



# Mercury Global Geological Map

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MESSENGER-BepiColombo Joint Meeting

DLR

16 June 2015

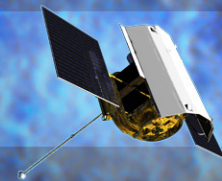




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## Background

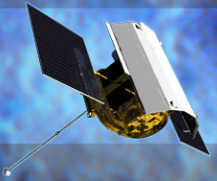
- The MESSENGER Project has agreed to support the production of a global map
  - Original plans for quadrangle maps are not being pursued at this time, due to resource constraints
- It is anticipated that the Mercury global map will be completed before the end of Phase F (April 2016)
- The map will be published online and as part of a peer-reviewed publication
  - Additional funding may be sought post-Phase F to publish the map as a formal USGS publication



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## Value of a global geological map

- This would be the first ever global map of Mercury
  - Global correlations among units would be enabled
  - The global stratigraphic history can be constructed
- Standards will be set to provide broad context for current and future quadrangle mappers
  - Some regional geologic mapping is underway, however, there is little or no coordination among these mappers
  - Global and regional map units will be defined
  - Existing units will be identified and reviewed, e.g., Mariner 10 maps; Galuzzi et al., submitted; Denevi et al. 2013, etc.
- The map will be useful for BepiColombo planning

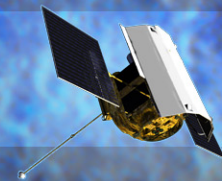




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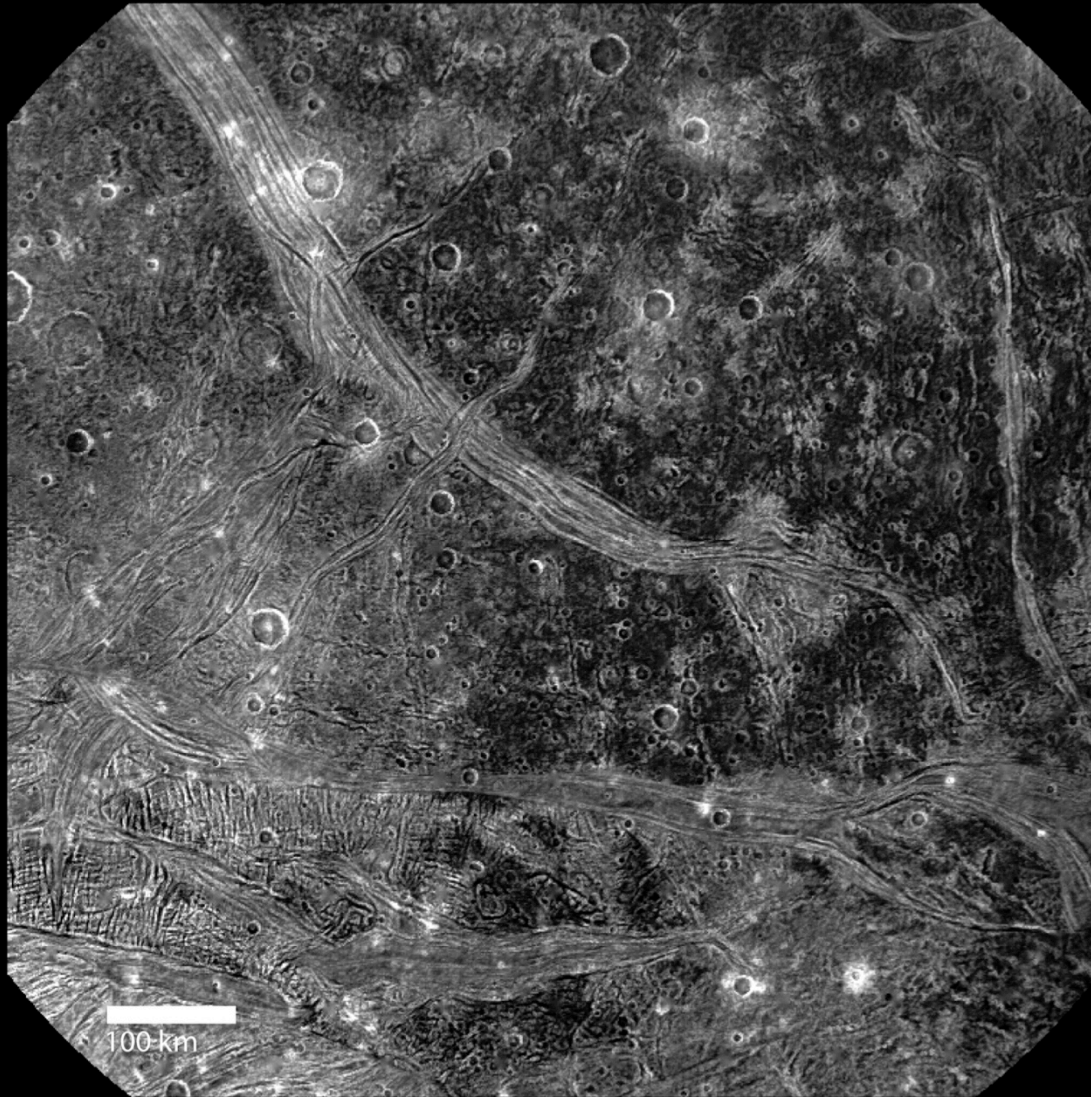
## Mariner 10 mapped units

### Plains units and relief-forming materials

		Bach	Beethoven	Borealis	Discovery	Kuiper	Michelangelo	Shakespeare	Tolstoj	Victoria
pvs	Very smooth plains material	X			X		X	X	X	
ps	Smooth plains material	X	X	X	X	X	X	X	X	X
psi	Intermediate plains material	X	X	X	X		X	X	X	X
pi	Intercrater plains material	X	X	X	X	X	X	X	X	X
pc	Cratered plains material					X				X
ptu/pu	Plains and terra material, undivided		X			X				
d	Dark material					X				
ptu	Plains and terra material									
pl	Lineated plains							X		
cfp	Caloris floor plains material							X	X	
h	Hilly plains material							X		
hl/thl	Hilly and lineated material				X	X				
ph	Hummocky plains material				X					
tr	Rough terra material					X				



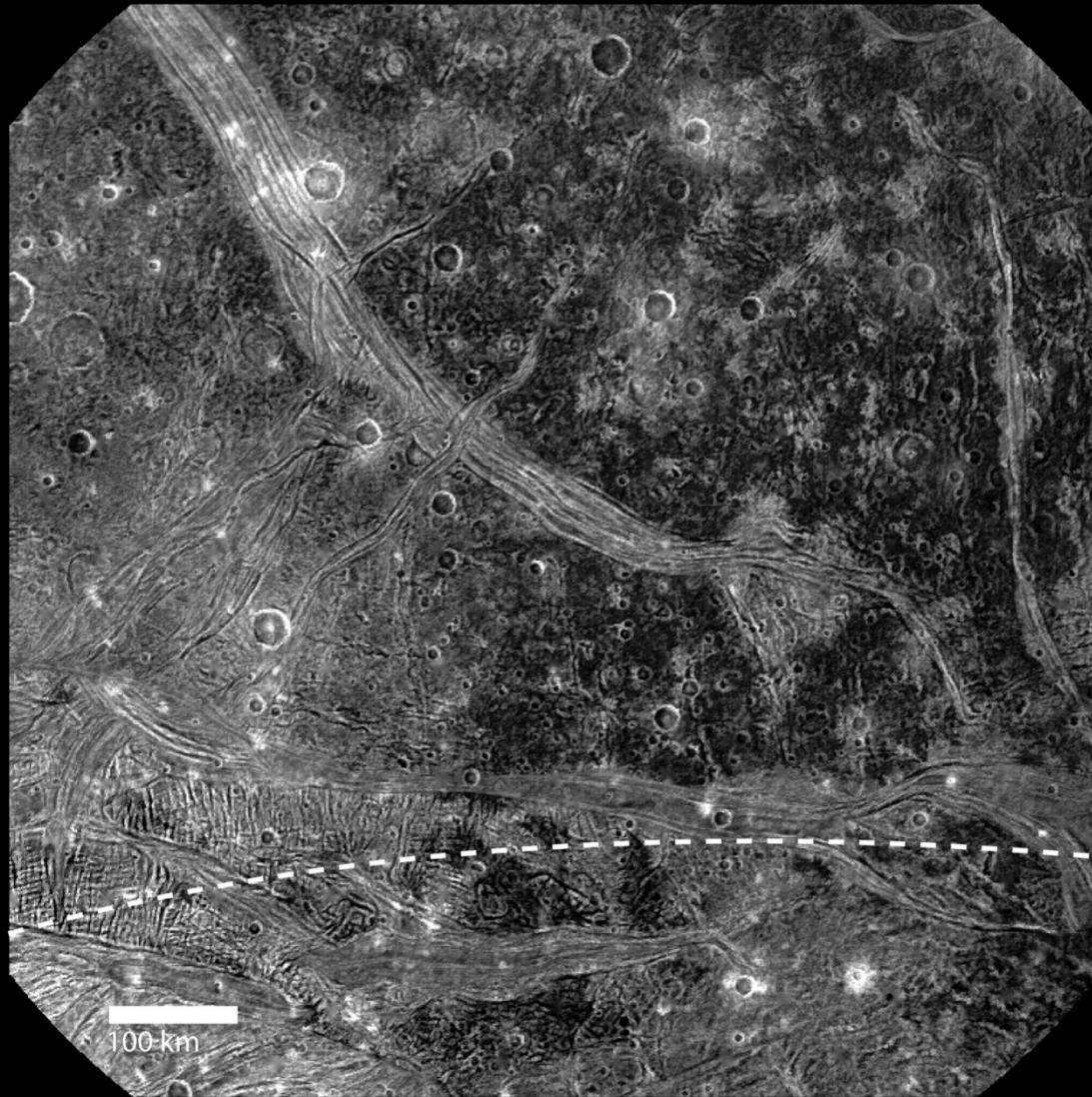
**A global map will provide regional-level guidance**



**Ganymede example**



**A global map will provide regional-level guidance**



**Ganymede example**



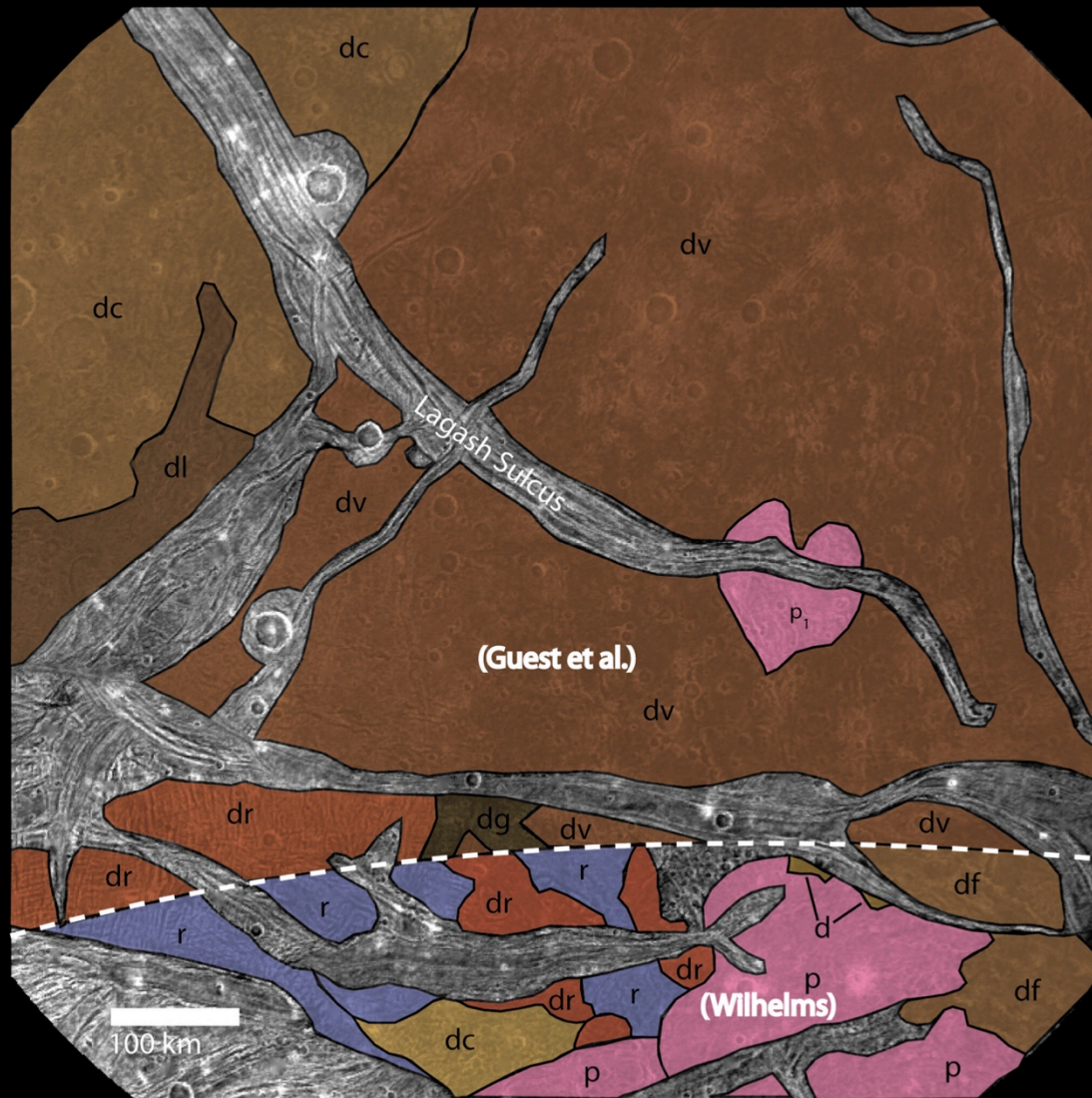
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Ganymede example

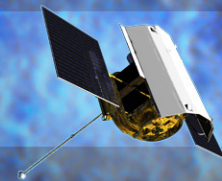




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## Current plan

- The final product will be a **morphostratigraphic** map
  - Chemical information will not be used to discriminate units, although geochemical datasets may be included in the final digital map product
- Mapping will be carried out at the 1:15 million scale, the same as the final printed map
  - Comparable to the second global map of Mars, (Scott and Tanaka, 1986; Greeley and Guest, 1987; Tanaka and Scott, 1987)
    - Viking Orbiter images mostly between 100 and 300 m/pixel resolution were used as the basemap
- Scale was chosen based on previous global maps (e.g., Mars, Ganymede) and on time availability
  - Detailed local mapping will be left to future quadrangle mappers

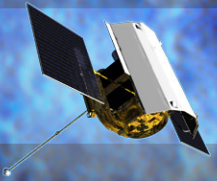




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## Existing and available datasets

- Global MDIS basemap
- Global MDIS color map
- Topography – existing archived database
- Tectonic structure map (P. Byrne)
  - 1:2 million scale
- Plains unit maps (B. Denevi, J. Whitten)
  - 1:25 million scale
- Crater database >20 km diameter (C. Fassett)
- Crater and ejecta units
- Hollows and vents database (R. Thomas)
  - These features are too small to be resolved individually on the map, but their extents and locations will be identified

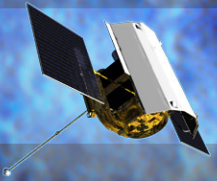




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## Schedule (1/2)

### Summer

- Define units at mapped scale – **in progress**
  - Mini-workshop held June 1 at APL
  - Intermediate plains unit designation will probably be discarded
- Incorporate existing databases into map – **in progress**
  - Verify existing unit boundaries and reclassify if necessary
  - Review and classify lobate scarps and wrinkle ridges
  - Map additional ghost craters
- Classify craters and basins by age – **in progress**
  - The five traditional age classes will be used as a baseline
  - We will investigate where Rembrandt falls in the stratigraphic column
- Map impact ejecta for large basins and craters

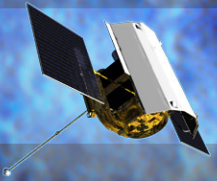




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## Schedule (2/2)

### Fall

- Finish mapping
- Contribute plains unit definitions to Brett Denevi's Mercury book chapter
- Ensure continuity among all Mercury book chapters referencing geological units

### Winter/Spring

- Prepare manuscript to accompany map
- Prepare map and manuscript for publication

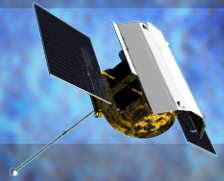




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**Backup**

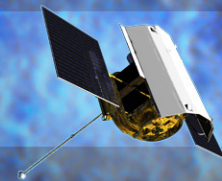




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## Digital mapping

- The map base is a geometrically controlled product that is the fundamental data set upon which map drafting is performed
  - The map base can be generated by the team with permission from the USGS Map Coordinator
- Mapping is generally carried out using Adobe Illustrator or ArcGIS
  - For GIS mapping projects the USGS GIS Project Specialist generates an ArcGIS map template after quality-checking and collating GIS data layers. The template includes map bases and a map-ready geodatabase with pre-populated symbols

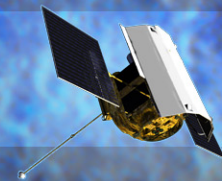




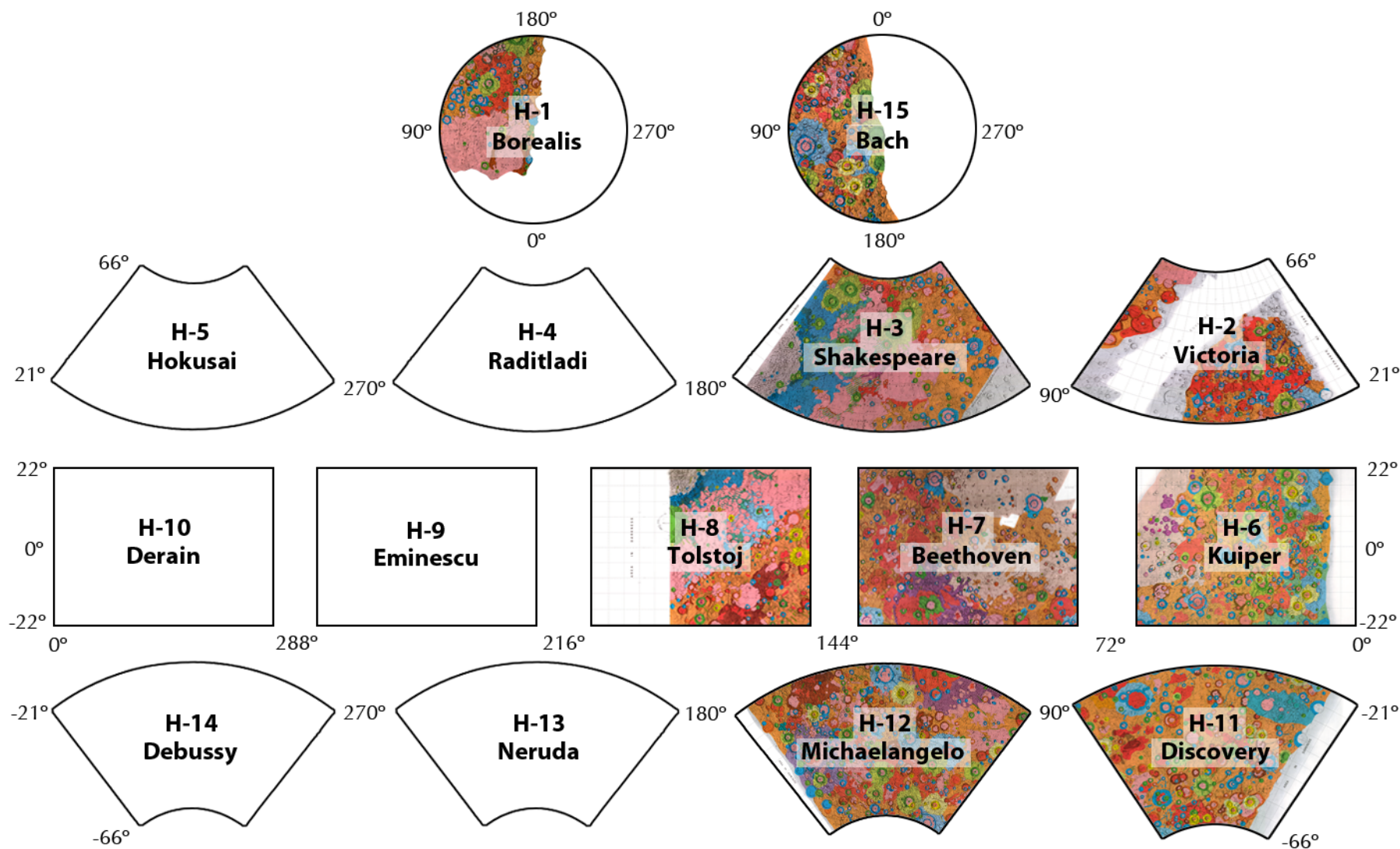
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## Existing quadrangle maps (Mariner 10)



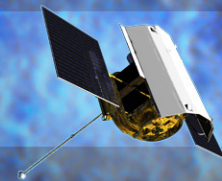




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## What mapping is underway?

- BepiColombo team mapping
  - Naples team – Victoria quad close to publication, they are also considering mapping Shakespeare
  - Padova/Padua team – two of these: Borealis, Kuiper, Neruda
  - Open University team – one other TBD quad, start Oct '15
- Regional maps
  - Rembrandt (Hynek, Whitten)
  - Caloris Basin (Buczkowski, Byrne, ???)
  - Raditladi, Rachmaninoff, Mozart (Prockter)
  - Others?

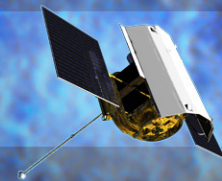




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# Current and proposed mapping

- The Padua team plan to map two of the three quads shown here
- There will be one additional quad from the OU, Oct 2015

