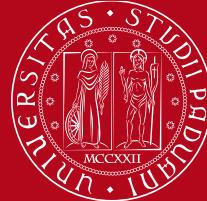


1222-2022
800 ANNI



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

Telerilevamento e mappatura di superfici planetarie

Silvia Bertoli - 36th Cycle

Supervisor:

Admission to the first year - 06/11/2020



Project focused on

MARS



CaSSIS

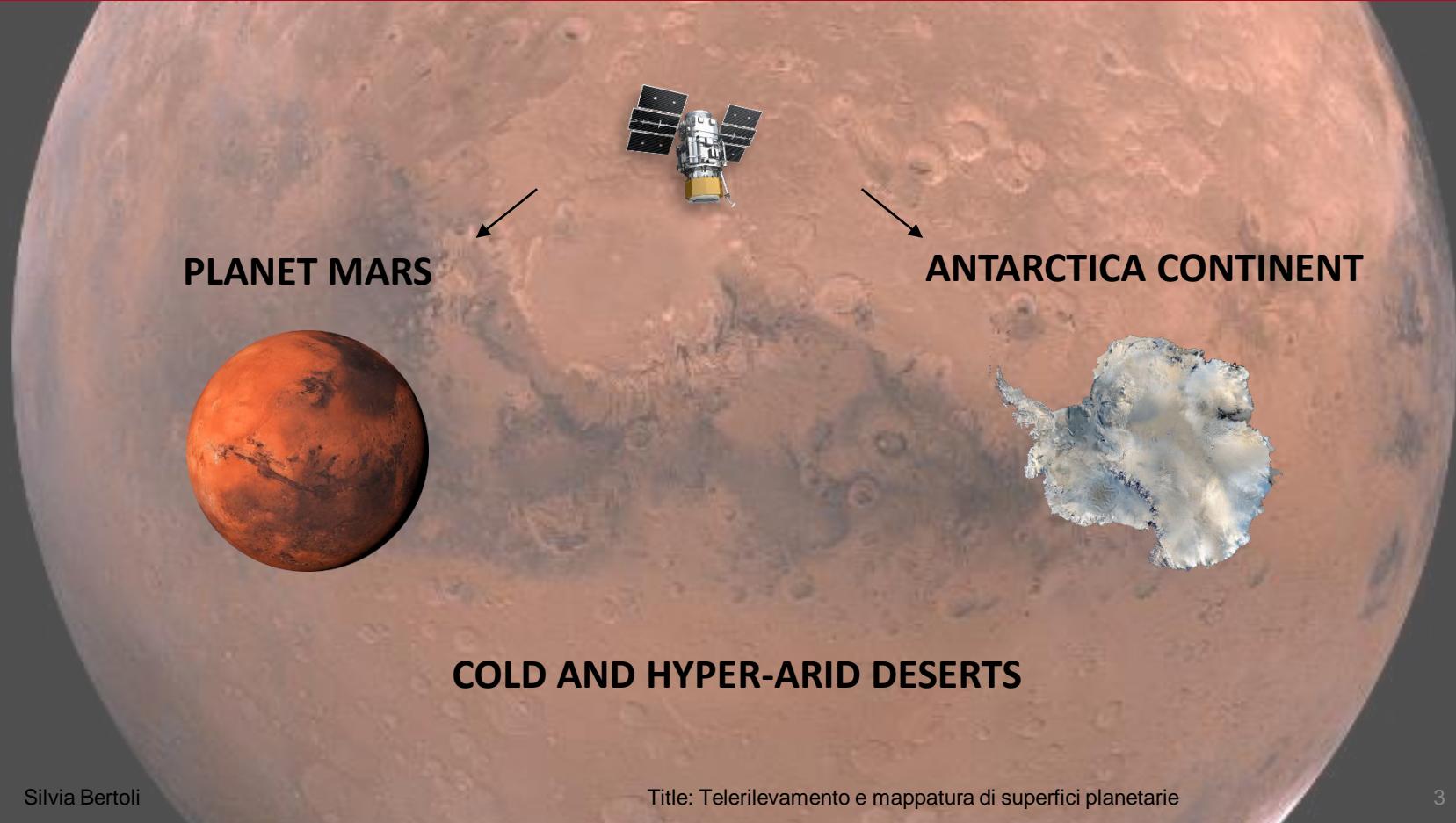
MERCURY



SIMBIO-SYS

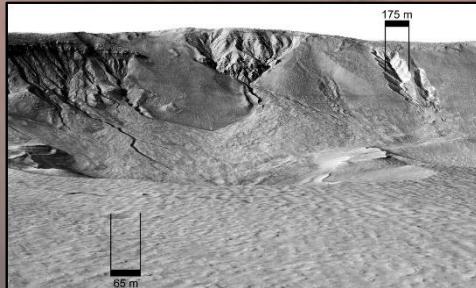


MARS: Introduction



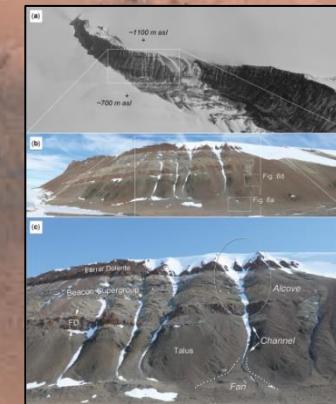
MARS: Scientific interest

The red planet keeps the traces of a similar terrestrial past.
On its surface there are clear morphological evidences of wind erosion and water action



Conway et al. (2018a)

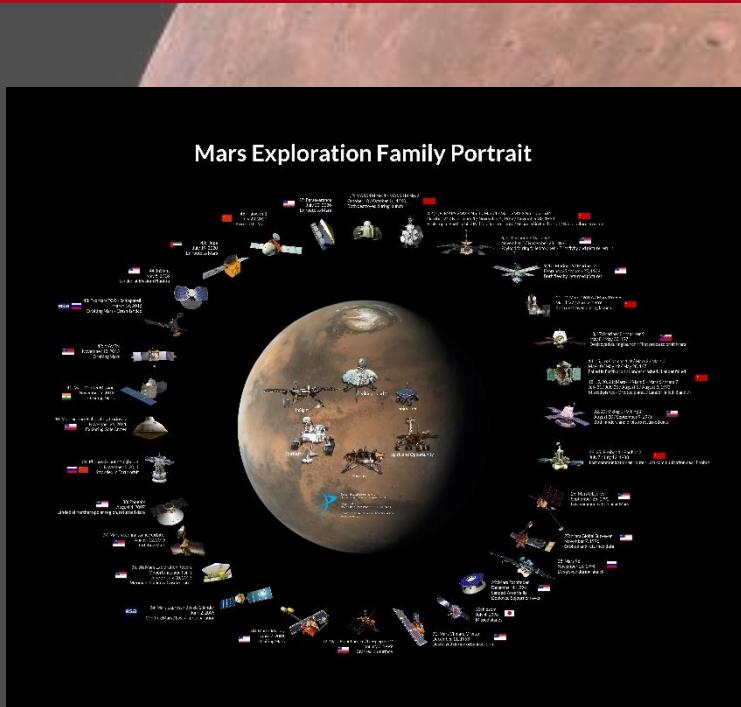
Antarctica landforms represent the best analogues to understand the Martian dynamics. Despite being a remote continent, it is possible verify multiple Martian studies with a field camp.



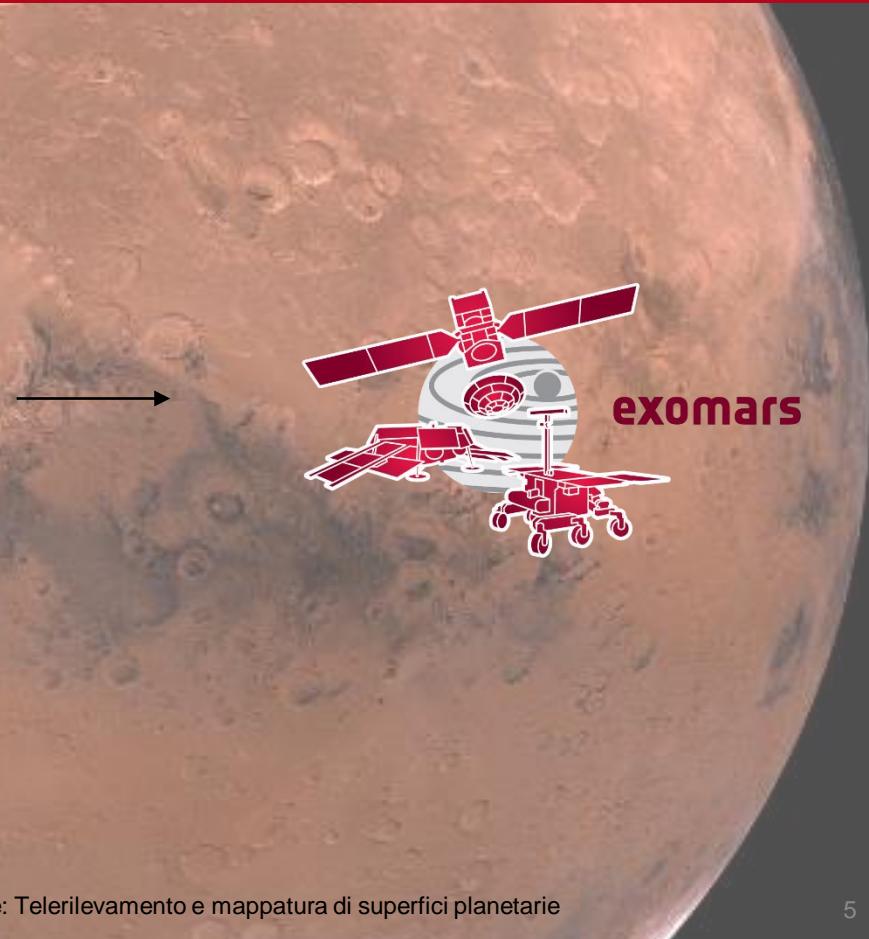
Hauber et al. (2019)



MARS: Scientific interest



(NASA / JPL / Roscosmos / JAXA / ESA / ISRO / Jason Davis / The Planetary Society)



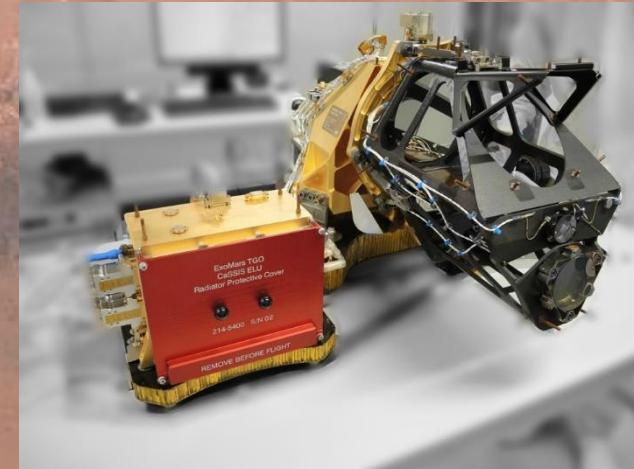
CaSSIS



Colour and Stereo Surface Imaging System

**Color and Stereo
Surface Imaging
System**

(PI: N.Thomas
CoPI: G.Cremonese)



CaSSIS: Top Level Requirements

- **Imaging at ~ 5 m/px (≤ 10 m resolution)** requires major optical design modification; 2.5x inferior to HiSCI (SNR)
- **Individual image size of $\sim >8\text{km} \times >8\text{km}$** dictated by sensor dimension
- **Stereo coverage in a pan-chromatic channel** to provide ≤ 15 m vertical resolution
- **Colour in 3 bands** (in addition to pan)



MARS: Aim of the project

- The study of periglacial forms and deposit (periglacial-like in the Martian context) as main indicator of potential ice and liquid water on the Martian terrains.
- The study of Antarctic and Martian periglacial morphologies also through the definition of morphodynamics and morphometry, will allow to implement the knowledge on Martian permafrost
- Understanding the evolution of the permafrost also in relation to the climatic changes that have affected and still affect Mars and Antarctica.

MARS: Investigation methods

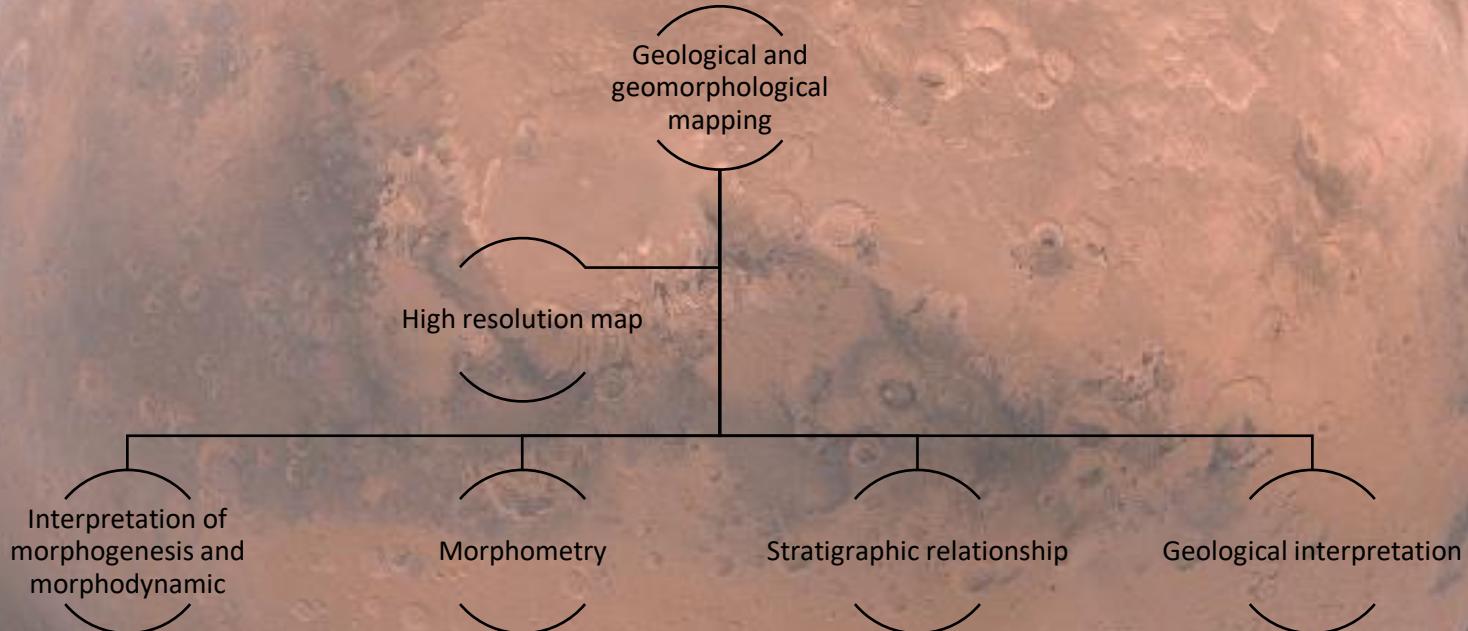
Landscape analysis on the **Antarctica context**:

- **Remote sensing part:** analysis of the aerial images Trimetrogon Antarctica by USGS (taken on 1957) and of the data from satellites (Word View)
- The data would be reworked in **GIS** (Geographic Information System) and **SNAP** (Sentinel Application Platform)
- A possible **geomorphological survey in situ**

Landscape analysis on the **Martian context**:

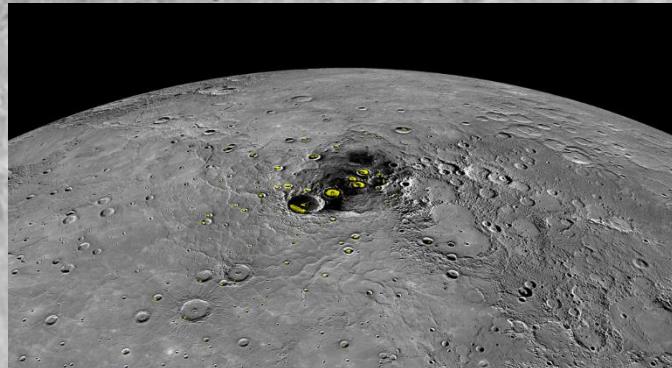
- **Remote sensing** (image processing and photointerpretation) with data from:
 - **CaSSIS** (the main part)
 - **HiRISE**
 - **CTX**
 - **HRSC and MOLA**
 - **CRISM**
- All analysis, 3D characterization and data processing would take place in the **GIS** environment

MARS: Investigation methods

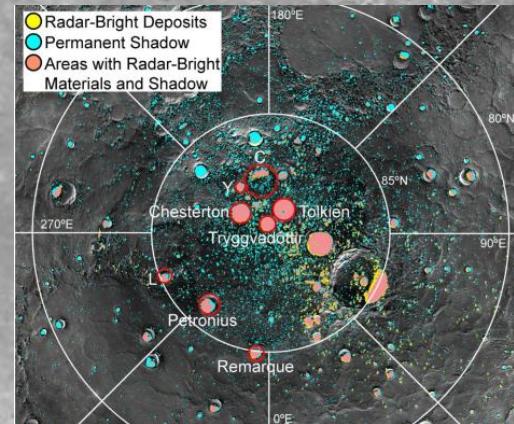




Water ice on polar regions



Instrument: Mercury Dual Imaging System (MDIS)
Arecibo Radar Image: In yellow (Harmon et al., 2011,
Icarus 211, 37-50)

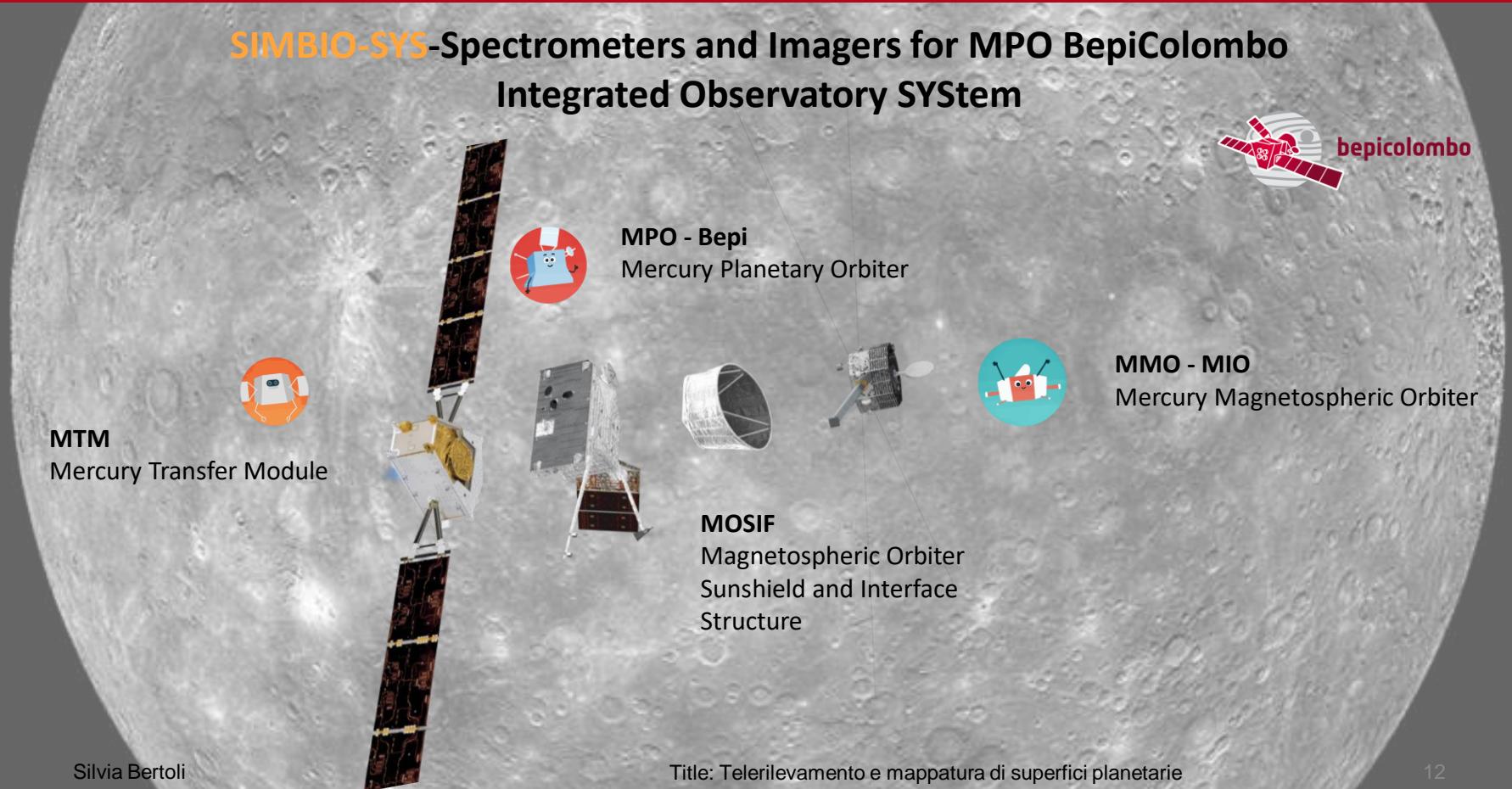


J.L. Fastook et al., 2019



MERCURY: SIMBIO-SYS

SIMBIO-SYS-Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem





SIMBIO-SYS-Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem

PI: Gabriele Cremonese



Main scientific objectives:

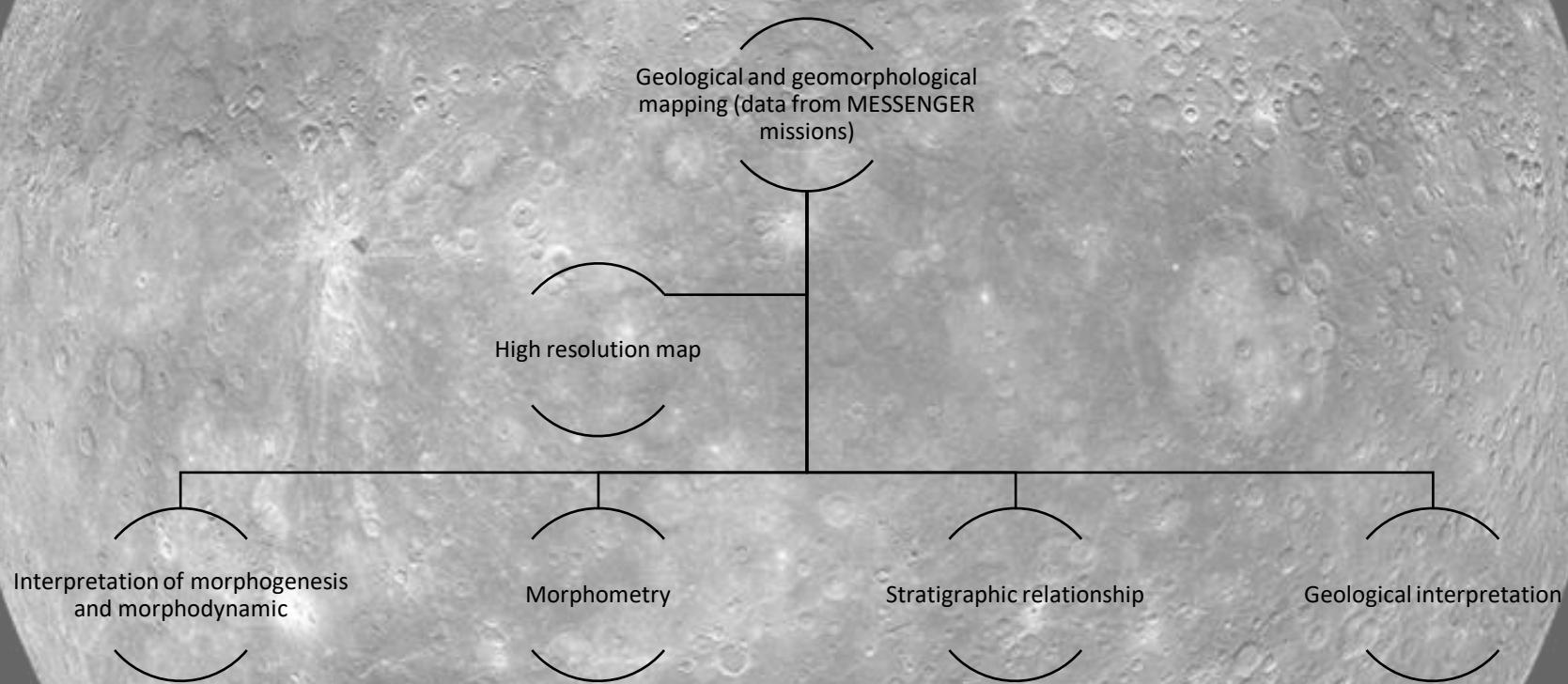
- Global stereo-mapping of the planet for the first 6 months of nominal mission
- Global spectroscopic mapping for the first 6 months
- High resolution images of about 20% of the surface



MERCURY: Aim of the project

- Study polar regions to understand better the processes and the morphologies on the shadowed areas
- Understand the role of the water ice and its possible source
- Landforms analysis to prepare the studies of specific target for Bepi Colombo Mission

MERCURY: Investigation methods





Conway S. J., Carrivick J. L., Carling P. A., De Haas T. & Harrison T. N. (2019) - *Martian Gullies and their Earth Analogues*. Geological Society, London, Special Publications, V. 467, pp. 267–287.

Fastook J. L. , Head J. W., Deutsch A. N. (2019) - *Glaciation on Mercury: Accumulation and flow of ice in permanently shadowed circum-polar crater interiors*. Icarus, V. 317, pp. 81-93

Harmon J.K., Slade M.A., Rice M.S. (2011) - *Radar imagery of Mercury's putative polar ice: 1999–2005 Arecibo results*. Icarus V. 211, pp. 37–50

Hauber E., Sassenroth C., De Vera J. P., Schmitz N., Jaumann R., Reiss D., Hiesinger H. and Johnsson A. (2019) – *Debris flows and water tracks in northern Victoria Land, continental East Antarctica: a new terrestrial analogue site for gullies and recurrent slope lineae on Mars*. In: Conway S. J., Carrivick J. L., Carling J. L., De Hass P. A. and Harrison T. N. (2019) - *Martian Gullies and their Earth Analogues*, V. 467, pp. 267-28

Thanks for the attention

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