From SPICE to map-projection

The Planetary Science Archive (PSA) approach to enhance visibility of ESA's space science data

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What is the Planetary Science Archive (PSA)?

→Repository of <u>ESA' missions</u> for exploration of the Solar System

→It contains <u>science</u> datasets, as well as <u>engineering</u> datasets of spacecrafts and instruments (i.e., HK)

→It uses a common format with other international planetary missions, the Planetary Data System (PDS)

→PSA is committed to provide access to ESA' missions scientific and engineering datasets for <u>decades to the public</u>.

Numbers of the PSA

10 missions

→ In Legacy Phase (Giotto, Vex, Smart-1, Huygens)

→ In Post-Operation Phase (Rosetta)

→ In Operation Phase (ExoMars 2016, MarsExpress)

→ In Development (BepiColombo, Juice, ExoMars RSP)

76 instruments

→ Including in-situ Vs. remote sensing

→ 44 more upcoming by 2024 (JUICE, BepiColombo, Exomars RSP)

45 TB of data and 11 millions products

→ coming from 76 instruments, 7 missions, spread over 20 years

→ 8 millions for Rosetta only!

Challenges

The PSA main challenge is at the same time to be and remain...
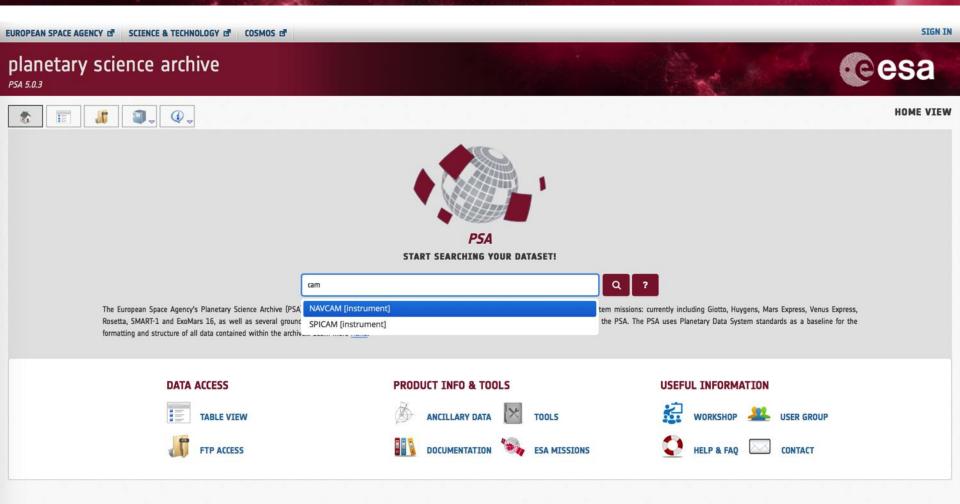
- a multi-missions archive
  - Compare products of ExoMars 2016 and Mars Express
- a multi-instruments archives
  - Combine observations of multiple instruments onboard Rosetta
- a multi-targets archives
  - Extract observations of an instruments towards multiple targets

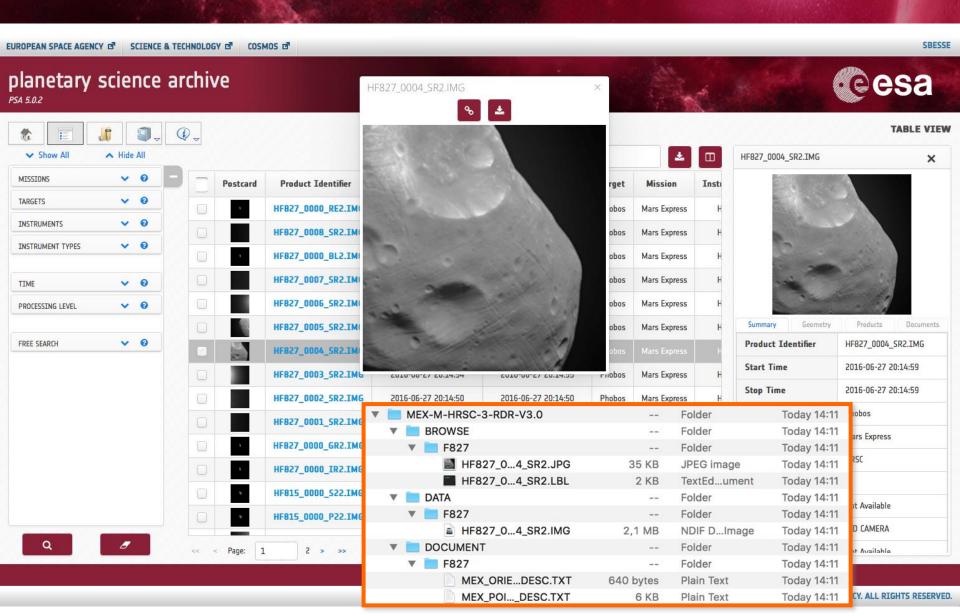**One Node, One place for all ESA's Planetary missions**

User interface to search datasets

UI to visualize and download products

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- Compare products of ExoMars 2016 and Mars Express

•a multi-instruments archives

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•a multi-targets archives

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•And offer the best tools, functionalities to enhance science exploitation

Projection of products on a surface and availability of referenced products is **key**, and this is a very high fraction of the products available at the PSA.

How do we go from the science products in the archive to their projection on the surface?
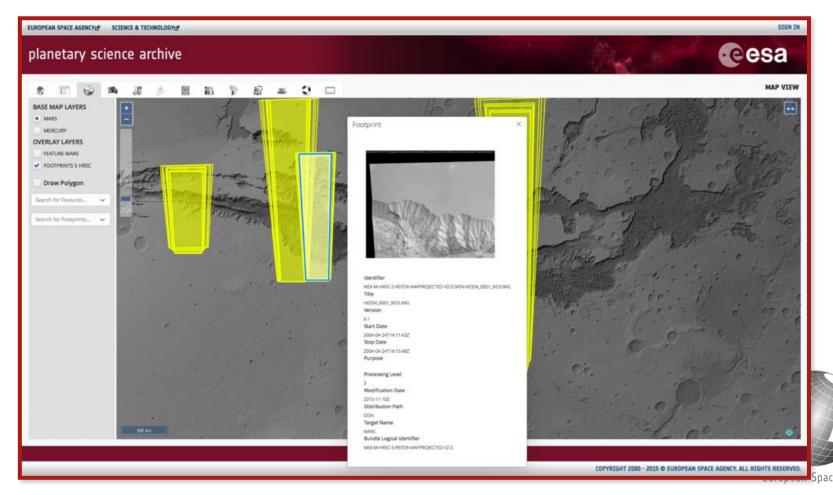
Short answer: we do not !

Projection of product on maps, How?

Short answer: we do not !

Long answer: we have a plan and we work on it ☺

Difficulties, issues and differences to other archives

•Instrument teams do not deliver the same geometrical information. From nothing to a lot of different things in different formats.

•We have <u>one</u> IRON man, not <u>four</u> SPICE Boys

•ESA's missions are not organized, run in the same way and with different budgets than NASA's missions
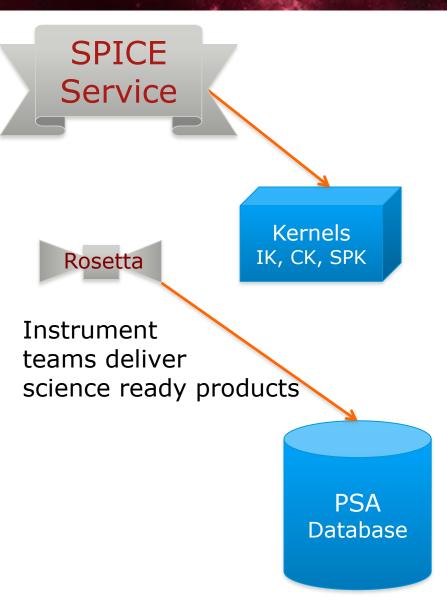
PSA plan is to prepare a controlled geometry pipeline, and generate the information needed for searching scientific products in the archive.

SPICE → CAMERA → Projection

SPICE → DATA→ Projection

SPICE Service

Kernels
IK, CK, SPK

Rosetta

Instrument teams deliver science ready products

PSA Database

SPICE Service

Pointing Trajectory

Kernels
IK, CK, SPK

Rosetta

Instrument teams deliver science ready products

Time of products

B3F
(Body Fixed Frame Frustum)

Sun direction
S/C direction
Inst boresight
Inst "corners" directions

PSA Database

SPICE
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directions

Shape
Model

Geometry
computator

Geom File
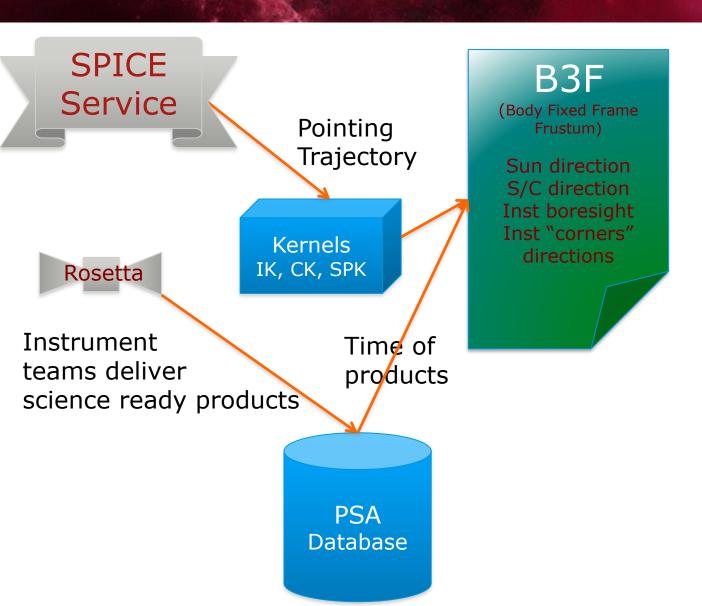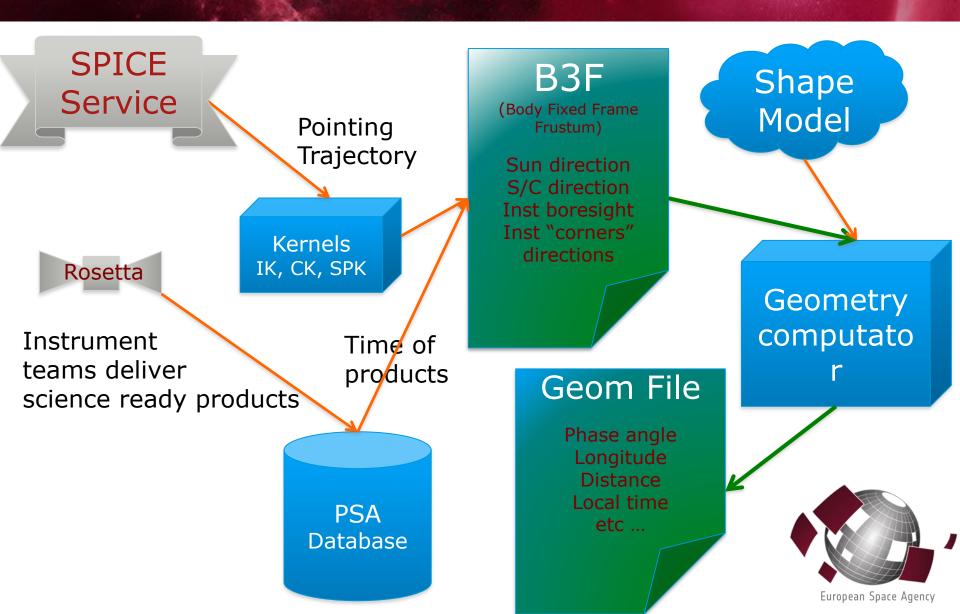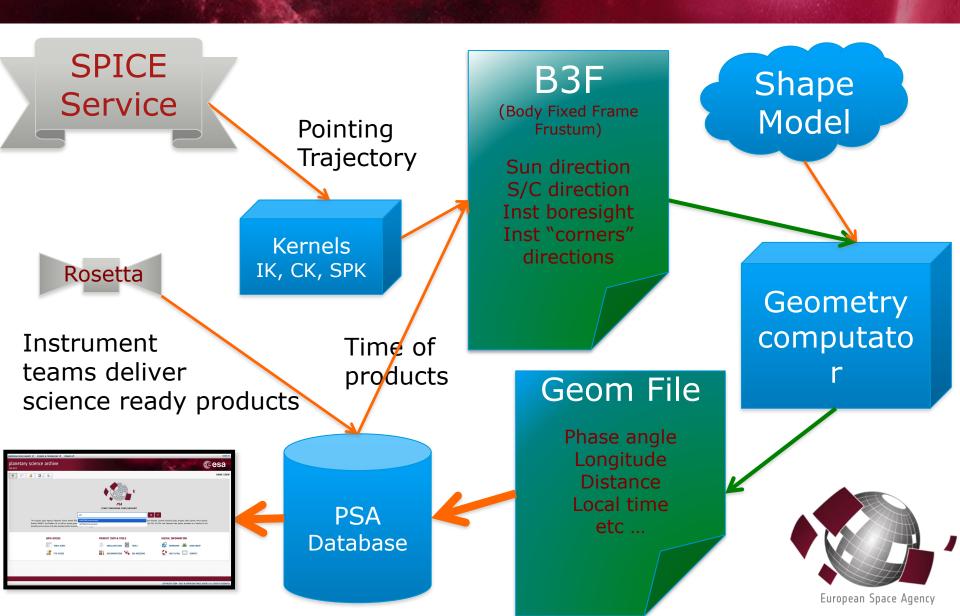
Phase angle
Longitude
Distance
Local time
etc …

A good approach with mostly pros

Pros

- Pointing and trajectory are treated independently from the products, updates of the SPICE kernels are easier to handle.

- Geometry is not taken from the datasets, updates are transparent.

- B3F files are created independently of the shape model. Crucial for missions like Rosetta where the shape model is changing with time.

- Parameters are independent to projections style, we can offer multiple projections to the users.

Cons

- We have ideas but few resources. It will take time for the PSA to develop this idea, test it and implement it.

- Bad surprises will happen, thus your patience is appreciated.

The PSA geometry effort is on-going

- The PSA is preparing a prototype to develop the concept

    SPICE → CAMERA/DATA → Search/Projection

- This approach will significantly increase the usability of ESA's Planetary Science missions

- Goal is to release the geometry search and projection in 2018

In the meantime…   **psa.esa.int**

PSA is one generic tool that offer and will offer different ways to search and visualize datasets for the benefit of science