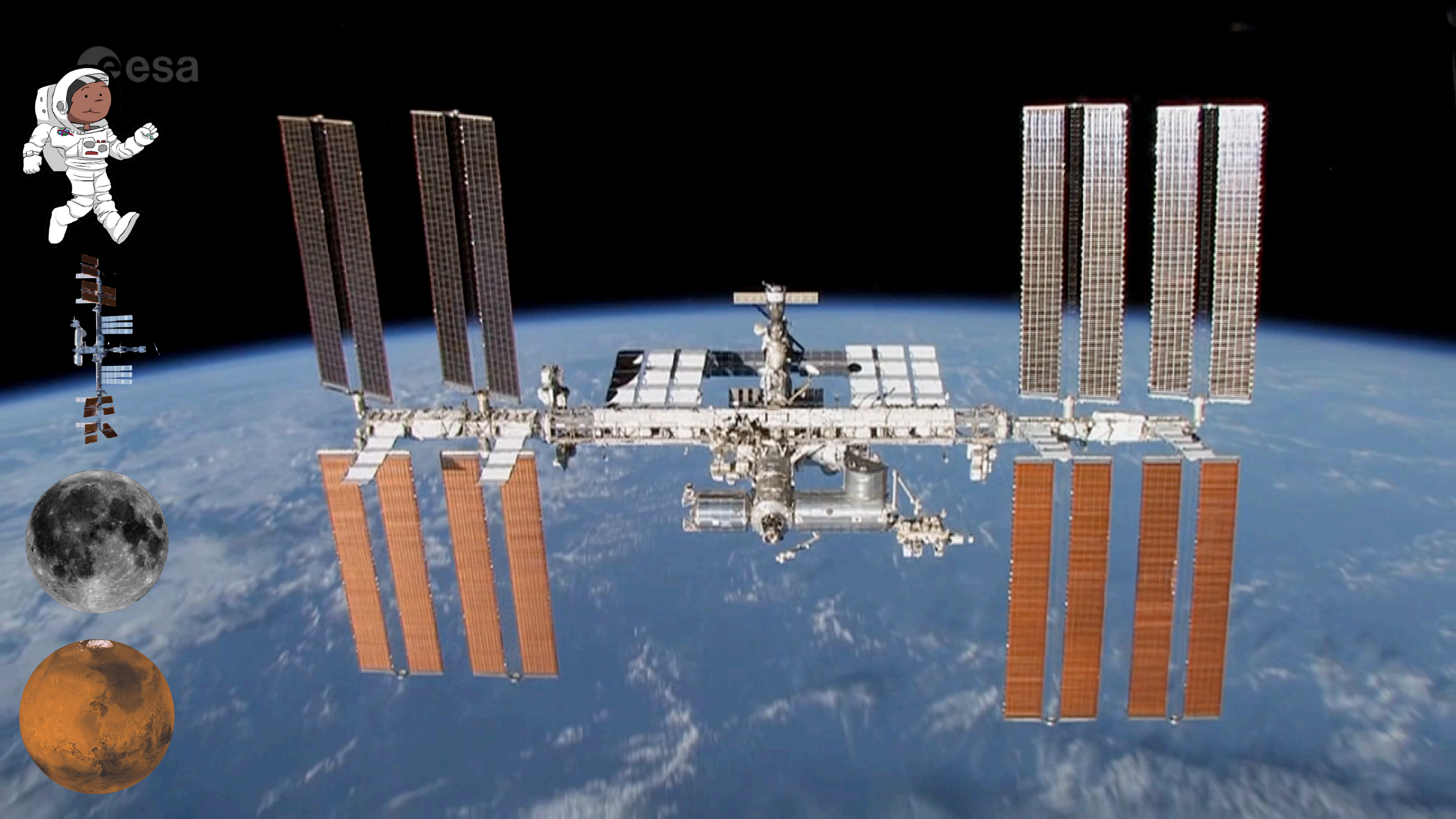

esa

ESA Science Missions

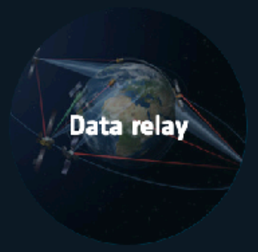
SCIENCE & EXPLORATION

MORE

SAFETY & SECURITY

MORE

APPLICATIONS



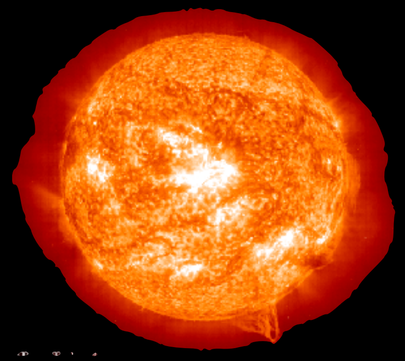
MORE

ENABLING & SUPPORT

MORE

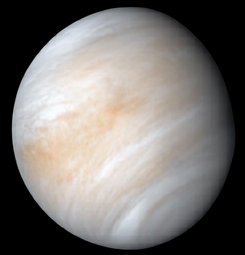
Why Space Missions?

Why do Science from Space?



Helioscience

Closer to the Sun - better view of details
Over the Sun to view the poles
Beyond Earth magnetosphere to study the Solar Wind



Planetary Science

Closer to the Planet - better view of details
Orbiting - stuyding the atmosphere and geology
Landing - sampling the composition

Astronomy

Accessing the wavelength that the Earth atmosphere blocks
Escaping the blurring of Earth’s atmopshere

COSMIC OBSERVERS

esa

IN DEVELOPMENT

- ariel (2029)
- roman (2026)
- euclid (2023)
- plato (2026)
- xrism (2022)
- einstein probe (2022)
- athena (2034)
- lisa (2037)

ACTIVE

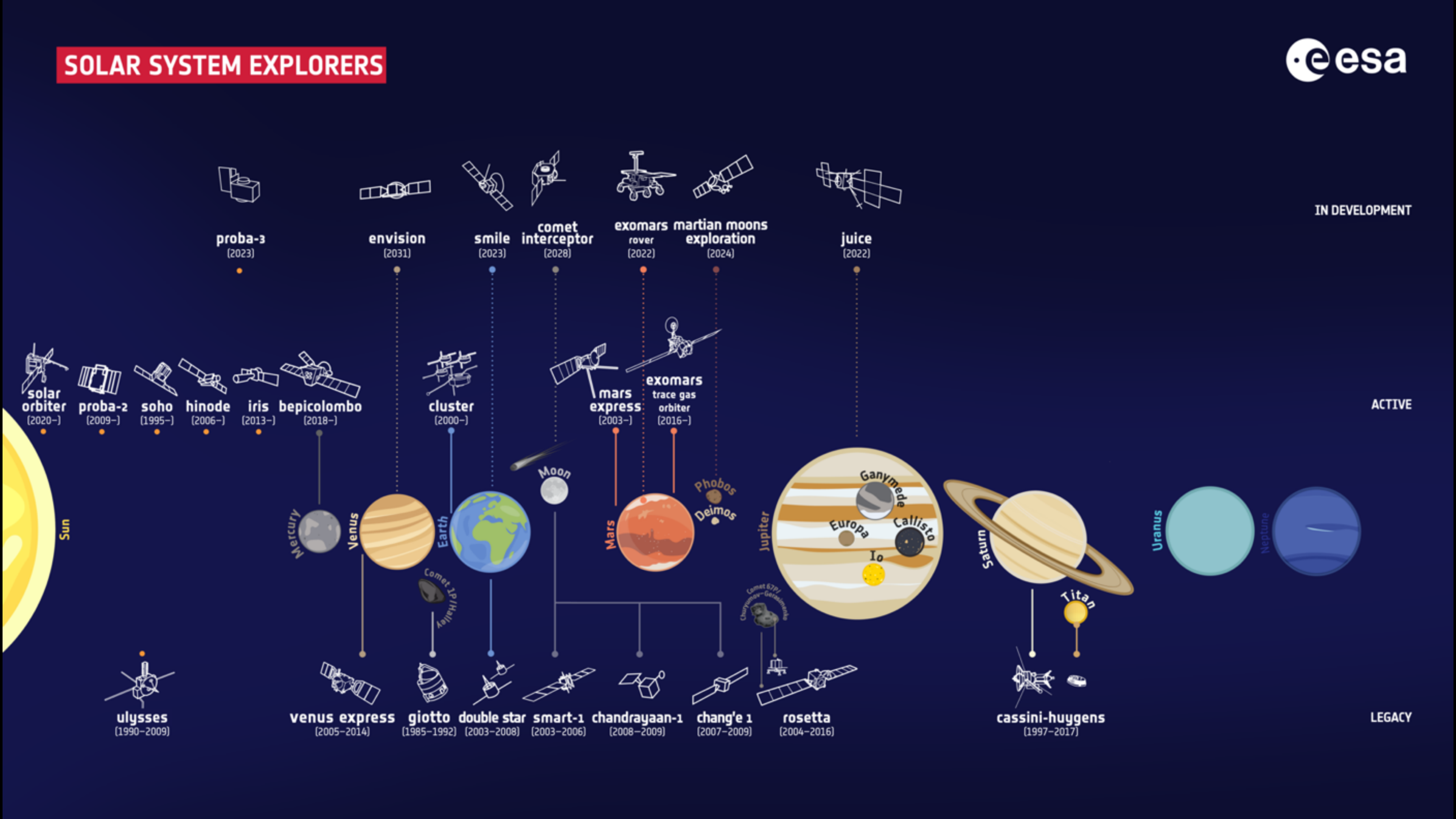
- webb (2021)
- hubble (1990–)
- gaia (2013–)
- cheops (2019–)
- xmm-newton (1999–)
- integral (2002–)

microwaves | sub-millimetre | infrared | optical | ultraviolet | x-rays | gamma rays | gravitational waves

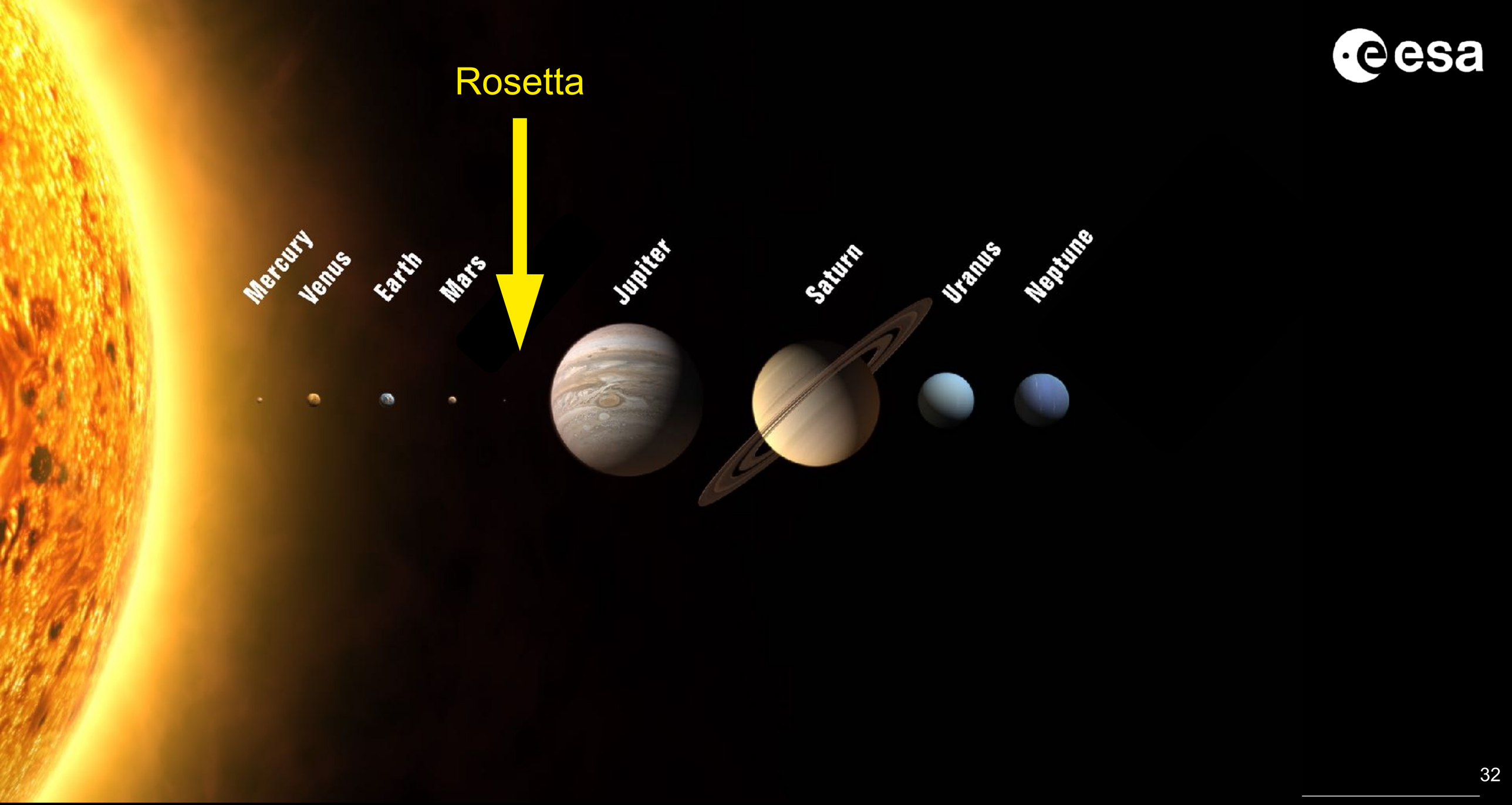
LEGACY

- planck (2009–2013)
- herschel (2009–2013)
- iso (1995–1998)
- akari (2006–2011)
- hipparcos (1989–1993)
- corot (2006–2014)
- iue (1978–1996)
- exosat (1983–1986)
- hitomi (2016)
- suzaku (2005–2015)
- cos-b (1975–1982)
- lisa pathfinder (2015–2017)
- microscope (2016–2018)

SOLAR SYSTEM EXPLORERS

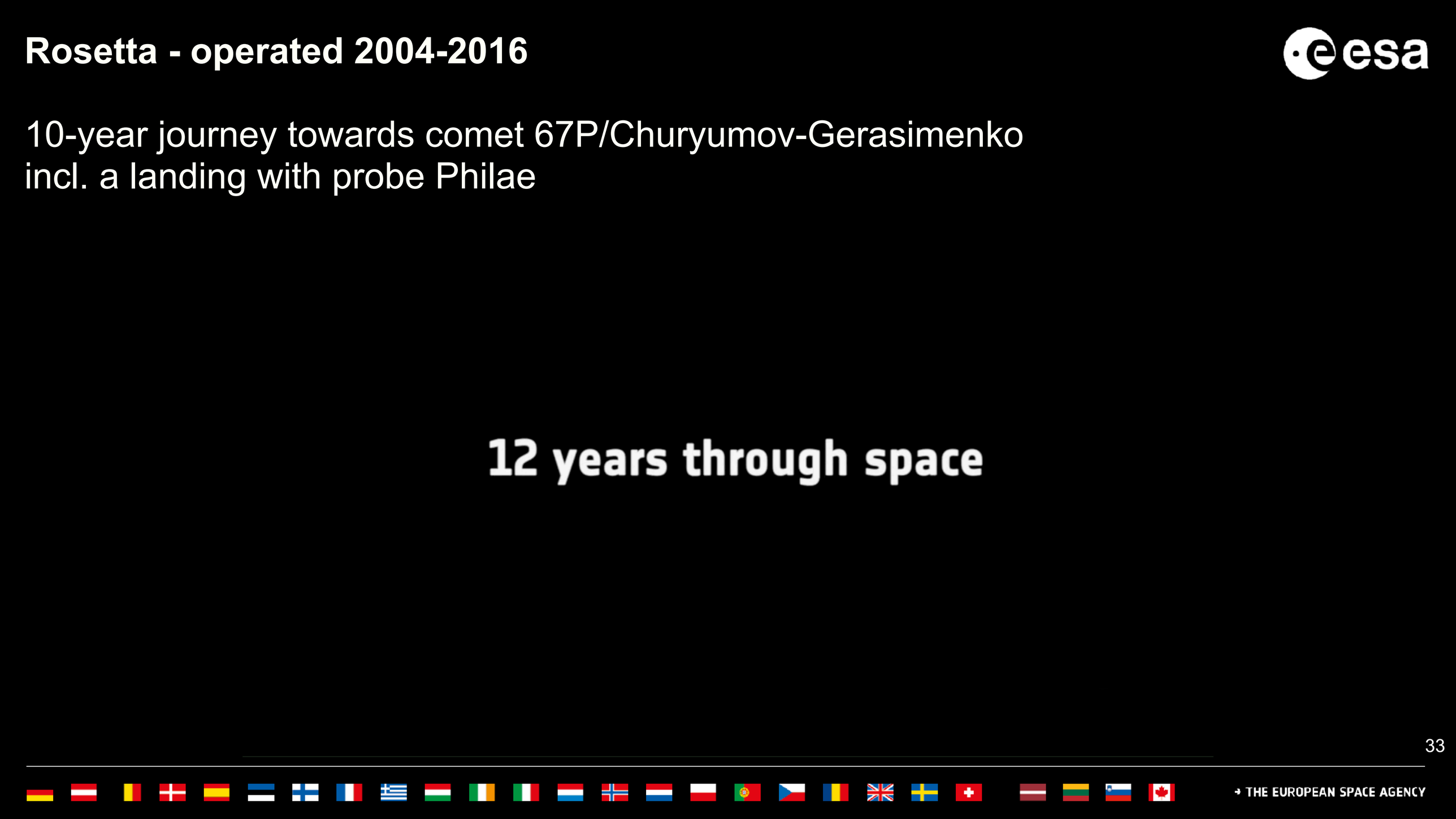


Some past Successes

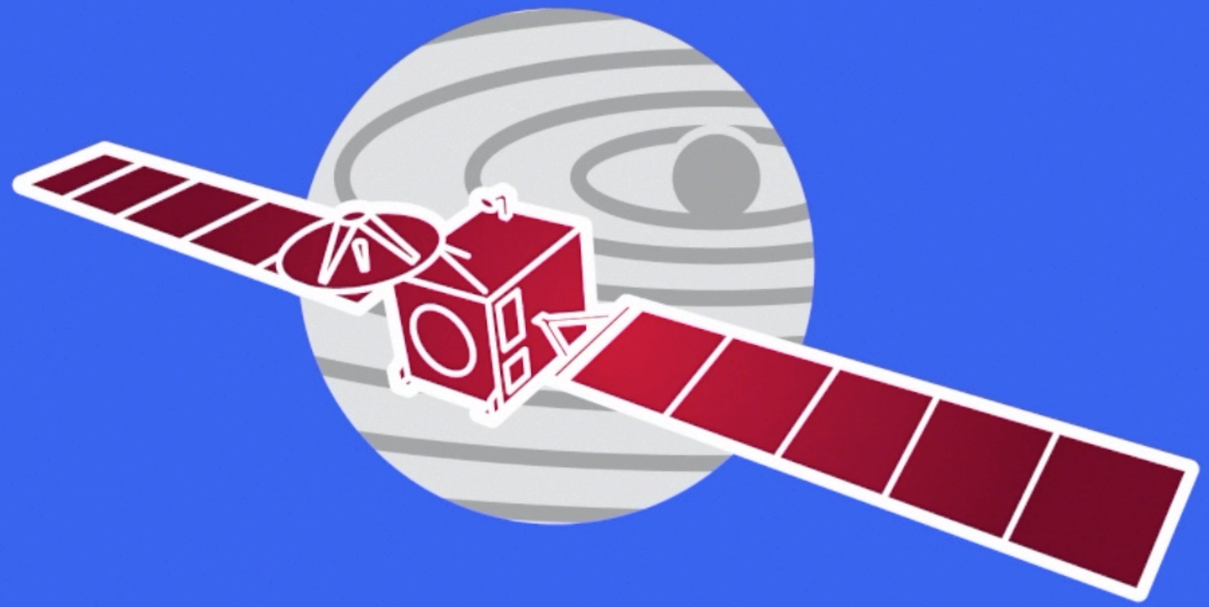

Rosetta
Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune

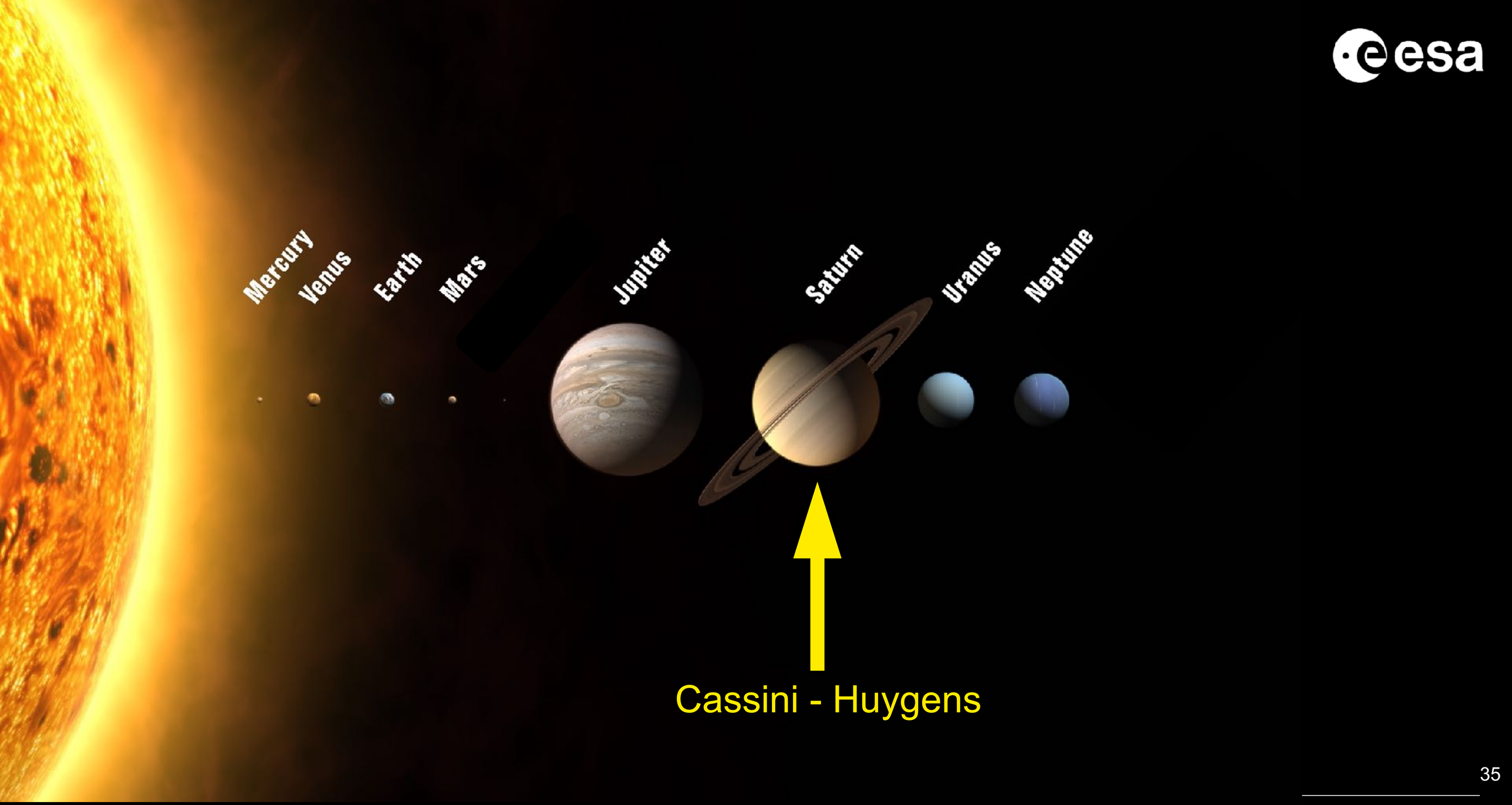
Rosetta - operated 2004-2016

10-year journey towards comet 67P/Churyumov-Gerasimenko
incl. a landing with probe Philae



→ ROSETTA: JOURNEY TO THE SURFACE OF A COMET



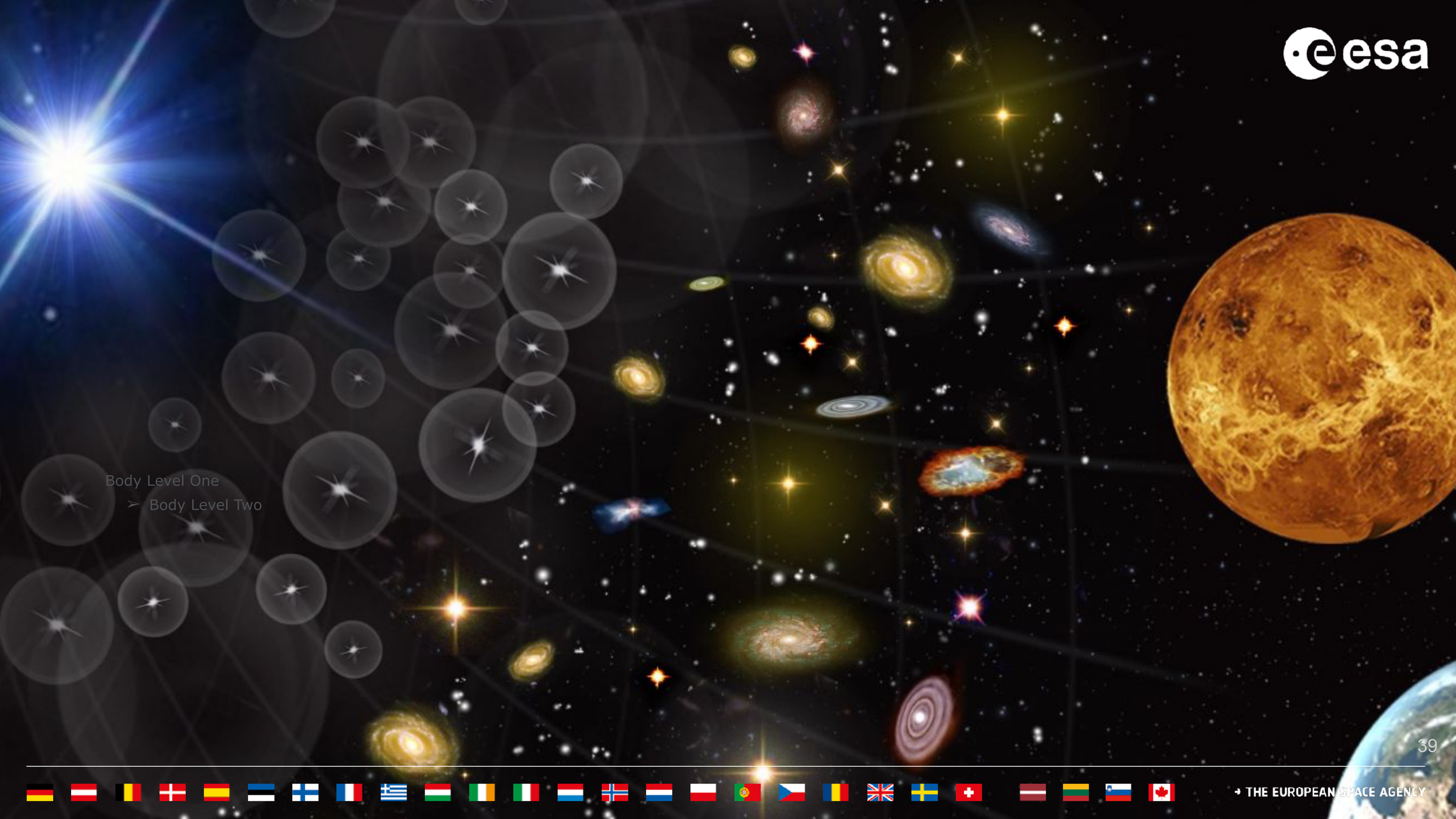

Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune
Cassini - Huygens

Huygens probe landed 2005 on Titan

The Cassini Mission launched in 1997,
and ended in 2017 plunging into Saturn

Summary


SAVE
OUR
PLANET
THERE IS NO
PLANET B
ACCELERATE



Body Level One

- Body Level Two