

# PLANetary MAPping at different scales: insights on Mercury and the Moon

PhD student: Gloria Tognon

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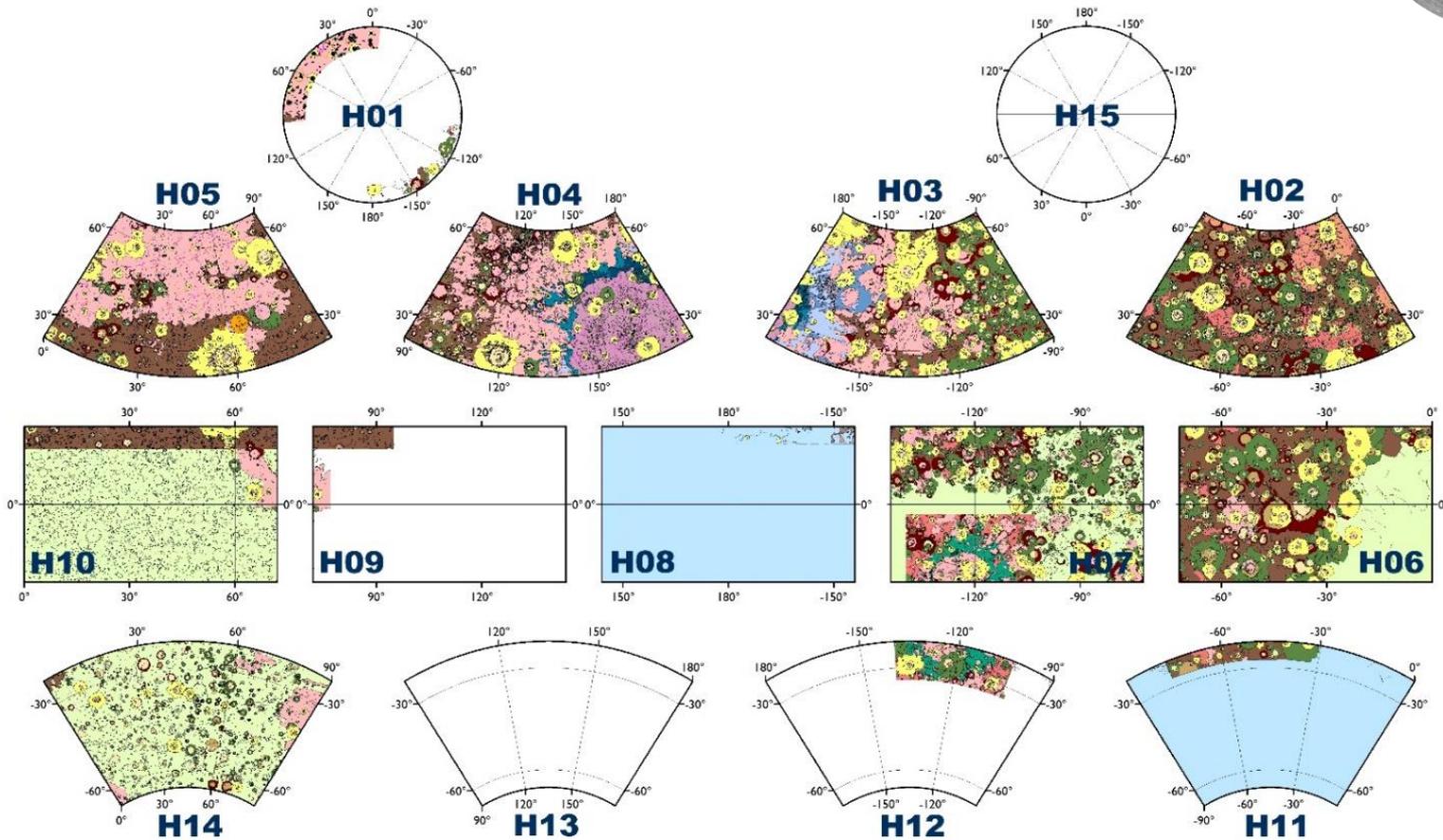


Mercury

Large-scale mapping

# Mercury's mapping

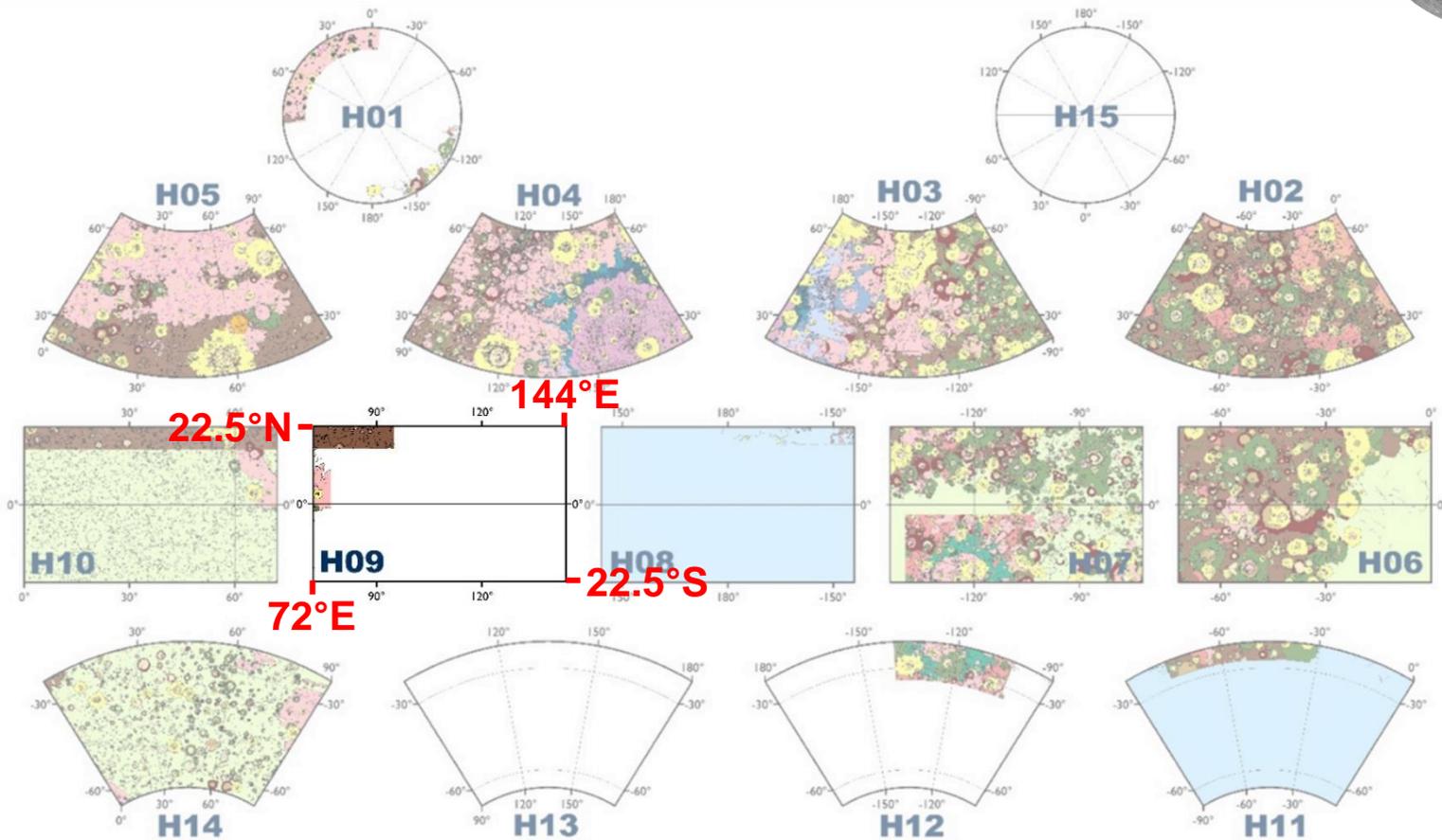
Current status of 1:3M regional geological maps production



# Mercury's mapping



Current status of 1:3M regional geological maps production



H9 Eminescu quadrangle ( $22.5^{\circ}\text{N} - 22.5^{\circ}\text{S}$ ,  $72^{\circ}\text{E} - 144^{\circ}\text{E}$ )

# Data

From MESSENGER mission



- Monochrome mosaics from Mercury Dual Imaging System (MDIS):

- Basemap reduced Data Record (BDR) ~ 166 m/px
- High-Incidence angle from East (HIE) ~ 166 m/px
- High-Incidence angle from West (HIW) ~ 166 m/px
- Low-Incidence angle (LOI) ~ 166 m/px

- Color mosaics from Mercury Dual Imaging System (MDIS):

- Enhanced-colour mosaic ~ 665 m/px  

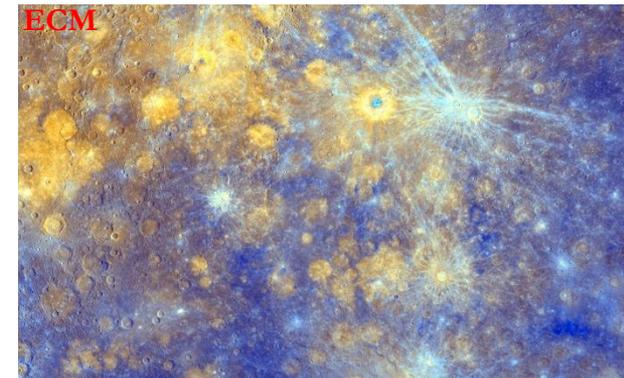
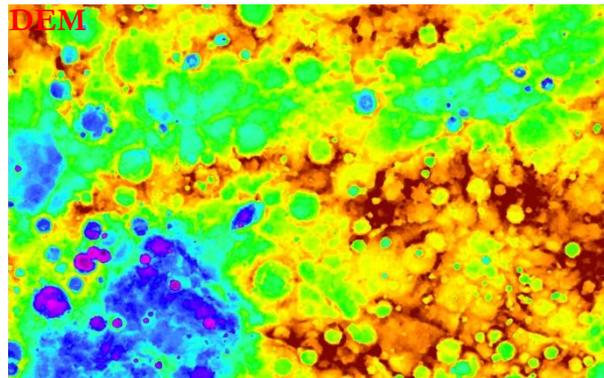
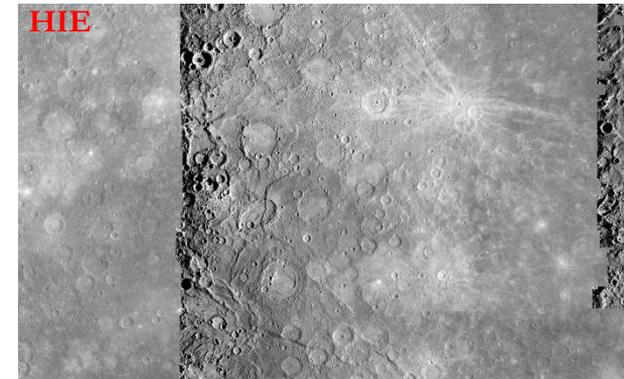
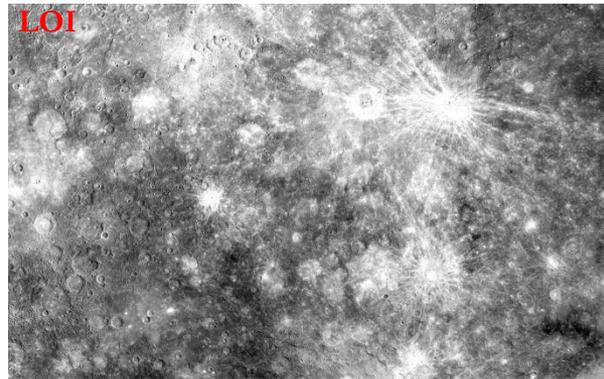
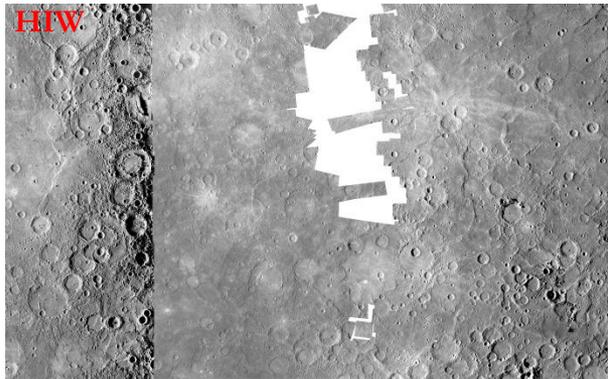
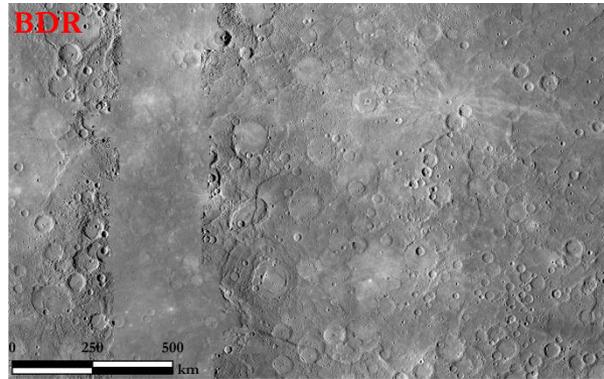
R: PC2	G: PC1	B: 430/996 nm
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- 3-Color map-projected Multispectral reduced Data Record (MD3) ~ 665 m/px  

R: 996 nm	G: 750 nm	B: 430 nm
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- Topographic data:

- USGS Mercury MESSENGER Global DEM ~ 665 m/px

# Data

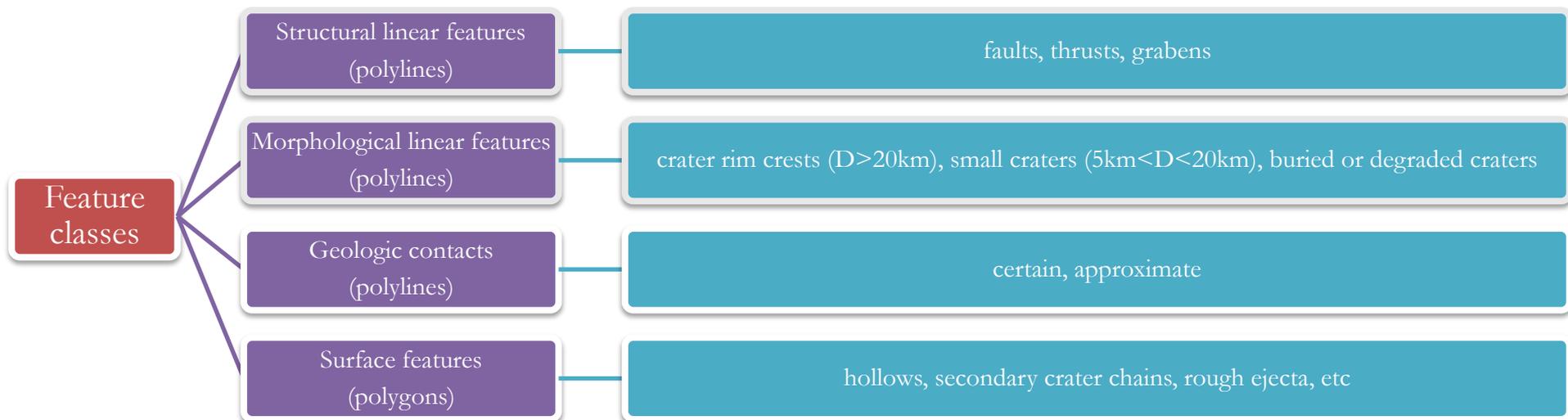


# Methods



- Software: ESRI ArcGis 10.4.1
  - Projection system: Equirectangular projection on D\_Mercury\_2015 datum
  - Output scale: 1:3.000.000
  - Mapping scale:  $\sim 1:332.000$  for monochrome basemaps  
 $\sim 1:1.330.000$  for colour basemaps
- }

$S_m = R_r \times 2000$   
*Tobler (1987)*
- Geodatabase configuration:

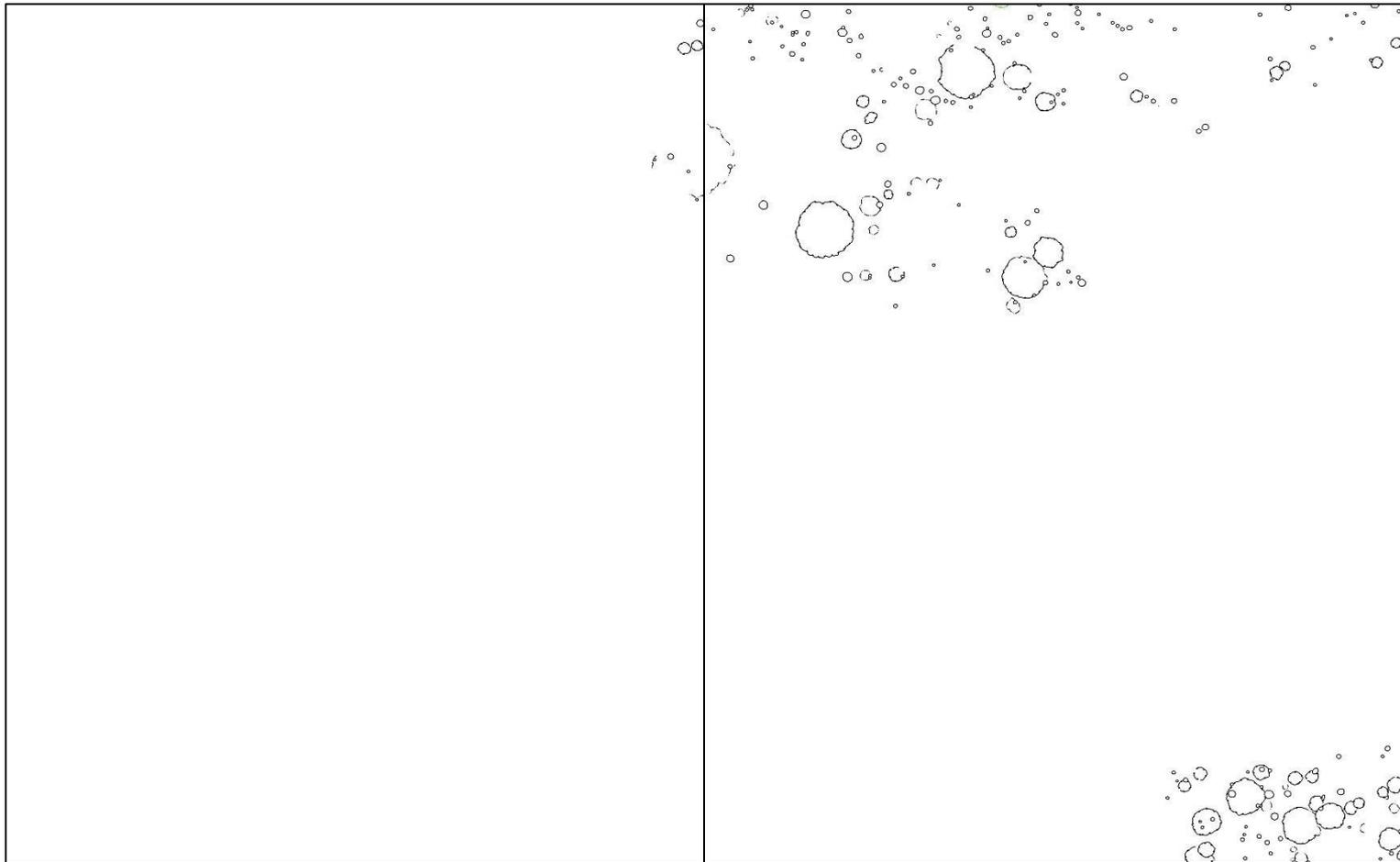


# Morphological mapping

— crest of crater rim  $5\text{km} < D < 20\text{km}$

— crest of crater rim  $D > 20\text{km}$

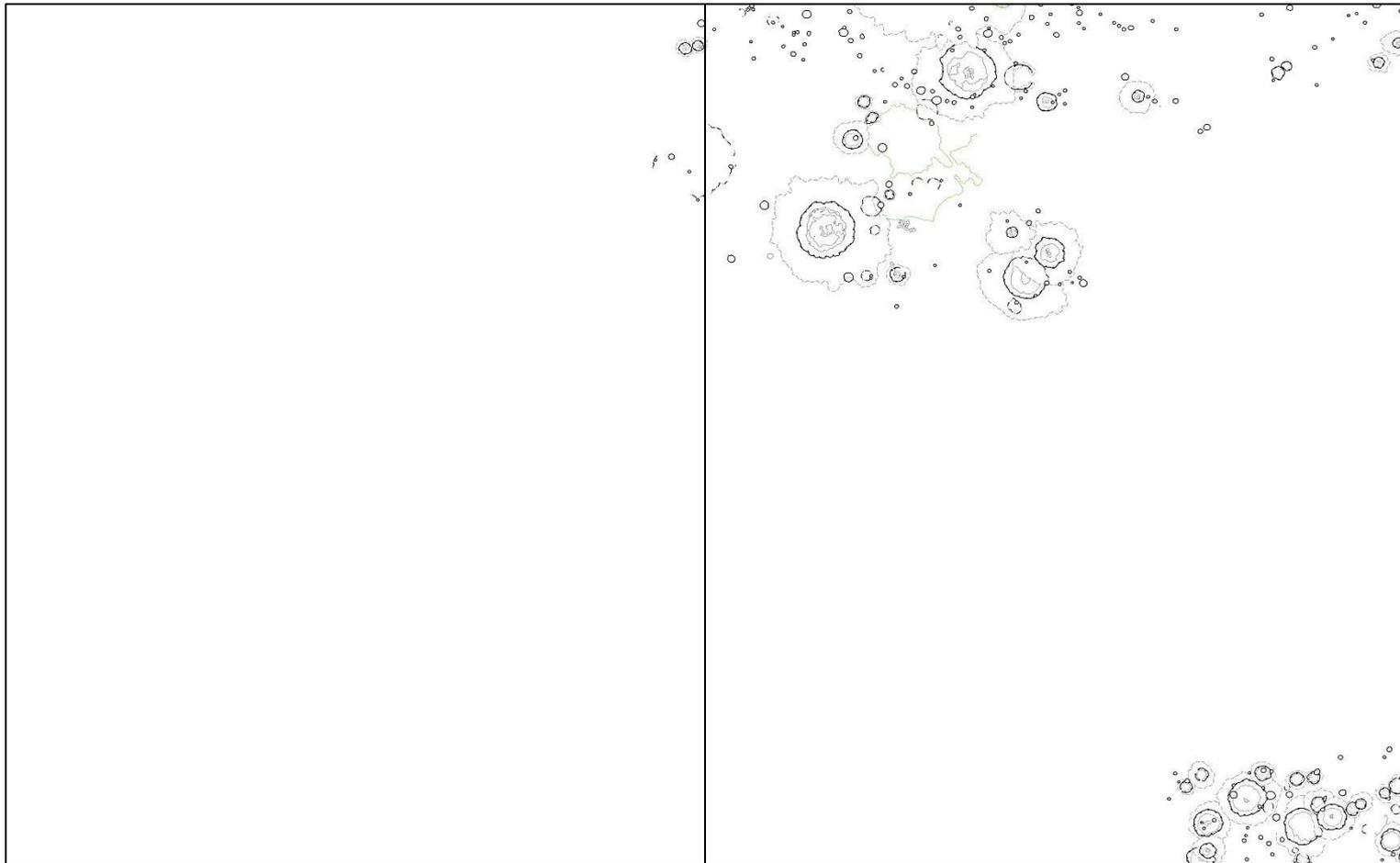
— crest of degraded or buried crater



# Geological mapping



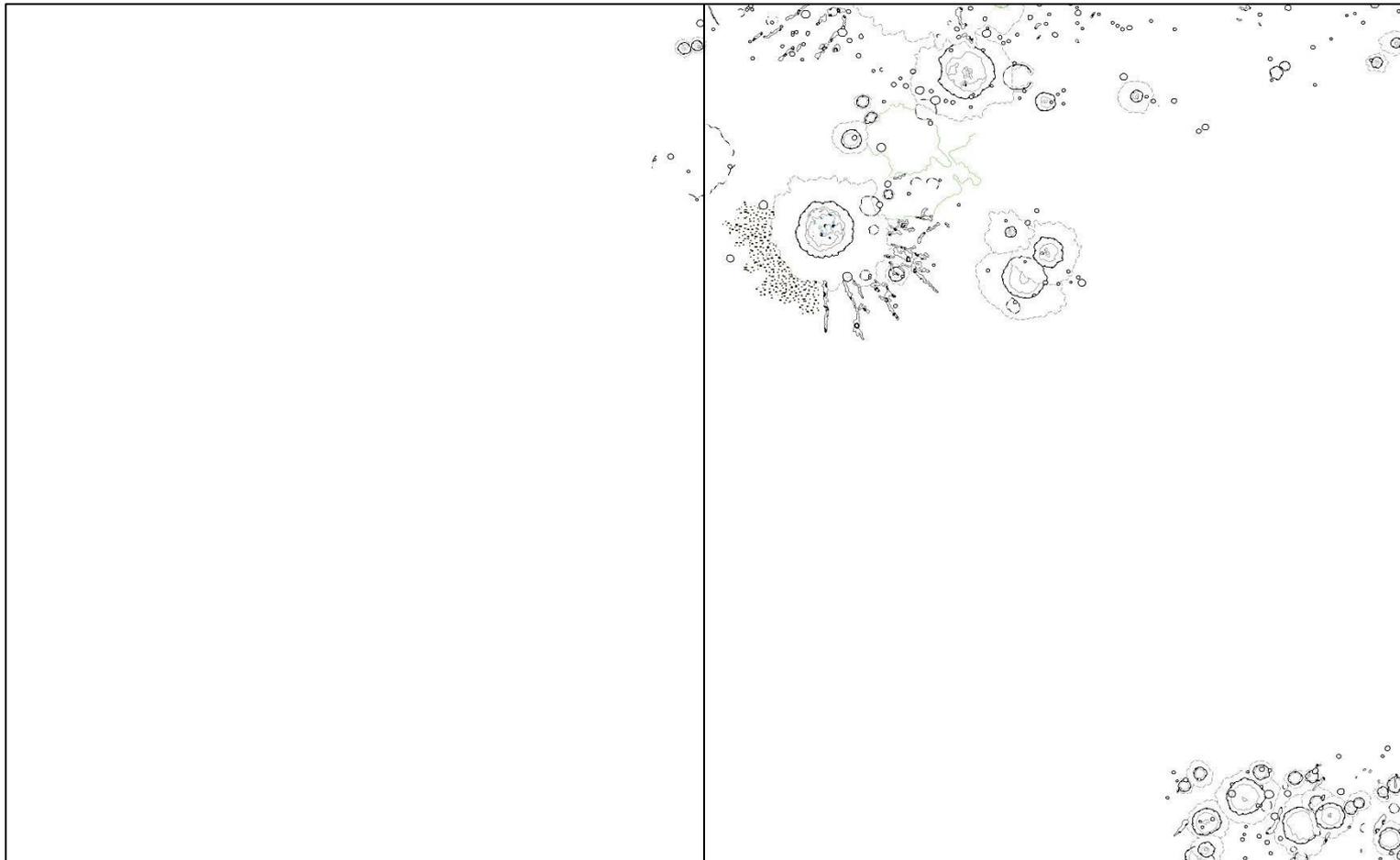
- undefined contact
- - - contact, approximate
- contact, certain



# Surface Features mapping



-  cluster of hollows
-  rough ejecta
-  secondary crater chain or cluster



# Output mapping

## Morphologies

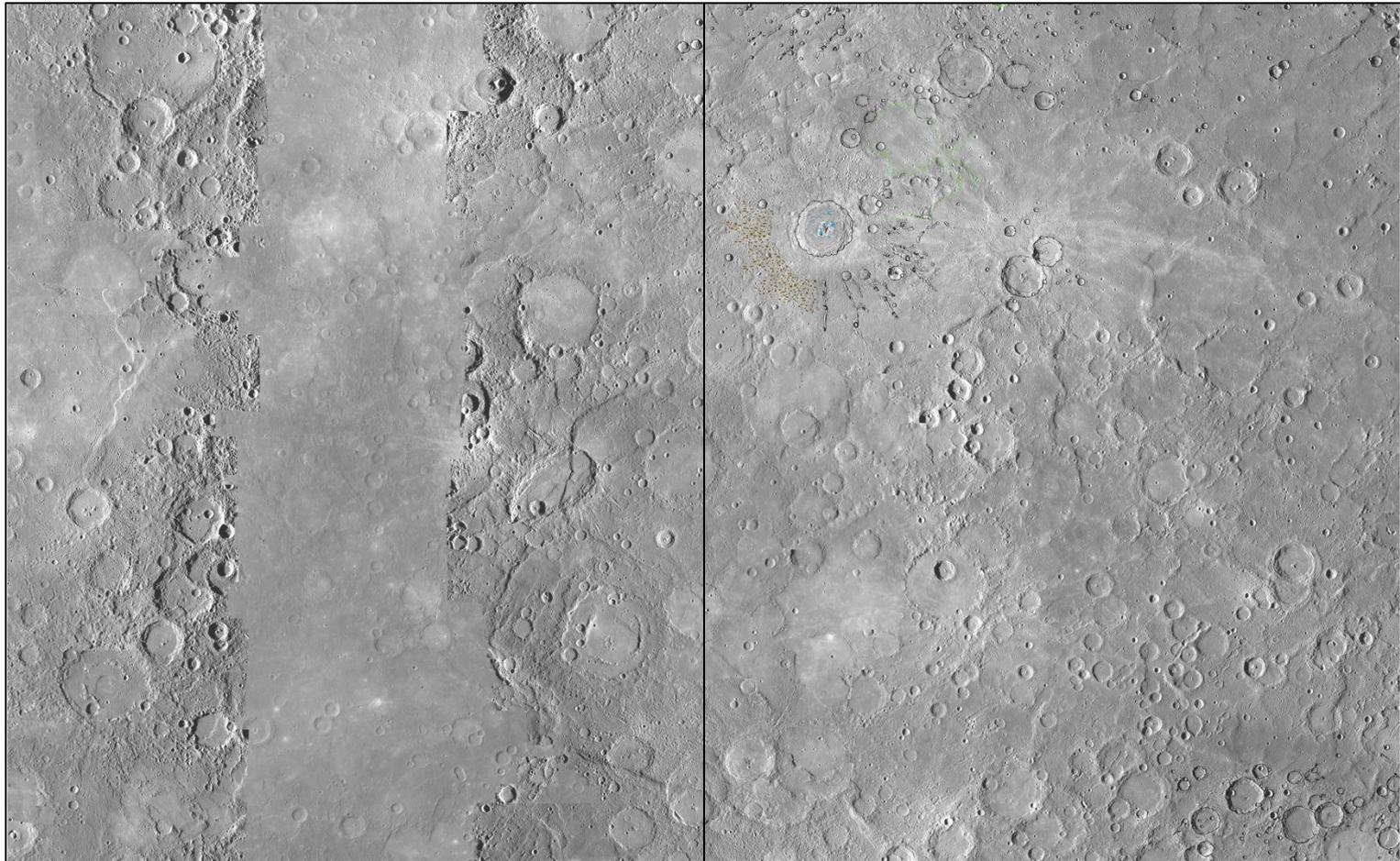
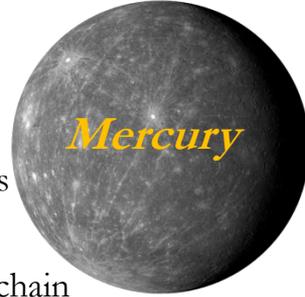
- crest of crater rim  $5\text{km} < D < 20\text{km}$
- crest of crater rim  $D > 20\text{km}$
- crest of degraded or buried crater

## Geological contacts

- undefined contact
- - - contact, approximate
- contact, certain

## Surface Features

- cluster of hollows
- rough ejecta
- secondary crater chain



# Future work



- Conclusion of the morphological, geological and kinematic mapping
- Mapping performed on the basis of the colour basemaps
- Detection of interesting sites for the BepiColombo mission

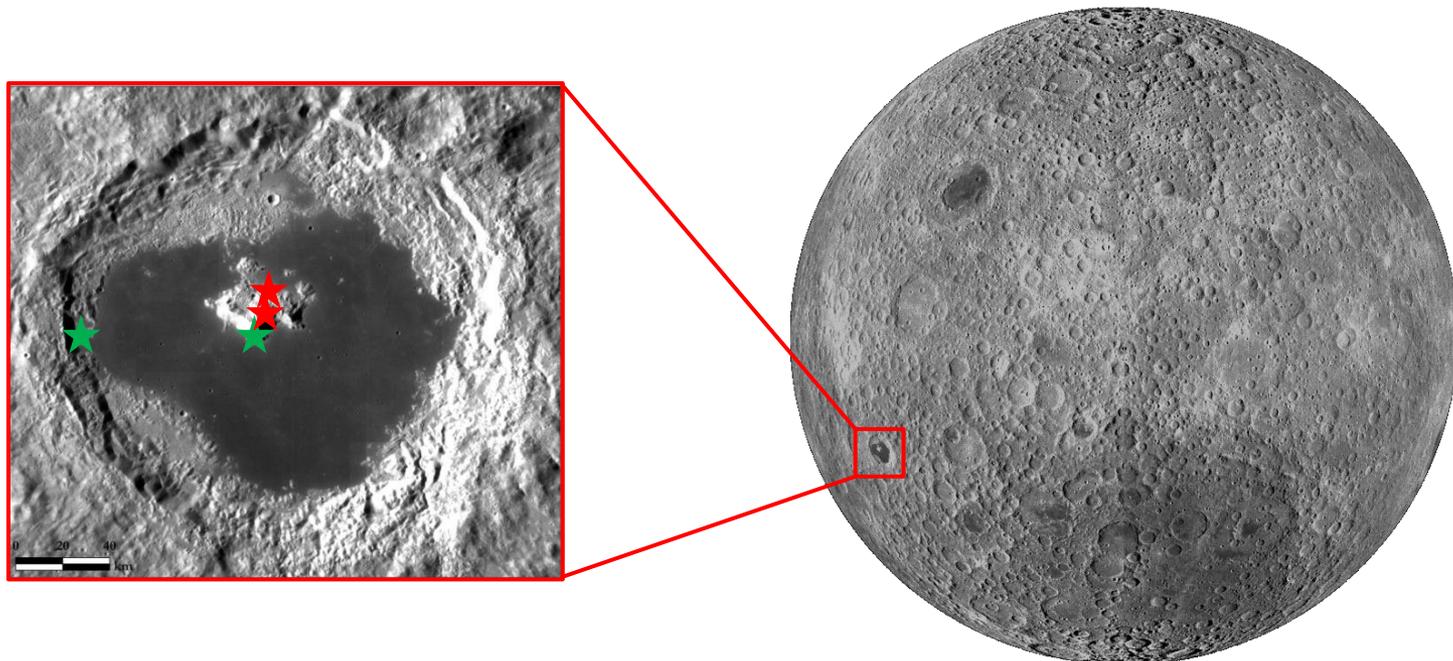


**Small-scale mapping**

# Tsiolkovsky crater



- Far side
- Feldspathic Highlands Terrane
- Oblique impact NW-SE
- Best example of farside mare volcanism
- Elevation floor difference ~450m
- Well-preserved central peak
- Detections of OL and PAN

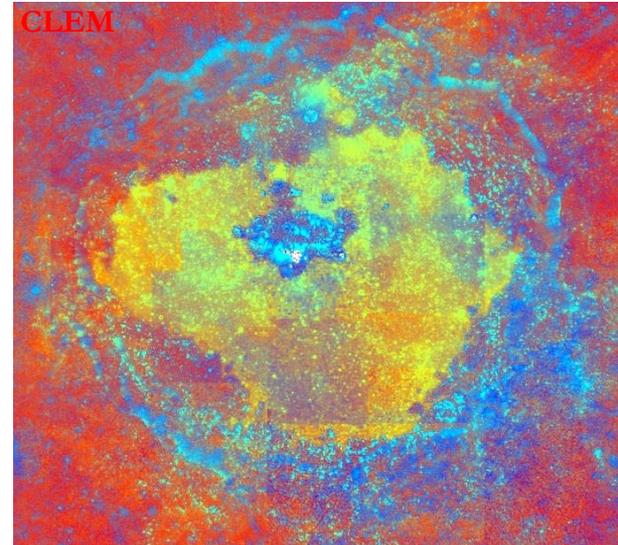
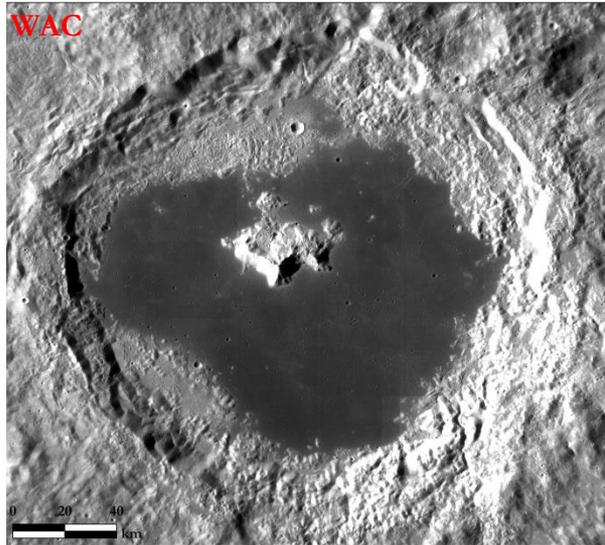


# Data

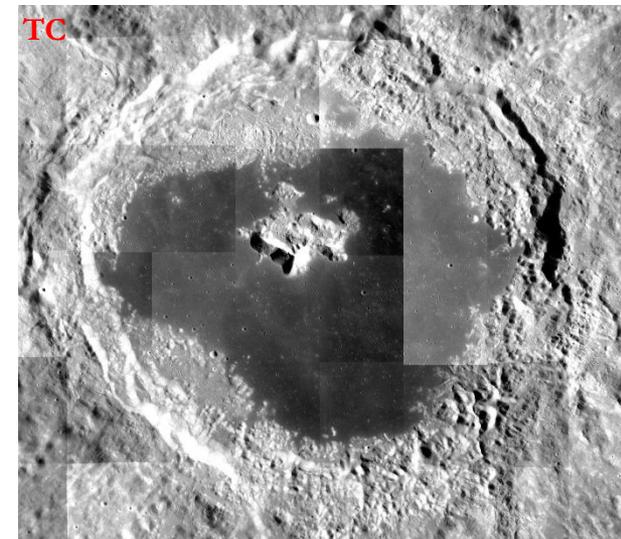
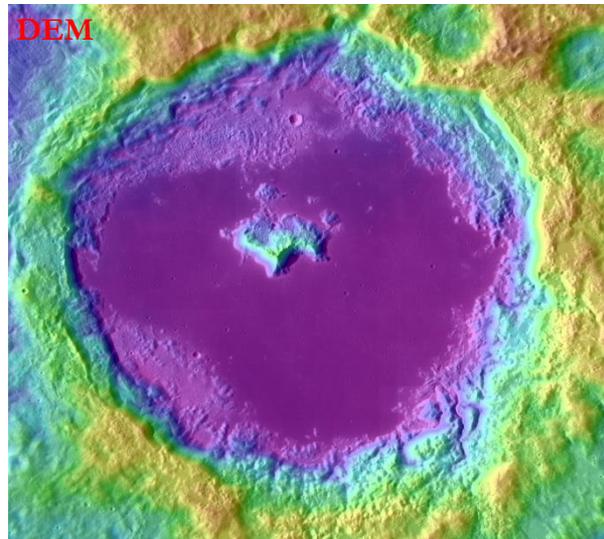
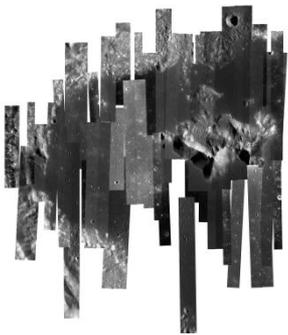


- Monochrome mosaics from Lunar Reconnaissance Orbiter Camera (LROC):
  - Wide Angle Camera (WAC) global mosaic ~ 100 m/px
  - Narrow Angle Camera (NAC) images ~ 0.5 m/px
  
- Monochrome mosaic from Kaguya Terrain Camera (TC):
  - Kaguya TC images ~ 10 m/px
  
- Color mosaic from Clementine UVVIS camera:
  - Global colour ratio mosaic ~ 200 m/px
  - R: 750/415 nm      G: 750/950 nm      B: 415/750 nm
  
- Topographic data:
  - LRO-LOLA and Kaguya DEM merge ~ 59 m/px

# Data



NAC



# Methods



- Software: ESRI ArcGis 10.4.1
- Projection system: Simple cylindrical projection on D\_Moon datum
- Mapping scale:
 

~ 1:200.000	for LR monochrome basemap
~ 1:20.000	for HR monochrome basemap
~ 1:400.000	for colour basemap

$$S_m = R_r \times 2000$$

*Tobler (1987)*

- Geodatabase configuration:



# Geological mapping



IMAGE

# Compositional mapping

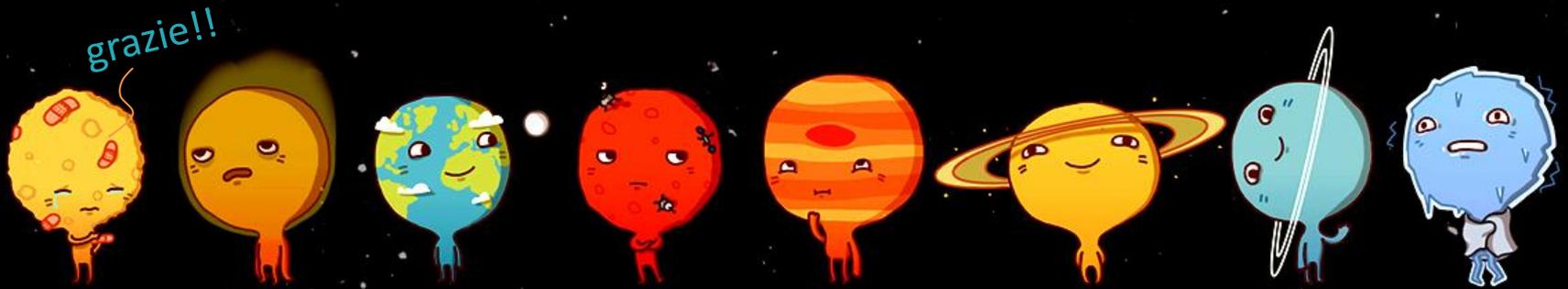


IMAGE

# Future work



- Construction of polygon units for the compositional mapping
- High-resolution geological mapping by means of LROC-NAC and Kaguya TC images
- Definition of traverses for rover exploration
- Characterization for a possible landing site



Thanks for your attention