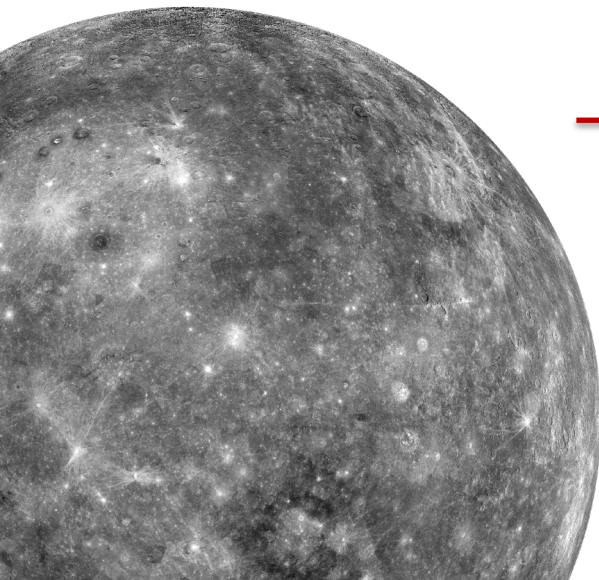


Mercury Day Schedule

09:00-10:00	Mercury surface morphology	V. Galluzzi
10:00-10:30	Mercury surface composition	C. Carli
10:30-10:40	Coffee Break	
10:40-11:10	Mercury spectral analysis	F. Zambon
11:10-11:50	Mercury base data & mapping	V. Galluzzi
11:50-12:00	Zoom link change for Mercury practical	
12:00-12:30	Mercury practical introduction	V. Galluzzi
12:30-14:00	Lunch	
14:00-17:50	Mercury practical	V. Galluzzi et al.
17:50-18:00	Reconveen to plenary room	
18:00-19:00	Invited Talk: Mercury's Tectonics	Prof. K. Crane



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871149.



Mercury Base Data & Mapping

Dr. Valentina Galluzzi

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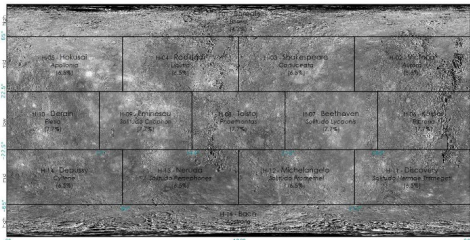


Mercury Base Data

MESSENGER datasets provide global coverage images useful for the photo-interpretation of the surface.

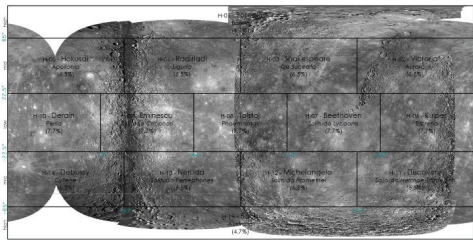
Best place to explore and download them: <https://messenger.quickmap.io/>

MDIS global mosaics



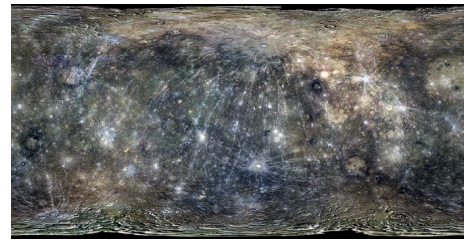
166 m/pixel

MDIS + M10 flyby mosaics



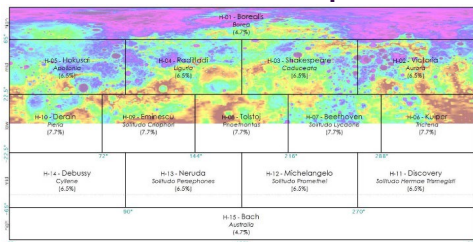
500 m/pixel

MDIS color mosaics



332, 665 m/pixel

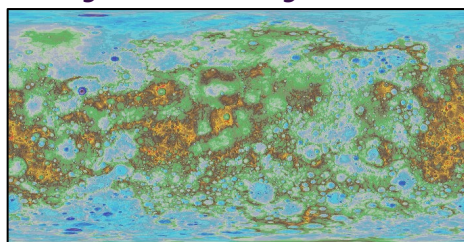
MLA DTM Northern hemisphere



[Zuber et al., 2012]

500 m

USGS global multi-image DTM



[Becker et al., 2016]

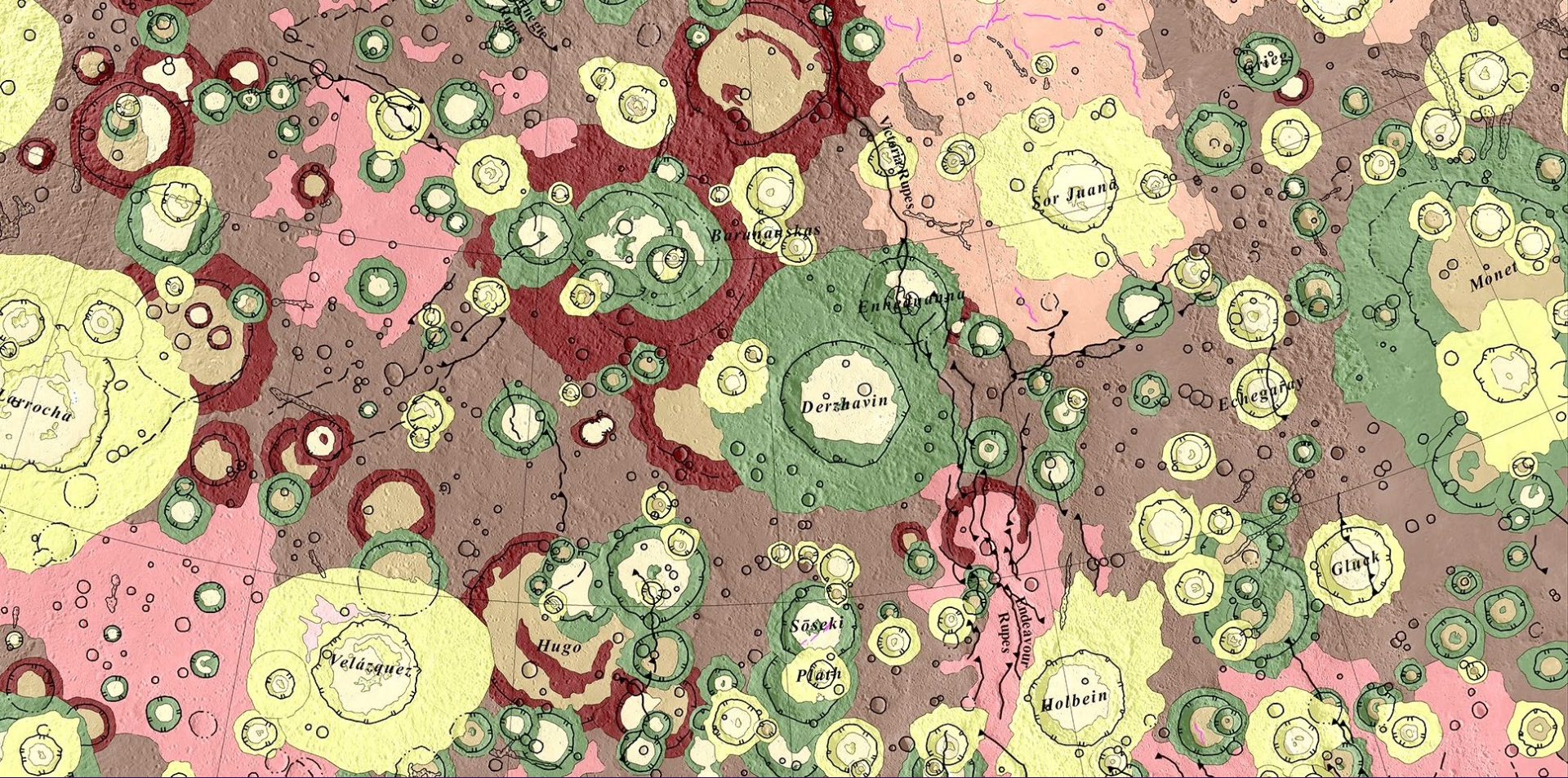
665 m

+ H03, H05, H06, H07

DLR regional DTMs

222 m

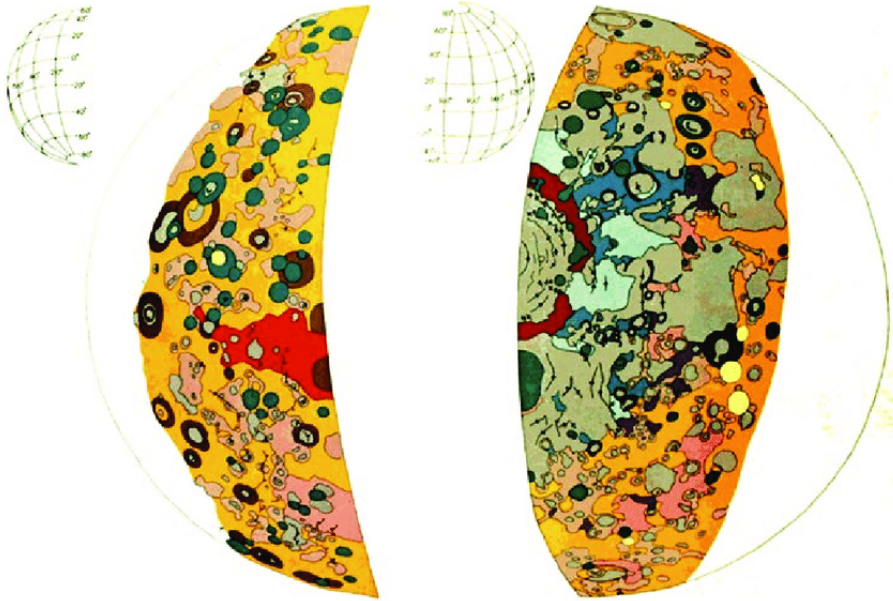




Past & Present Geological Maps of Mercury

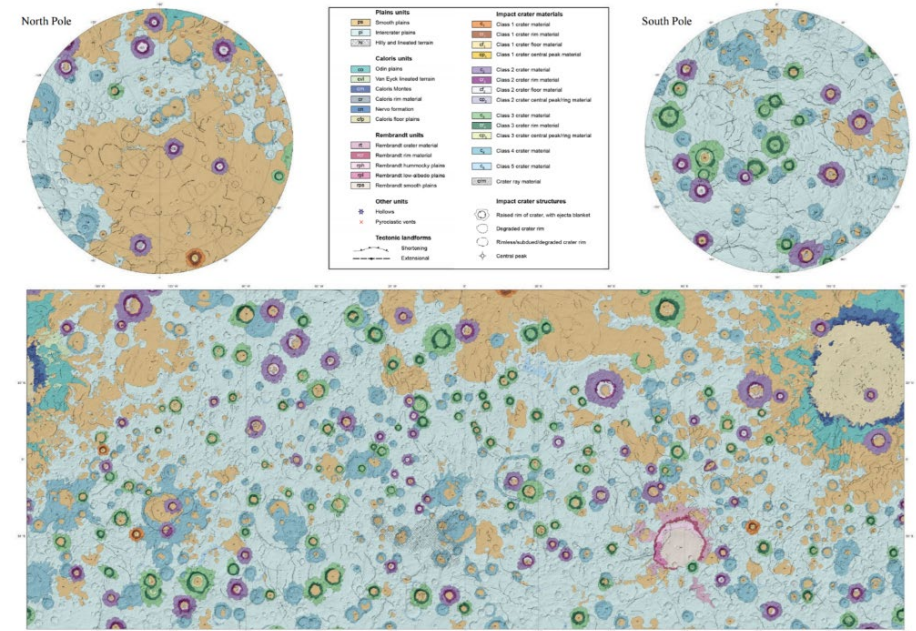
After the end of the Mariner 10 mission, a series of 1:5M-scale maps was produced.

Today, a 1:15M global map is being prepared by the MESSENGER team.



Mariner 10 preliminary geological map [Trask & Guest, 1975]

MESSENGER team, 1:15M global geologic map [Prockter et al., 2016]



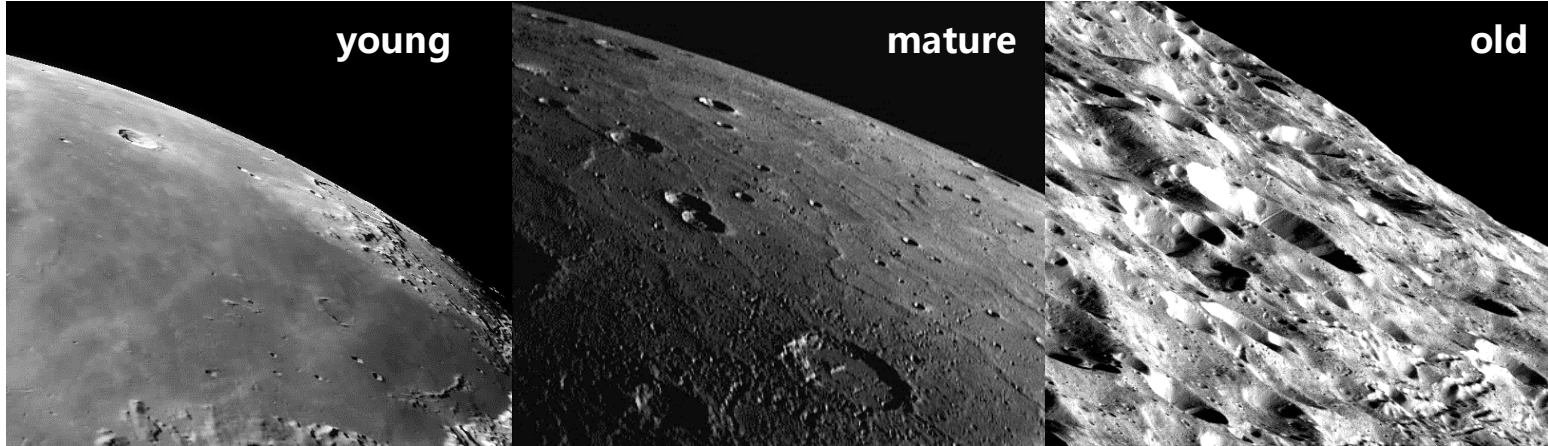
Space Weathering and Terrains Relative Ages

Impact craters are part of the space weathering process and change the terrain appearance in time.

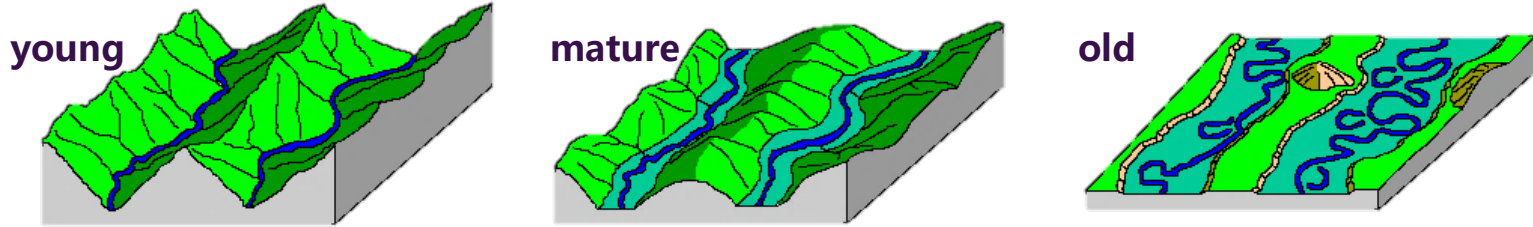
«On Mercury surface morphology reflects the age, composition, lithology, and mode of formation of the underlying rock units»

(Trask & Guest, 1975).

Airless Bodies



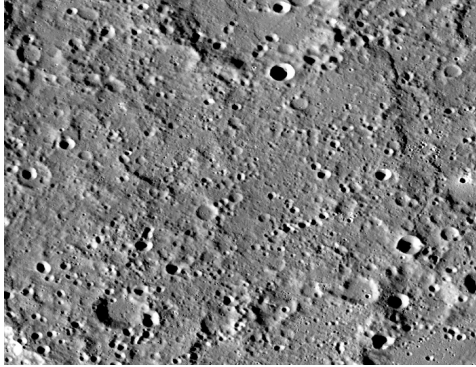
Earth



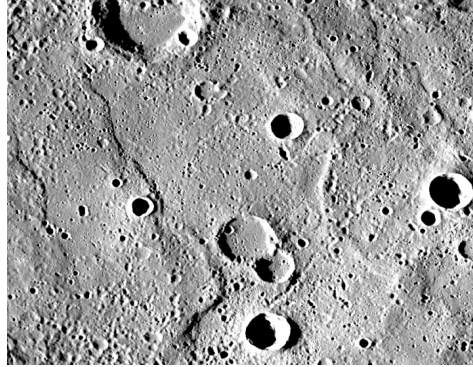
Main Geological Units

smoother = younger

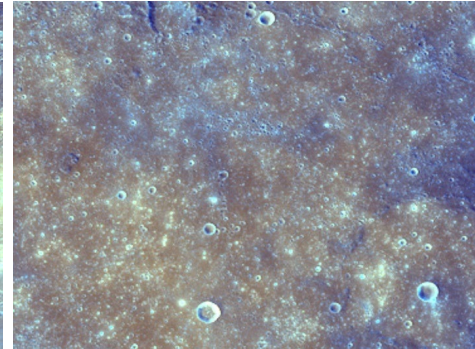
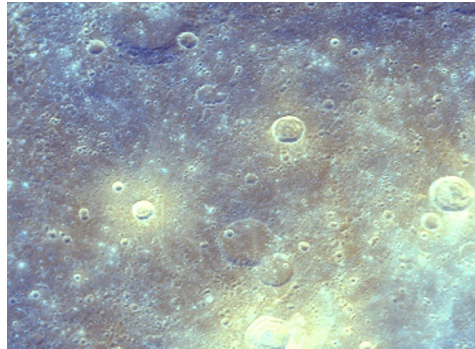
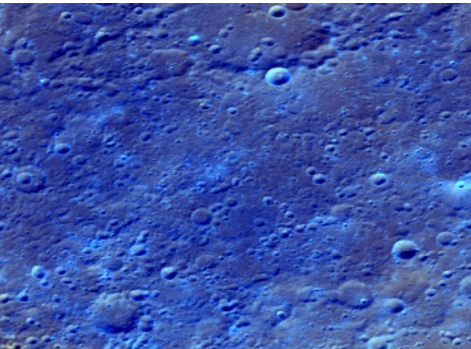
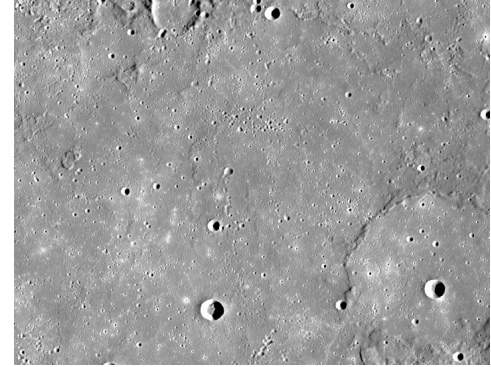
Inter crater Plains



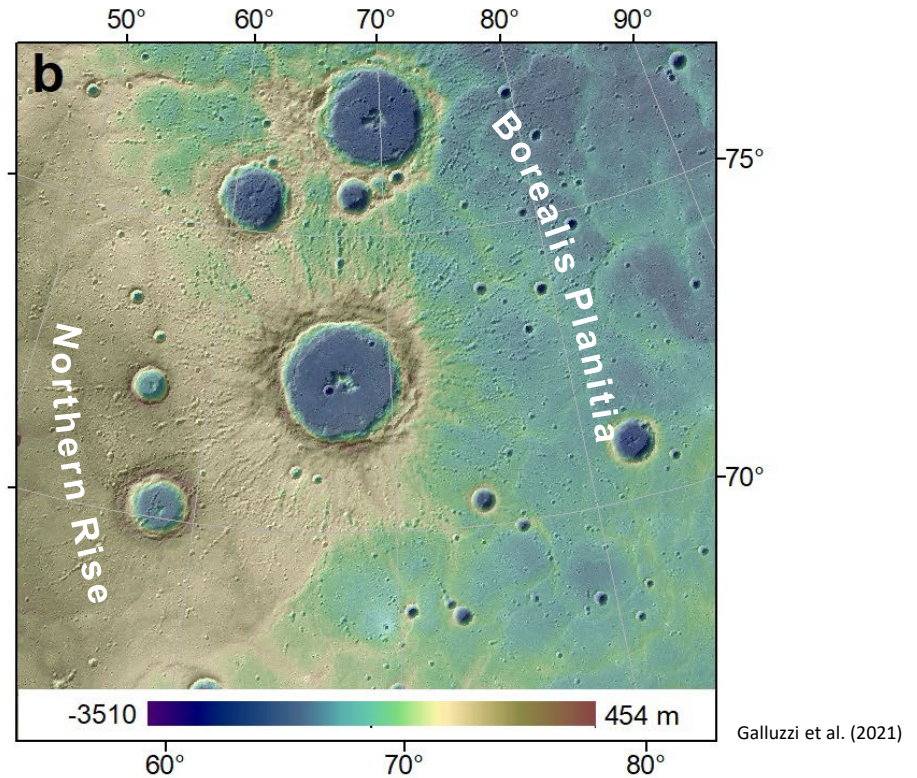
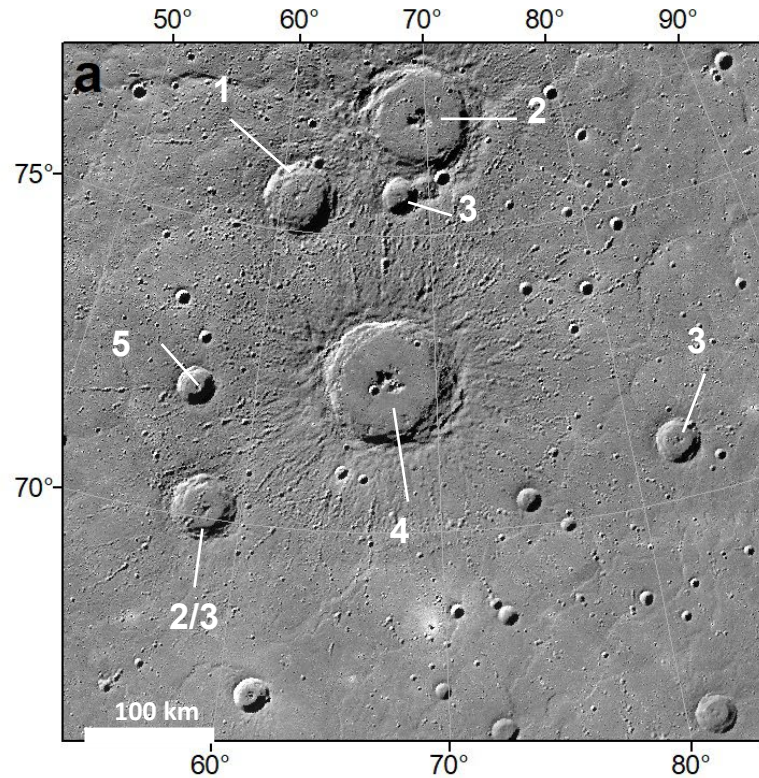
Intermediate Plains



Smooth Plains



Crater relative ages



Hermean Craters








Munch, Sander and Poe craters in false color, Caloris Planitia, Mercury, MESSENGER/MDIS

Geological Mapping

Legend



Crater Materials

-  fresh crater
-  moderately degraded crater
-  heavily degraded crater
-  crater smooth floor
-  crater hummocky floor




Surface Features

-  crater chain
-  hollow cluster
-  bright deposits
-  low reflectance material
-  faculae

Geological Contacts

-  contact, approximate
-  contact, certain





Terrain Units

-  smooth plains
-  intermediate plains
-  intercrater plains








Basin Units

-  Caloris inner smooth plains
-  Odin Formation
-  Van Eyck Formation
-  Nervo Formation
-  Caloris Montes Formation
-  Beethoven rim unit
-  Rembrandt rim units

Craters

-  crest of crater rim (diam. > 20 km)
-  crest of small crater rim (diam. > 5 km)
-  crest of subdued or buried crater
-  irregular pit

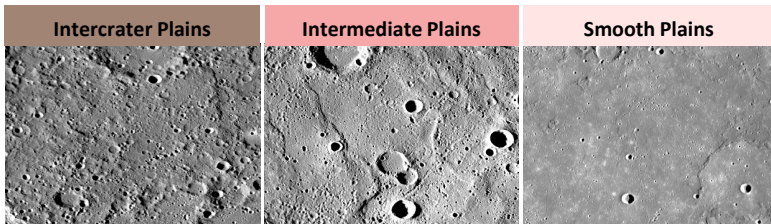
Structures

-  thrust, certain
-  thrust, uncertain
-  fault, certain
-  fault, uncertain
-  graben, certain
-  graben, uncertain
-  wrinkle ridge

Map symbols follow Planmap standards that are based on USGS FGDC standards.

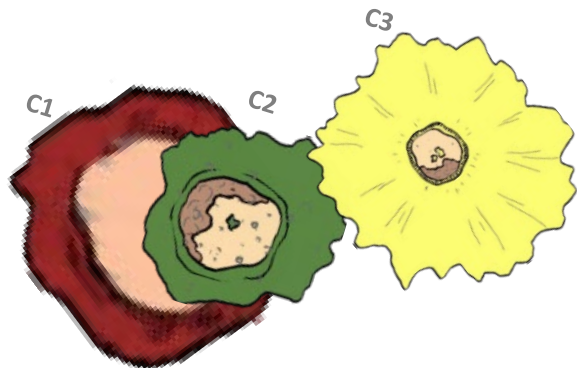
Quadrangle series

H02-H05
Map projection: Lambert Conformal Conic
Standard Parallels: 30°N, 58°N
H06-H10:
Map projection: Equirectangular
H11-H14
Map Projection: Lambert Conformal Conic
Standard Parallels: 30°S, 58°S
H01, H15
Map Projection: Polar Stereographic

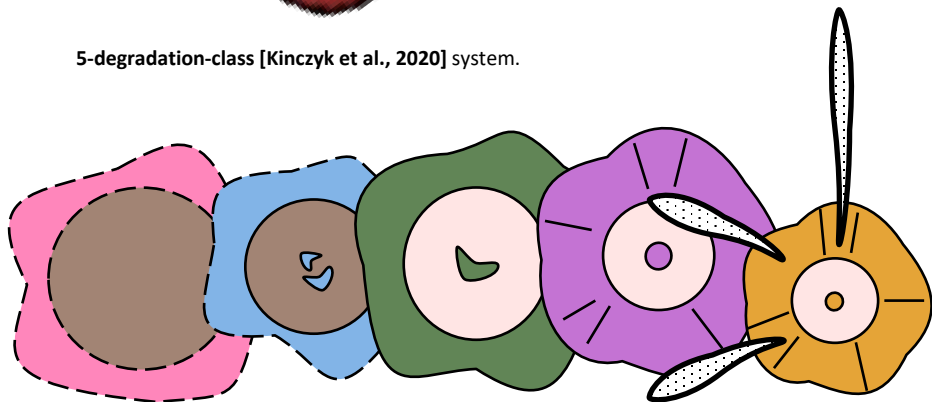


Craters larger than 20 km:

3-degradation-class [Galluzzi et al., 2016] system.



5-degradation-class [Kinczyk et al., 2020] system.



c1: Pre-Tolstojan | c2: Tolstojan | c3: Calorian | c4: Mansurian | c5: Kuiperian



European 1:3M Quadrangle Geological Map series

Legend

Crater Materials

- fresh crater
- moderately degraded crater
- heavily degraded crater
- crater smooth floor
- crater hummocky floor

Surface Features

- crater chain
- hollow cluster
- bright deposits
- low reflectance material
- faculae

Geological Contacts

- contact, approximate
- contact, certain

Terrain Units

- smooth plains
- intermediate plains
- intercrater plains

Basin Units

- Caloris inner smooth plains
- Odin Formation
- Van Eyck Formation
- Nervo Formation
- Caloris Montes Formation
- Beethoven rim unit
- Rembrandt rim units

Craters

- crest of crater rim (diam. > 20 km)
- crest of small crater rim (diam. > 5 km)
- crest of subdued or buried crater
- irregular pit

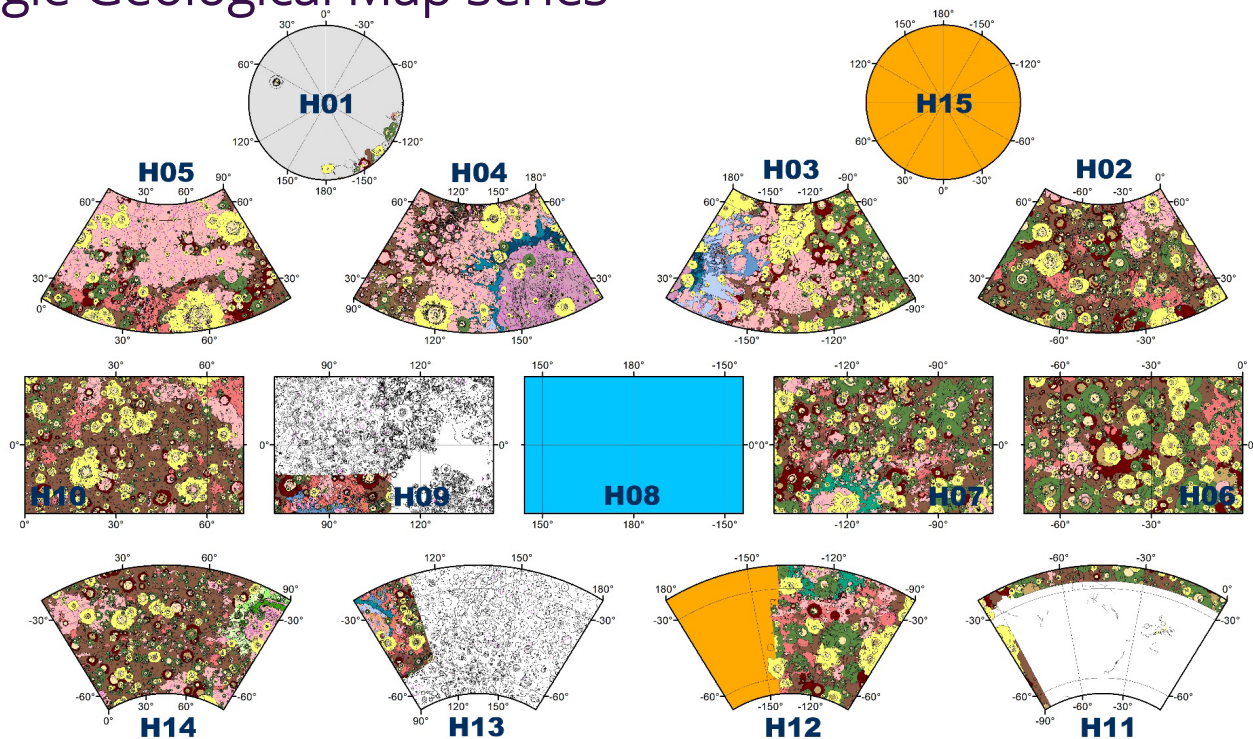
Structures

- thrust, certain
- thrust, uncertain
- fault, certain
- fault, uncertain
- graben, certain
- graben, uncertain
- wrinkle ridge

Map symbols follow Planmap standards that are based on USGS FGDC standards.

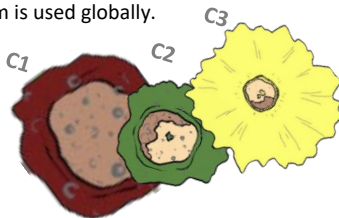
Quadrangle series

H02-H05
Map projection: Lambert Conformal Conic
Standard Parallels: 30°N, 58°N
H06-H10
Map projection: Equirectangular
H11-H14
Map projection: Lambert Conformal Conic
Standard Parallels: 30°S, 58°S
H01, H15
Map Projection: Polar Stereographic



Craters larger than 20 km:

3-degradation-class system is used globally.



In Progress



Scheduled



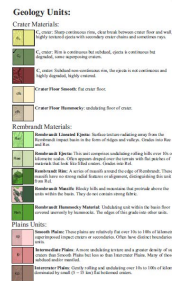
Not Scheduled
(see Ostrach et al., 2020)



D. L. Pegg², D. A. Rothery¹, M. R. Balmé¹, S. J. Conway³, C. C. Malliband¹, B. Man¹


¹The Open University, Milton Keynes, MK7 6AA, UK. ²CNRS UMR 6112 Laboratoire de Plasmologie et Géodynamique, Université de Nantes, France

The location of the Debussy Quadrangle (H-14) on Mercury. Shown on the "global colour mosaic" [1] using a Robinson projection.

Science and
Technology
Facilities Council

Pegg et al.
[2021, JoM]

Crater Rim (Diameter > 20 km)
 Crater Rim (Diameter 5 - 20 km)
 Crater Crest (Subdued or Buried)
 Contact, Certain
 Contact, Approximate
 Thrust Fault, Certain
 Thrust Fault, Uncertain
 Fault, Certain
 Fault, Uncertain
 Wrinkle Ridge
 Graben, Certain
 Graben, Uncertain
 Pig

	Hollowness: Random, irregular, but focused depressions with relatively high altitude compared to our readings.
	Bright Center Rays: High altitude quasi features often found radial to a growing ring location.
	Fuzziness: Most of which are spectrally red spots with diffuse edges, many of which are interpreted to be products of stepwise reduction.
	Calamities: Chains of cavities in a line, often linked to a nearby large insect cavity.

Central Meridian: 45°E
Standard Parallel 1: 30°N
Standard Parallel 2: 58°N
Spheroid Radius: 2440 km
Scale: 1:3 Million

Key words:
 [1] Donati, B.V. et al., *Final calibration and multi-epoch map products from the Mercury Double Imaging System Wide-Angle Camera* on MESSENGER, *Lunar Planet. Sci.*, abstract 13246.
 [2] *Guide to Planetary Nomenclature*, International Astronomical union, <http://planetarynames.wr.usgs.gov/account>, 27th May 2012

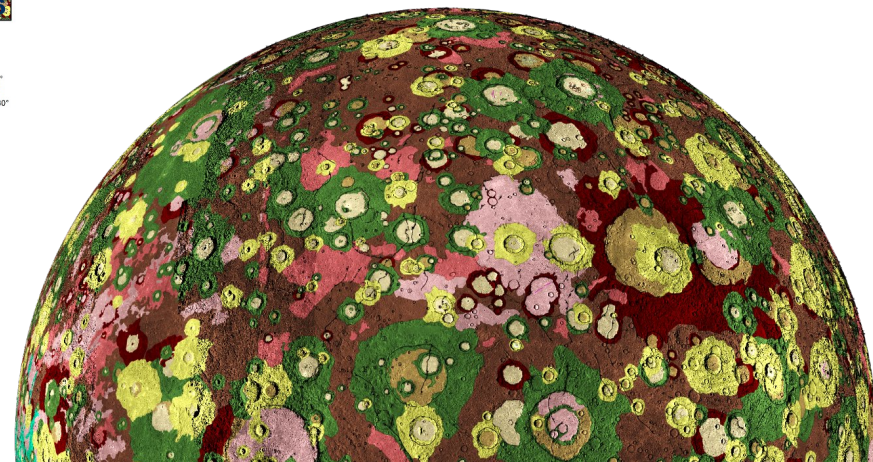
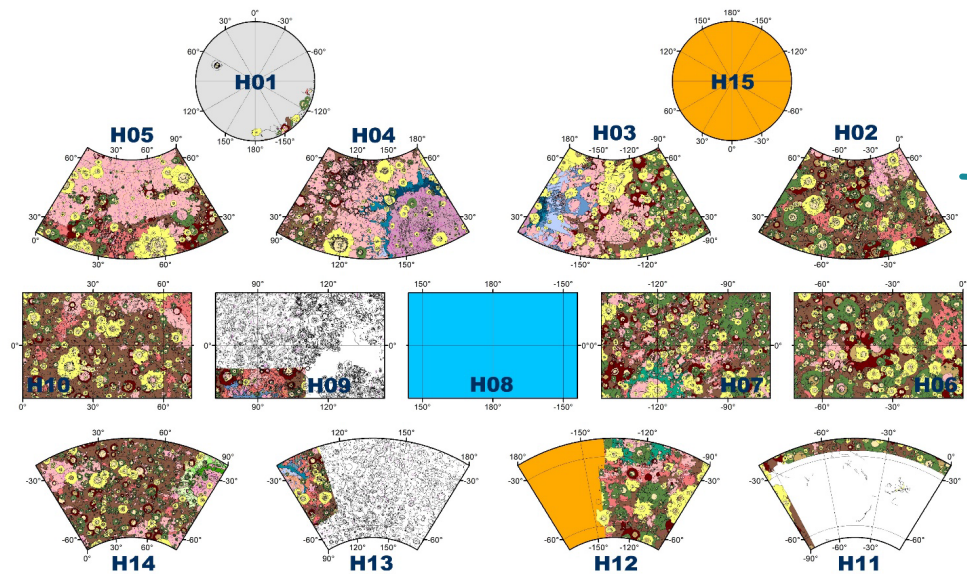
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 782756. David Pegg was part funded by UKRI STFC studentship grant number ST/R009933/1.



PLANMAP



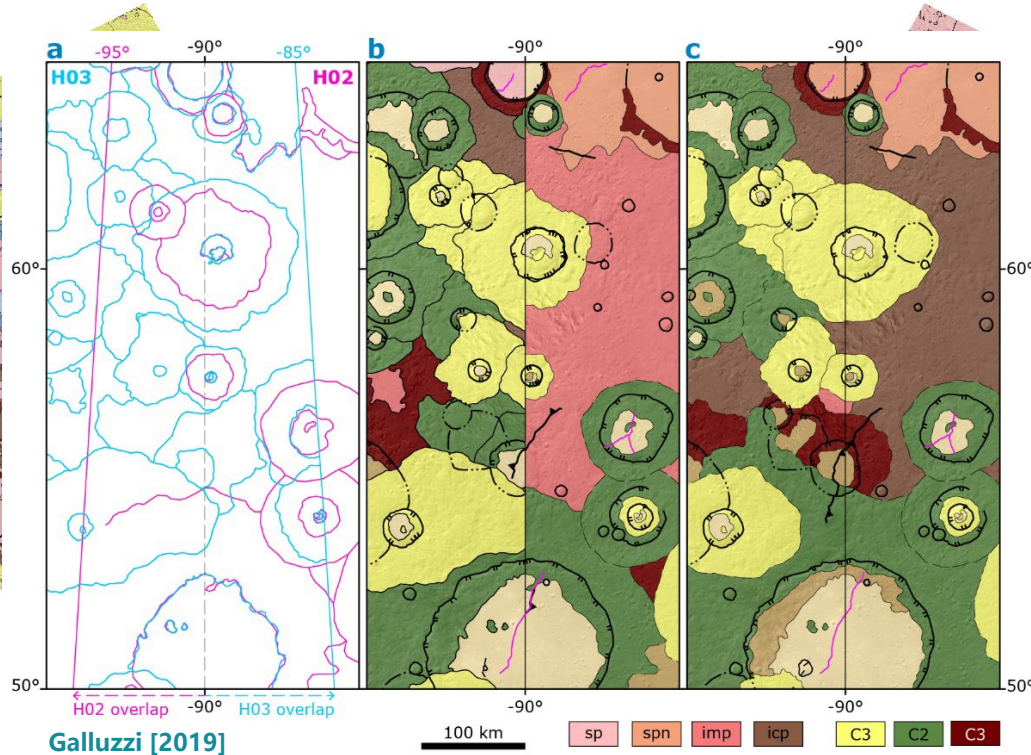
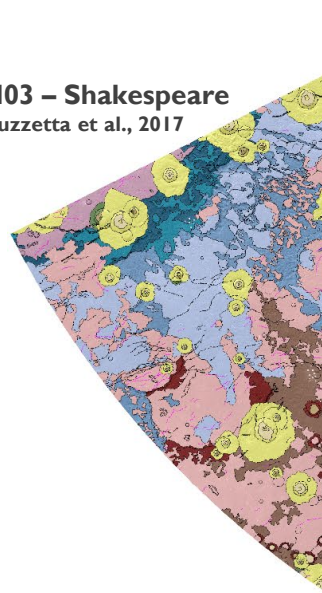
Towards a Global Map



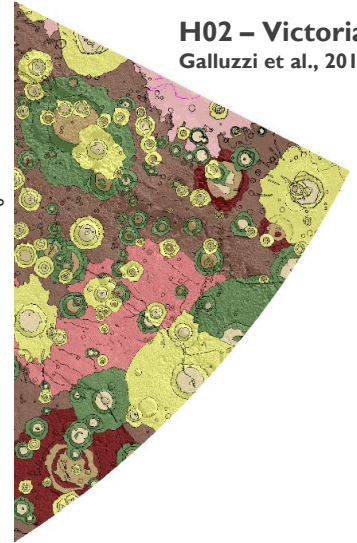
Towards a Global Map

When two adjoining maps are completed they are manually **stitched together** by the authors to avoid unconcinstencies. The correct stitching among all quadrangles will be fundamental for deriving the **global stratigraphic column**.

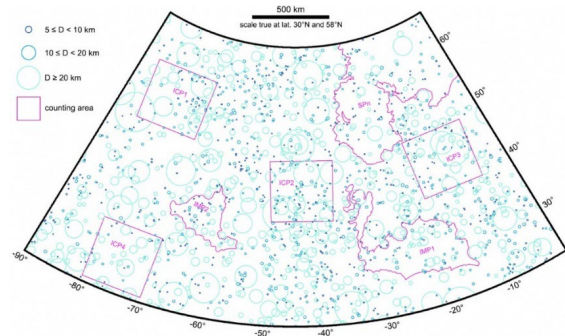
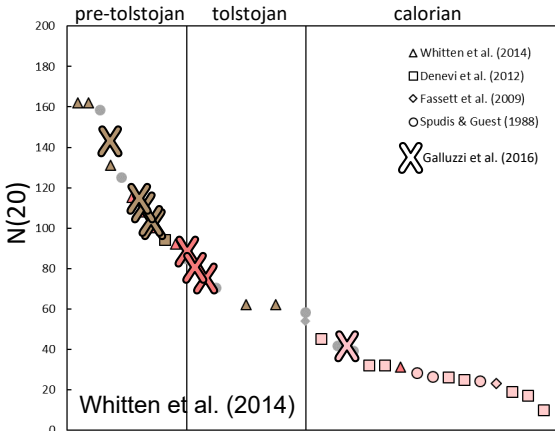
H03 – Shakespeare
Guzzetta et al., 2017



H02 – Victoria
Galluzzi et al., 2016

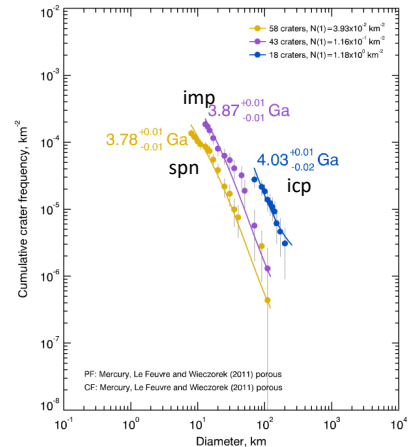
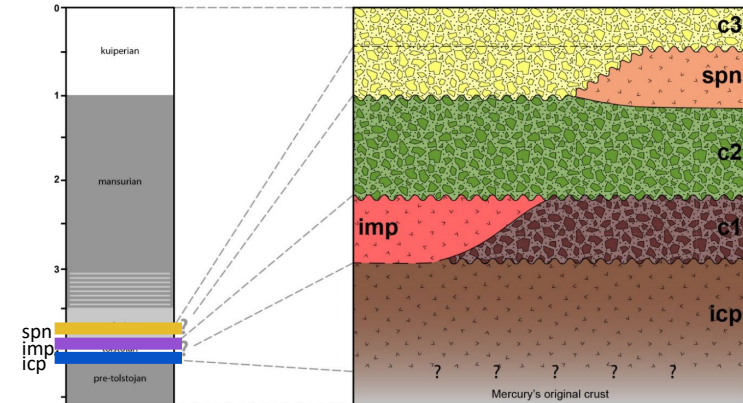


Understanding the Stratigraphy



Galluzzi et al. [2016, JoM]

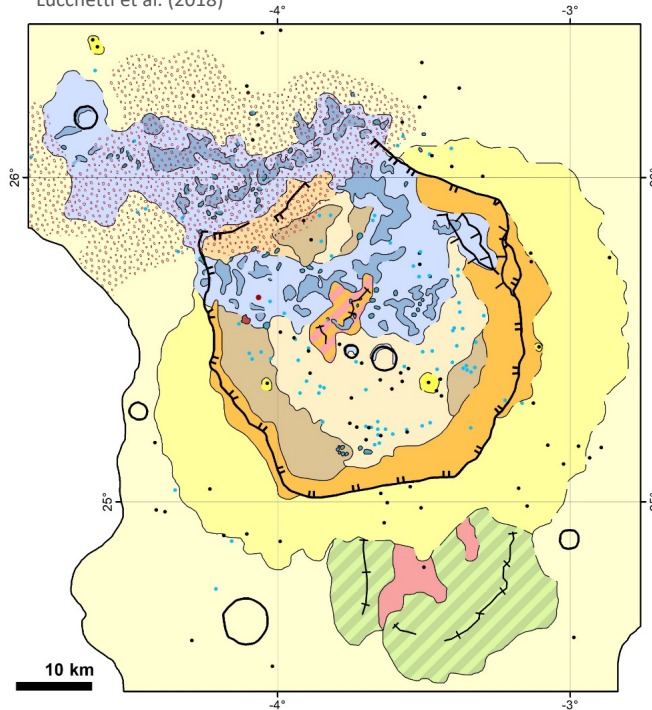
Area name	Unit description	N(20) ± σ
SPn	Northern smooth plains, NE	40 ± 10
IMP1	Intermediate plains, E	76 ± 20
IMP2	Intermediate plains, W	89 ± 34
IMP	Intermediate Plains, all areas	80 ± 17
ICP1	Inter crater Plains, NW	102 ± 25
ICP2	Inter crater Plains, central	142 ± 30
ICP3	Inter crater Plains, E	103 ± 26
ICP4	Inter crater Plains, SW	111 ± 26
ICP	Inter crater Plains, all areas	114 ± 13



Mapping Hollows

Geological Map of Canova crater, Mercury 1:400,000

Lucchetti et al. (2018)



Legend

Crater Units

- crater rim unit
- crater central peak
- crater proximal ejecta
- crater distal ejecta
- wall smooth talus
- crater floor
- crater floor talus
- secondary crater ejecta
- dark material

Hollows Units

- single hollow
- hollow field
- hollowed terrain

Other Units

- melt pool
- older central peak

Surface Features

- facula

Geological Contacts

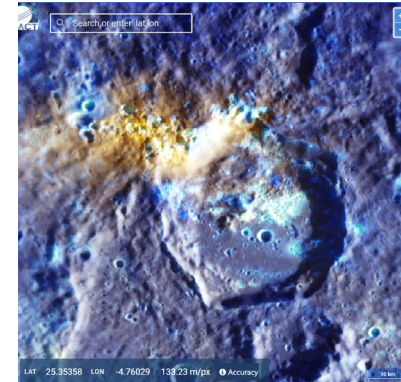
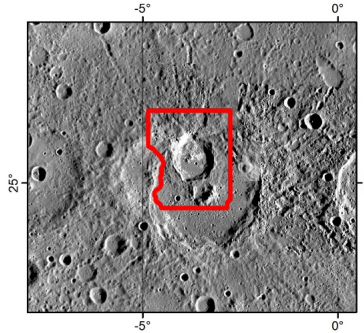
- contact, certain
- contact, approximate

Location Features

- dark spot
- bright spot
- secondary crater

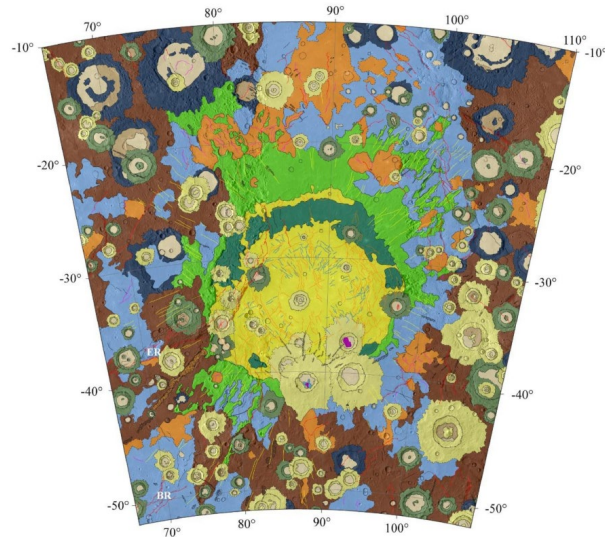
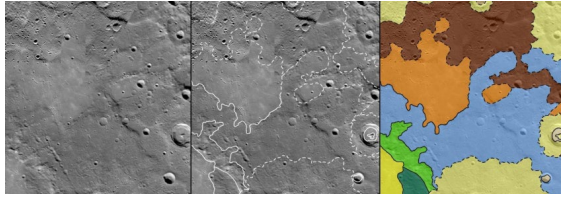
Map Projection

- Equidistant Cylindrical
- Central Meridian: -3.75°
- Central Parallel: 25.58°
- Planet Radius: 2439.4 km

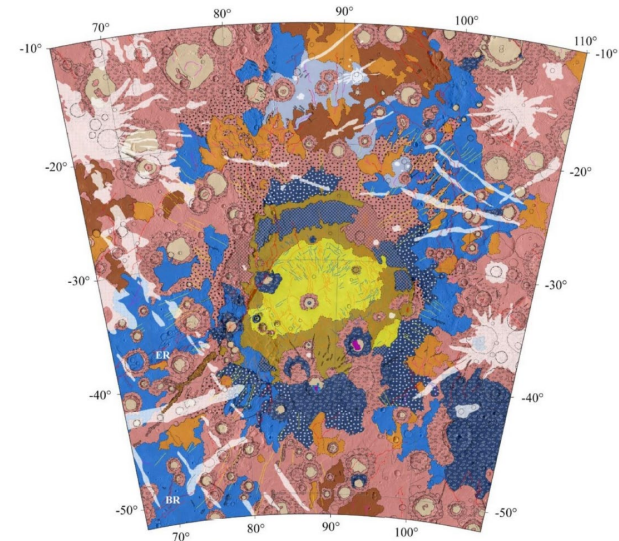
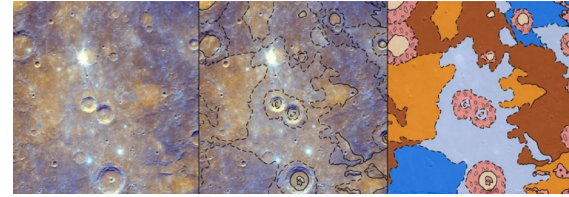


Integrated Planetary Geological Maps

Morpho-Stratigraphic Map



Geo-Stratigraphic Map



Semenzato et al. (2020)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871149.



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A stylized illustration of a solar system on a dark blue background with white stars. A large yellow sun is at the top left. Several planets of different colors (orange, blue, white, teal) and sizes are shown on elliptical orbits. A satellite is depicted in the center. The text 'eur@PLANET 2024' is in the top right, with 'Research Infrastructure' below it.

eur@PLANET 2024

Research Infrastructure