

Welcome from ESA and Introduction: SciOps 2017: Distributed Science Operations

Martin Kessler, 17 October 2017

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Euro

ESAC: History and Current Activities



- 1978: Opening of ESA
 VILlafranca SPAin Satellite
 Tracking Station, VILSPA.
- 1970s, 1980s, 1990s: Support various astronomy missions.
- Early 2000's: Expansion to planetary missions.
- 2005 Cebreros Deep Space Antenna inaugurated.
- 2008: VILSPA became ESAC, European Space Astronomy Centre.

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ESAC'S main activities now:

- Satellite Tracking,
- Earth Observation:
 - SMOS Spanish National Centre,
- INTA/CSIC Astrobiology Centre (CAB)
- Space Situational Awareness,
- Galileo Science Office,
- ESAC Communication Office,
- Space science missions:
 - Science ops, archives, in-orbit management.

D/SCI Operations Department

- Science Operations Centres (SOCs) for
 - > Astronomy,
 - Heliospheric, and
 - Planetary missions.
- Science Data Archives
 - Iong-term access to data & information.
- Overall management of ESA's operational space science missions.
- Involved in ~25 missions/studies.
- Nearly 250 scientists and engineers involved at ESAC and at STScI, GSFC, ESTEC, ...





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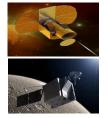
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Science Missions in Development

2019





- 2018 CHEOPS (CHaracterising ExOPlanet Satellite)
- 2018 BepiColombo (Closing in on Mercury)

JWST (Observing the First Light)



2018 Solar Orbiter (Closest to the Sun)





2020 Euclid (Mapping the geometry of the Dark Universe)



2022 JUICE (JUpiter ICy Moons Explorer)



2026 PLATO (PLAnetary Transits and Oscillations of Stars)

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Astronomy & Fundamental Physics Missions in Orbit



1990 Hubble Space Telescope (UV/Optical/NIR Observatory)



1999 XMM-Newton (X-ray Observatory)



2002 INTEGRAL (Gamma-ray Observatory)



2009 Herschel (FIR Observatory) – now in post ops



2009 Planck (Mapping microwave background) – now in post ops



2013 Gaia (astrometry – charting a billion stars)



2015 Lisa Pathfinder (gravitational wave technology) – now post ops

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Heliospheric & Planetary Missions in Orbit





1995 SOHO (Solar and Heliospheric Observatory)

Cassini-Huygens (Saturn and probe to Titan) – post ops



1997

2003







2004 Rosetta (Comet exploration) – now in post ops



2005 Venus Express – now in post ops



2009 PROBA-2 (technology and solar observations)

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Mars Express

Collaborations with Member States (1)

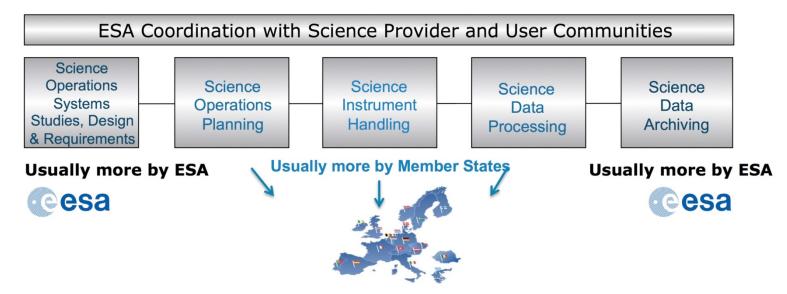


European Space Agency

- ESA science ground segments are usually a collaborative development multiple Member State entities.
- ESA-provided elements usually "embedded" in a larger system.
- > Task distribution between ESA and Member States is mission specific.
- Member States usually contribute bulk of resources.
- ESA provides overall coordination (rather than direct management).
- > ESA has overall responsibility for scientific outputs of the mission.

Collaborations with Member States (2)



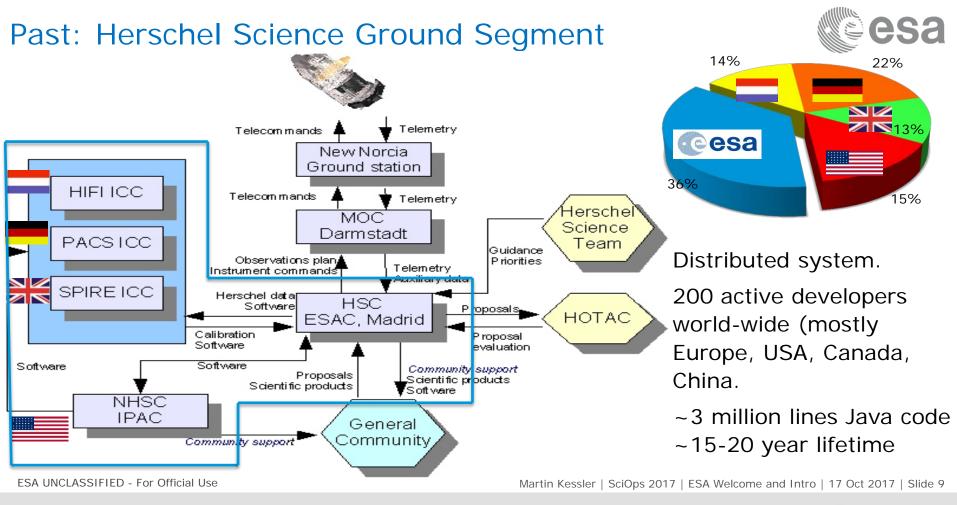


- Approach, naturally, leads to distributed ground segments
 - Many past, present and future examples:
 - Herschel, Cluster, Gaia, BepiColombo, Solar Orbiter, Euclid, ...

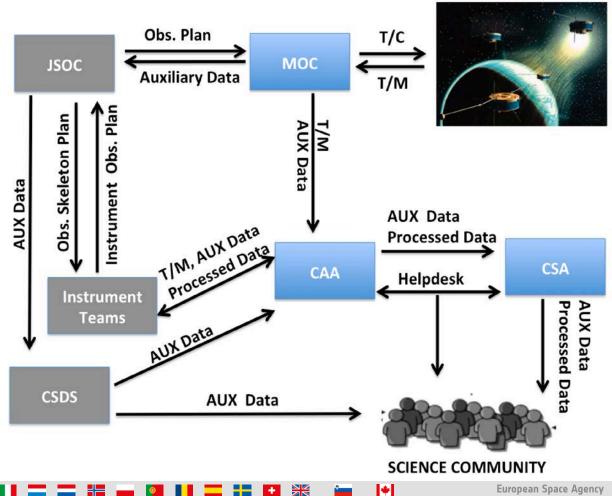
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Present: Cluster



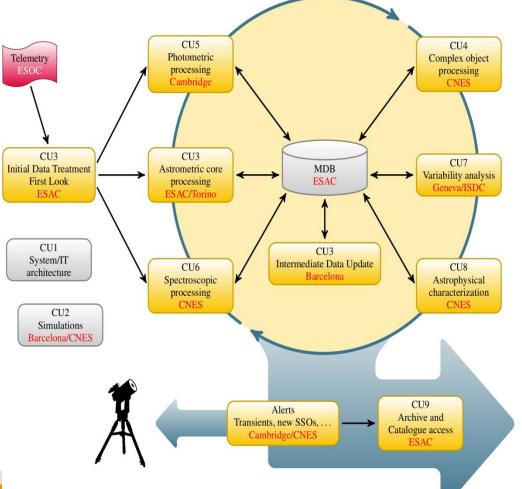
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European Space Agency

attillits.



Present: Gaia-DPAC

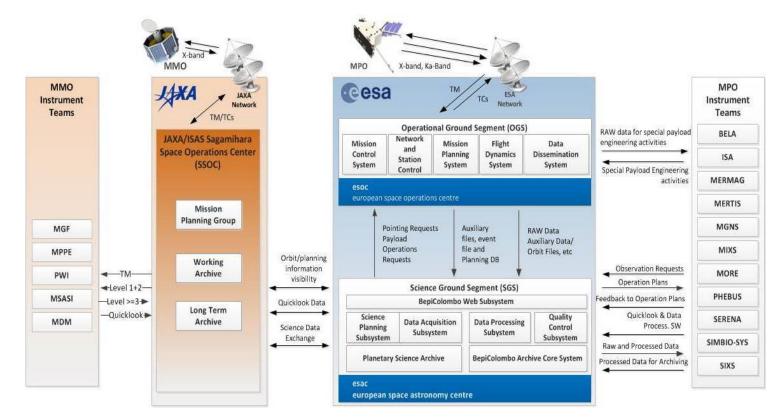


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Future: BepiColombo (at Mercury)





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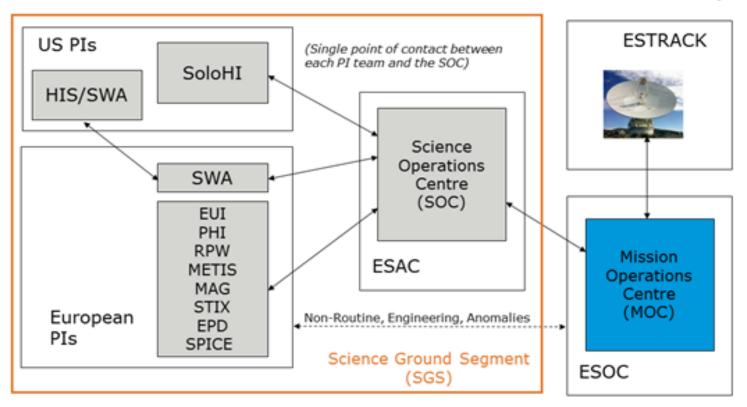
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Future: Solar Orbiter





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Future: Euclid

Euclid Consortium ESA **Operations Ground Segment** SDC-ES Telecommands Telemetry SOC Level 2, 3 Data Files ECSGS Mission External Operations Data **Euclid Archive** Centre Providers Pointing, TM, Aux. External data Command Reg. data SDC-NL SDC-DE SDC-UK SDC-FR SDC-IT Science Processing Operations Metadata, Catalogues Centre Level 2, 3 Public scientific Data Files Data Files Data Files Data Files Data Files data Level 2, 3 Public (public users) Data Files Scientific Community data a III) a IIII a III a IIII a nn Dini D Raw EXT Raw EXT Level 1 Data Files Data Data Level 1 **Data Files** Non-public SDC-FI SDC-CH SDC-US Scientific data Metadata replication (Consortium users) Metadata Metadata (backup) (prime) Level 2, 3 Level 2, 3 Level 2, 3 Data Files Data Files Data Files Operations requests 0 111 0 111 0 111 0 Processing coordination

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Collaborations with Member States (3)



- Collaborative approach, naturally, leads to distributed ground segments
 - Many past, present and future examples:
 - > Herschel, Cluster, Gaia, BepiColombo, Solar Orbiter, Euclid, ...
 - > Challenges are scientific, technical, managerial, financial,
 - Looking forward to this conference to discuss them!!

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Distributed Science Operations

> 3rd ESA-ESO collaborative workshop.

> Aims:

- Focus on challenges that distributed science operations present to space and ground based projects,
- Promote the interchange of ideas and information between ESA, ESO and the broader community.

SCIOPS 2017

Working together in support of science

www.cosmos.esa.int/web/sciops-2017

Distributed science operation

The objective of SciOps 2017 is to examine the challenges that distributed science operations present to space and ground based projects.

17-20 Oct 2017 ESAC - Madrid

Programme Organising Committee Olivier Hainaut (ESO) John Hoar (ESA) Andreas Kaufer (ESO) Uwe Lammers (ESA) Bruno Leibundgut (ESO) Pedro Garcia Lario (ESA) Danny-Lennon (ESA: Co-chair) Michael Sterzik (ESO: Co-chair) Damien Texier (ESA) Eva Verdugo (ESA)

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Distributed Science Operations

> 3rd ESA-ESO collaborative workshop.

> Approach:

- Review experience gained from past projects (e.g. Herschel/Planck), and discuss experiences of ongoing projects (e.g. Gaia and the ESO Public Surveys),
- Look forward to challenges presented by more complex future projects, e.g. Euclid and 4MOST, especially relevant to space/ground coordination.

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Distributed Science Operations

- 3rd ESA-ESO collaborative workshop.
- Discussion areas will include:
 - Experience gained from space missions: past and present,
 - Experience gained from ground-based projects: past and present,
 - Strategic coordination issues between space and ground-based projects,
 - What can we learn from planetary missions, etc.,
 - Challenges of future projects.

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Let's go further!

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