



# **ESA Welcome**

## **SciOps2015: Science Data Management**

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European Space Agency



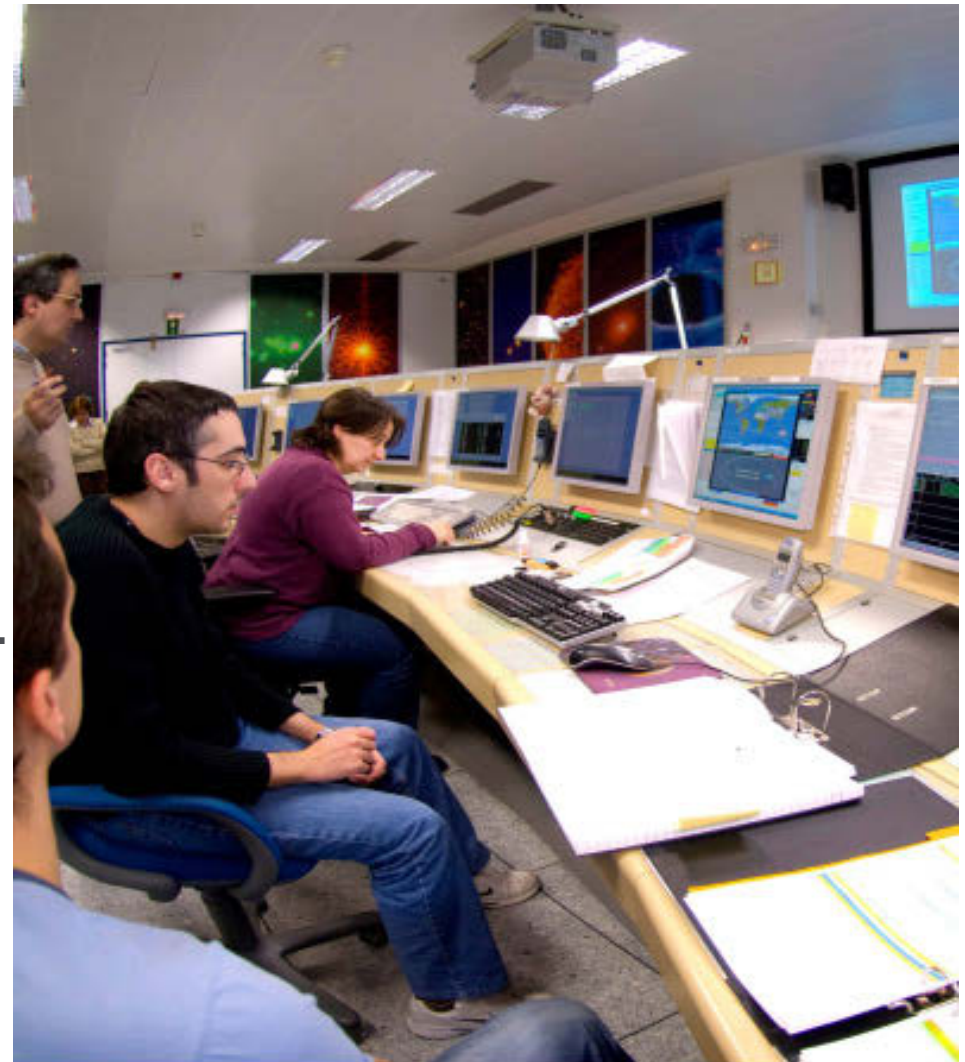
- **Workshop Objective:**
  - Present and discuss various approaches to science data management.
  
- **Topics include:**
  - Quality assurance of science data and related calibrations.
  - Data reduction and analysis.
  - Science archives (content and user services).

A poster for the SciOps 2015 workshop. The background is a dark space scene with a satellite in orbit and a view of the Earth from space. The ESA and ESO logos are in the top right. The title 'SCIOPS 2015' is in large white letters. Below it, the text reads 'Science Data Management', 'An ESO/ESA Workshop Working Together in Support of Science', and '24-27 November 2015 ESO, Garching bei München, Germany'. A paragraph describes the objective of the workshop, and a URL is provided. At the bottom, there are two columns of names for the Program and Local Organising Committees. The bottom of the poster shows a night view of the ESO observatory buildings.

# SciOps - Responsibilities and Scope



- Science Operations Centres for
  - Astronomy,
  - Heliospheric, and
  - Planetary missions.
- Science Data Archives
  - long-term access to data and information.
- Overall management of ESA's operational space science missions.
- Involved in >25 missions/studies.
- Over 250 scientists and engineers involved at European Space Astronomy Centre (ESAC), Madrid.



# Science Operations Centres ...

... provide some/all of following elements



➤ **Interfaces to users:**

- calls for proposals, information, workshops, training, helpdesk, ...

➤ **Payload operations:**

- scientific scheduling and optimisation, payload monitoring, quick-look data analysis, ...

➤ **Payload data acquisition and processing:**

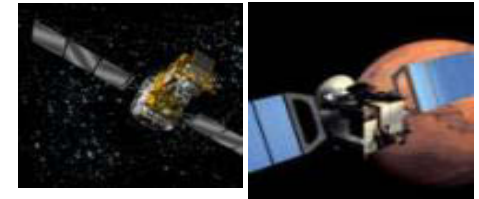
- calibration and cross-calibration, interactive and pipeline processing tools, ...

➤ **Science data archiving and distribution:**

- archive development, population and maintenance, ...

➤ **Plus associated software (and procedures):**

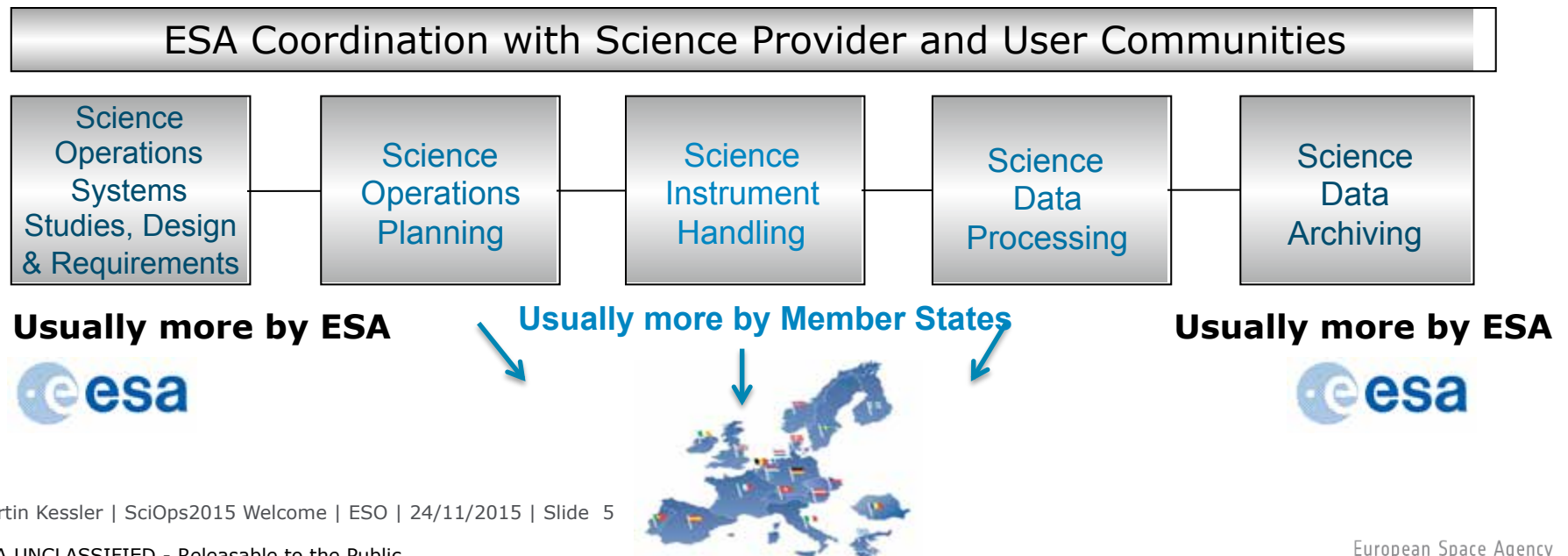
- development, integration, test, operation and maintenance



# Collaborations with Member States



- ESA-provided elements usually “embedded” in a larger cooperation with multiple Member State entities on Science Ground Segment.
- 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.



# Developing Science Operations for ...

(in launch date order)



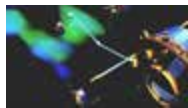
- 2015 Lisa Pathfinder (demonstrating gravitational wave technology)
- 2016 ExoMars2016 (Trace Gas Orbiter and EDL demonstrator)
- 2016 ASTRO-H (JAXA-led, soft X-ray to gamma-ray mission)
- 2017 BepiColombo (Closing in on Mercury)
- 2018 Solar Orbiter (Closest to the Sun)
- 2018 JWST (NASA-led, Observing the First Light)
- 2020 Euclid (Mapping the geometry of the Dark Universe)
- 2022 JUICE (**JU**piter **ICy** Moons **E**xplorer)
- 2024 PLATO (**PLA**netary **T**ransits and **O**scillations of Stars)

LPF launches  
on  
2 December

# Executing (Science) Operations for ... Heliospheric/Planetary Missions (in launch date order)



1995 SOHO (Solar and Heliospheric Observatory)



2000 Cluster (Sun-Earth Environment)



2003 Mars Express



2004 Rosetta (Cometary exploration)



2005 Venus Express – now in post operations



2009 PROBA-2 (technology demonstrator and solar observations)

# Executing (Science) Operations for ...

## Astronomy Missions (in launch date order)



1990 Hubble Space Telescope (NASA-led, UV/Opt/NIR Observatory)



1999 XMM-Newton (X-ray Observatory)



2002 INTEGRAL (Gamma-ray Observatory)



2009 Herschel (FIR Observatory) – now in post operations



2009 Planck (Microwave background) – now in post operations



2013 Gaia (astrometry – charting a billion stars) – now in routine ops



# SciOps2015: Some Changes since SciOps2013

- Some missions have completed in-orbit operations and are now in their post-operational phases:
  - Herschel, Planck, Venus Express.
- Rosetta orbited a comet and deployed its lander.
- Gaia launched, commissioned and into routine operations.
- Lisa Pathfinder ready for launch on 2 December 2015.



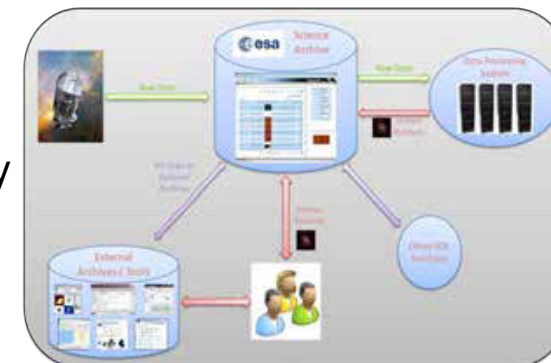
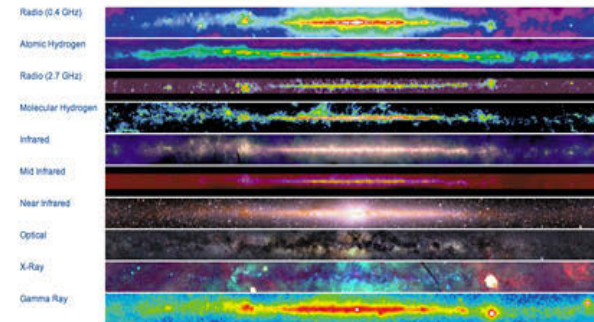
- Significant advances in archive areas.



## ESAC Archives Long-Term Plan: Introduction



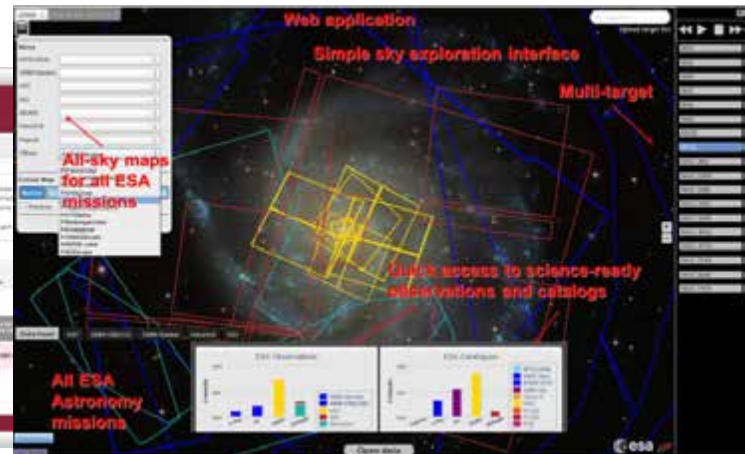
- Large set of science archives co-located at ESAC are a major research asset for community
- Need to be kept readily available for future users and novel uses
- Thus, must plan now for next 5–20+ years
- Planning based around 3 major goals:
  - Enable maximum scientific exploitation of data sets
  - Enable efficient long-term preservation of data, software and knowledge, using modern technology
  - Enable cost-effective archive production by integration in, and across, projects



# Archives in 2015 ...



## Astronomy:



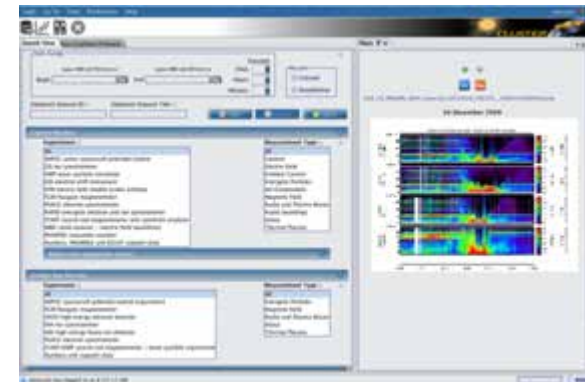
ESASky (MMI) public beta end of October

## Planetary



Archive Image Browser

## Solar & Heliospheric



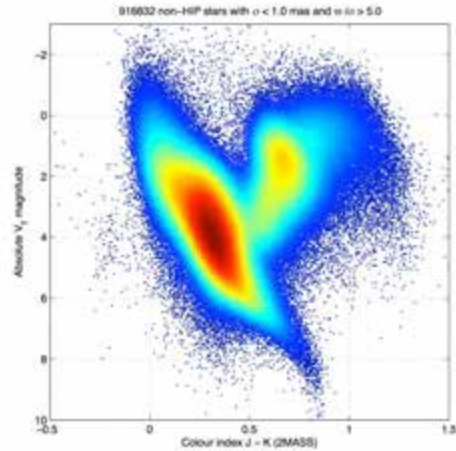
CSA now including Double Star data

European Space Agency

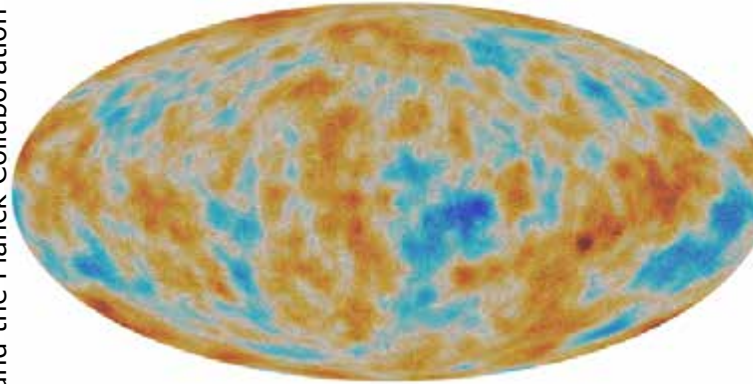
... and why we do it!!



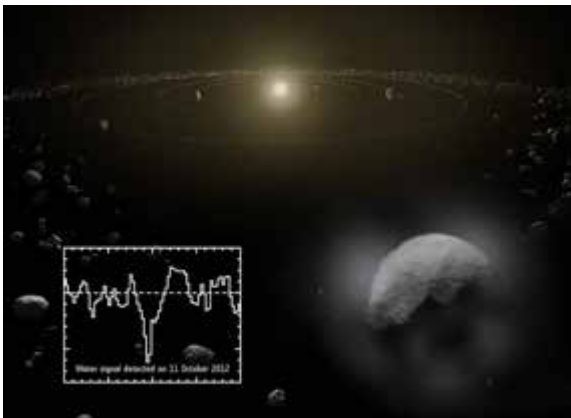
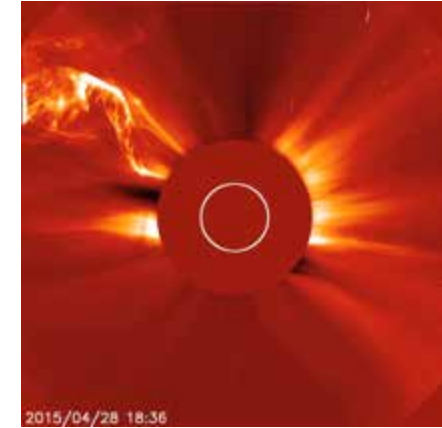
ESA/ATG medialab/Küppers et al. ESA/Gaia/DPAC/IDT/FL/DPCE/AGIS



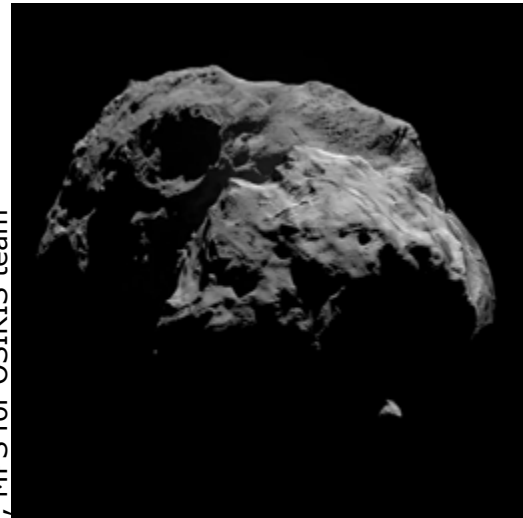
ESA and the Planck Collaboration



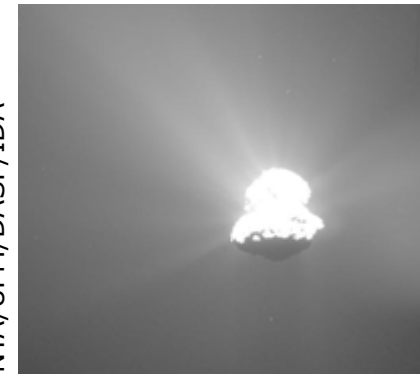
SOHO (ESA/NASA)



67P/C-G 3D shape model and surface model based on Rosetta images / Mattias Malmer, ESA/Rosetta/NAVCAM / MPS for OSIRIS team



ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO /INTA/UPM/DASP/IDA



“Science Operations: Data Management” enable missions’ scientific output!

Let’s enjoy this meeting and see how we can optimise these activities!