



USGS Global Geological Map of Europa: A Work in Progress

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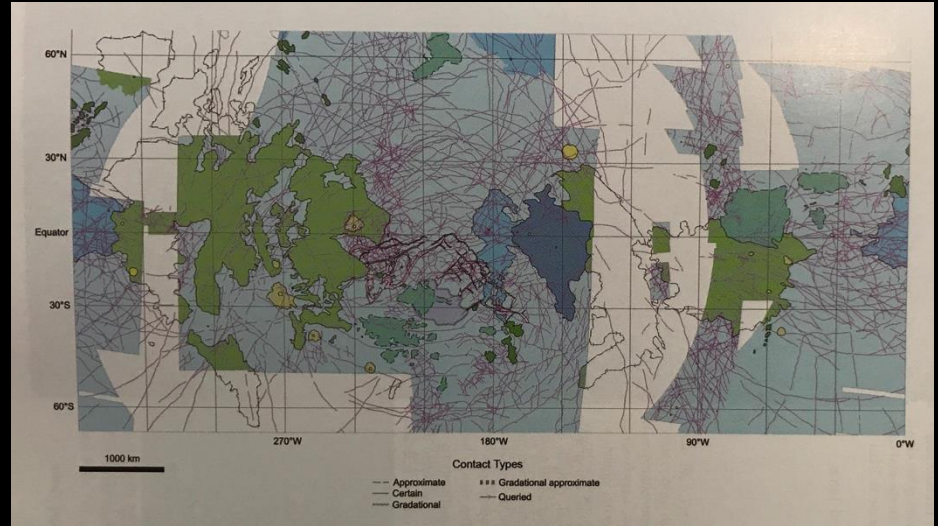
USGS Map of Europa

- History

- Doggett et al. 2009
- Bunte et al. 2015

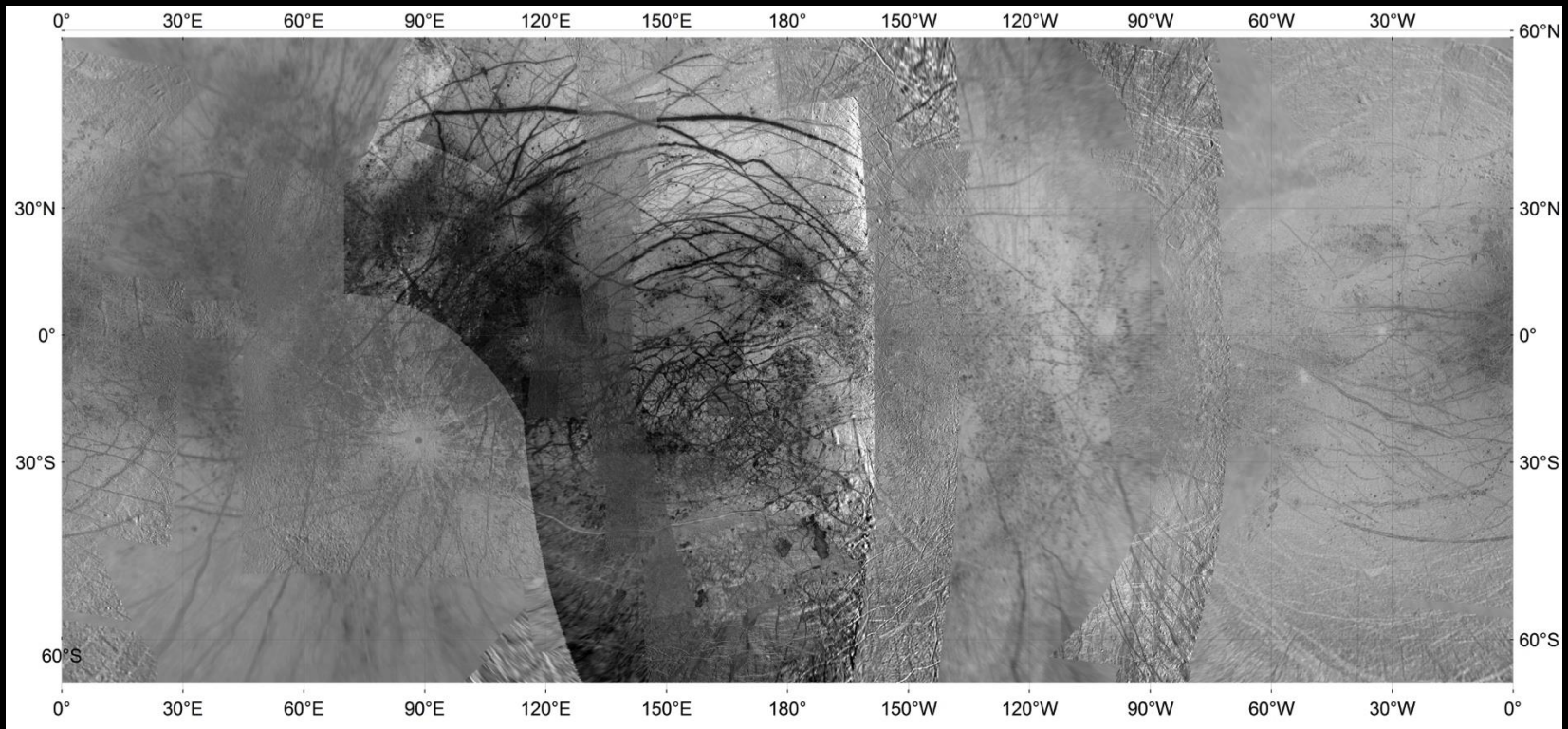
- This map

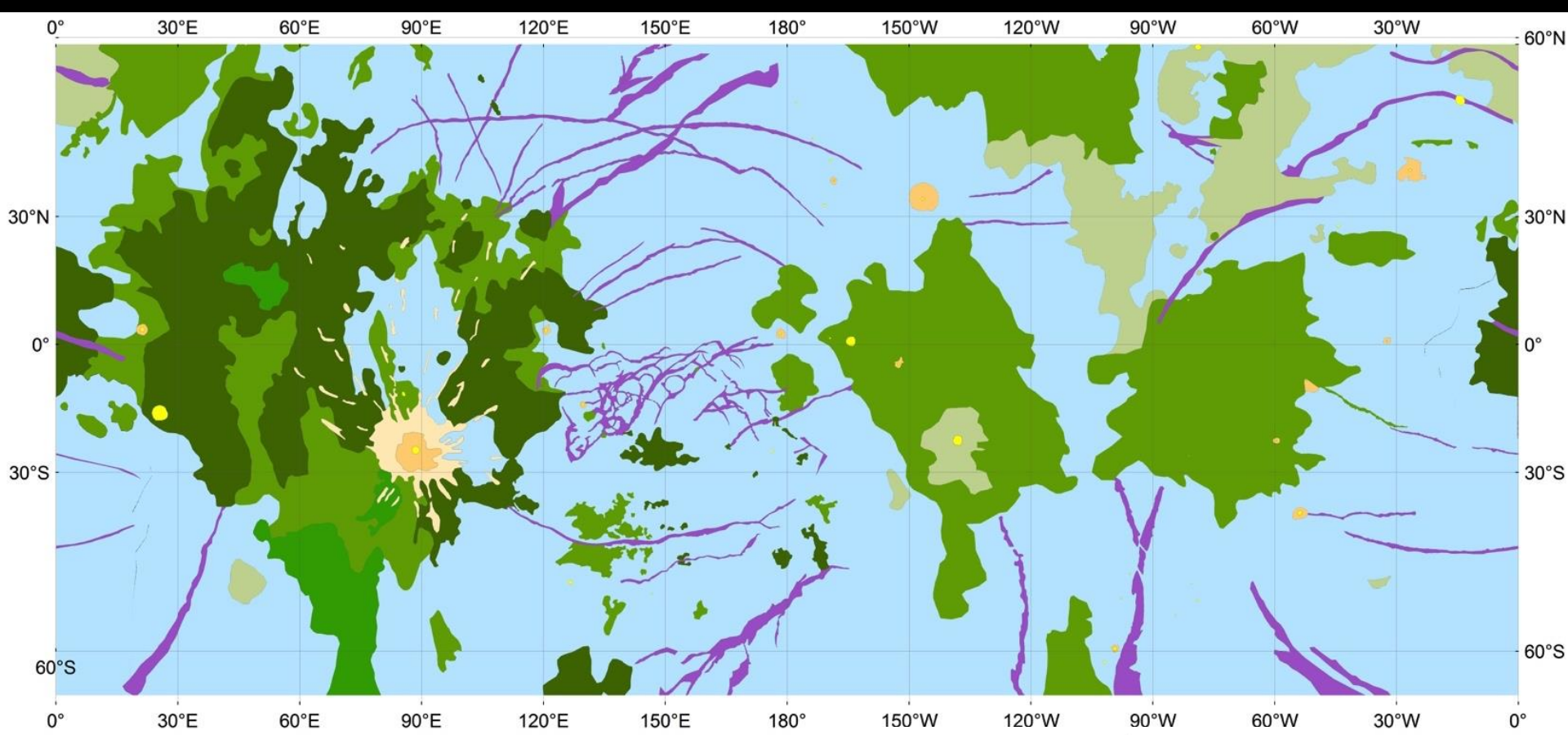
- Scale of map is 1:15,000,000
- Based generally on Bunte et al. map
- Use USGS Basemap + Geoff Collins “Super Mosaic”
 - Galileo SSI and Voyager data



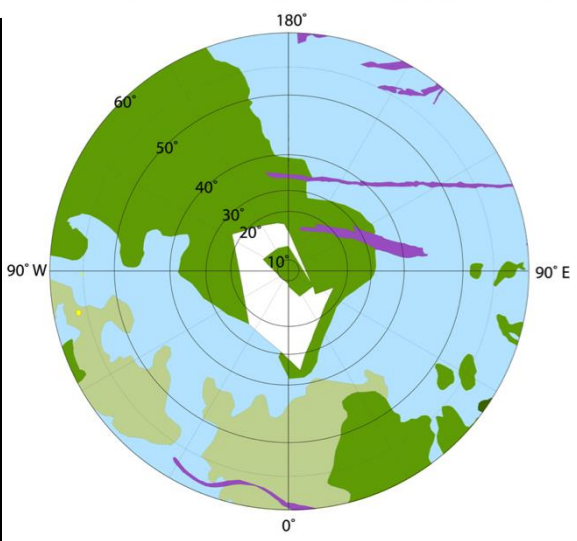
Mapping Method

- Draw GeoUnit contacts in ArcGIS 10.3
- Turn contacts into polygons (Feature to Polygon)
- Assign units to polygons

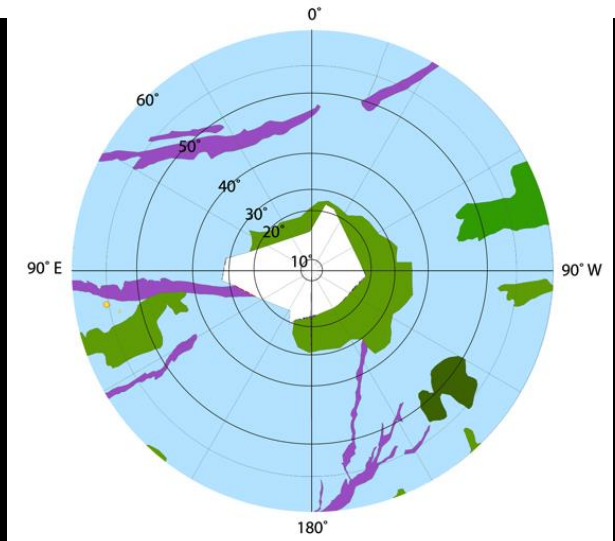




North Pole



South Pole

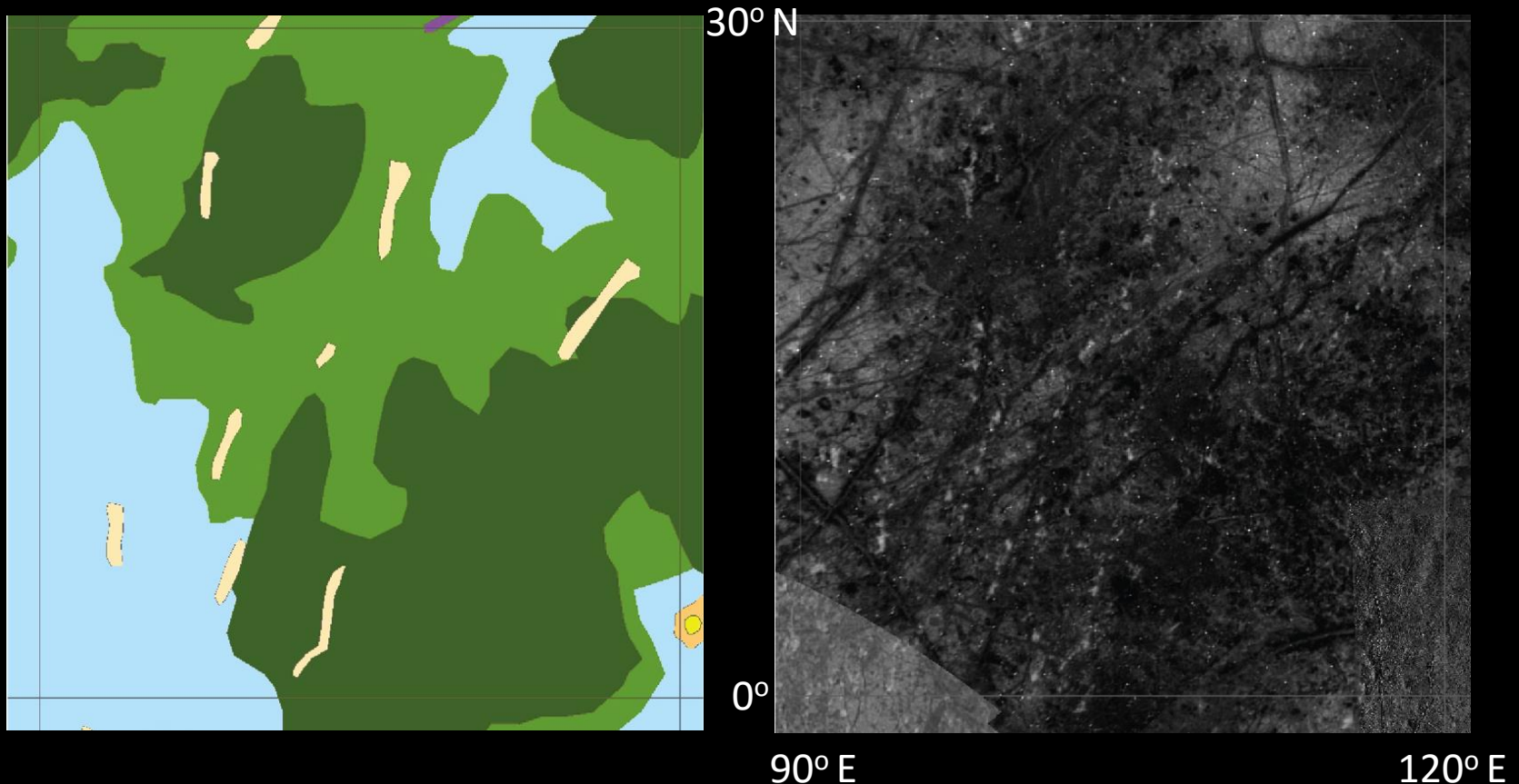


Map Units

- Chaos
 - Low Albedo Chaos
 - Mottled Chaos
 - High Albedo Chaos
 - Knobby Chaos
- Ridge
 - Low Albedo Mantling (?)
- Bands
- Ridged Plains
- Crater Units
 - Crater
 - Continuous Crater Ejecta
 - Discontinuous Crater Ejecta

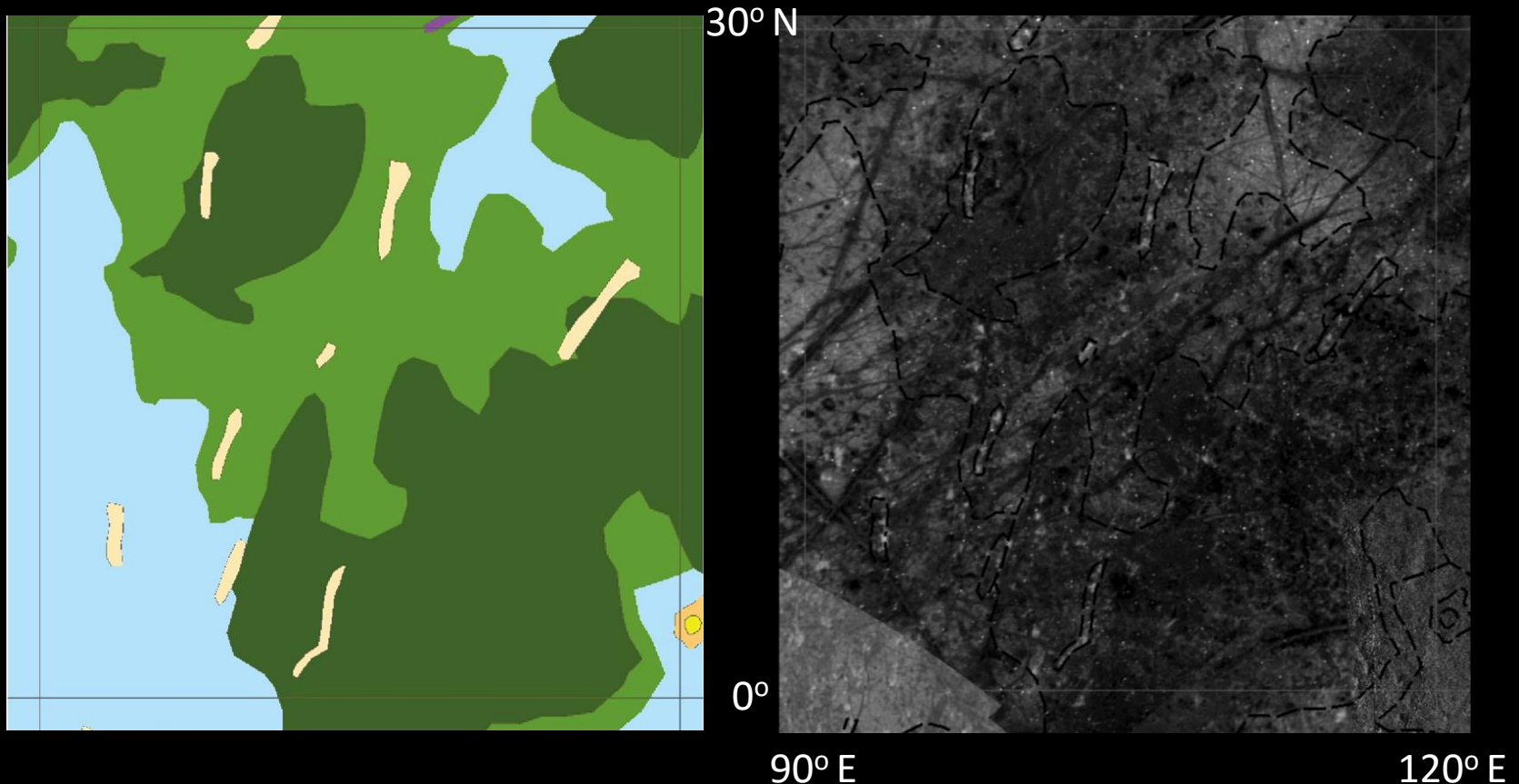
Chaos Units

- Low Albedo Chaos – disrupted terrain with a relatively uniform low albedo appearance
- Mottled Chaos – disrupted terrain with varying albedo, appears patchy



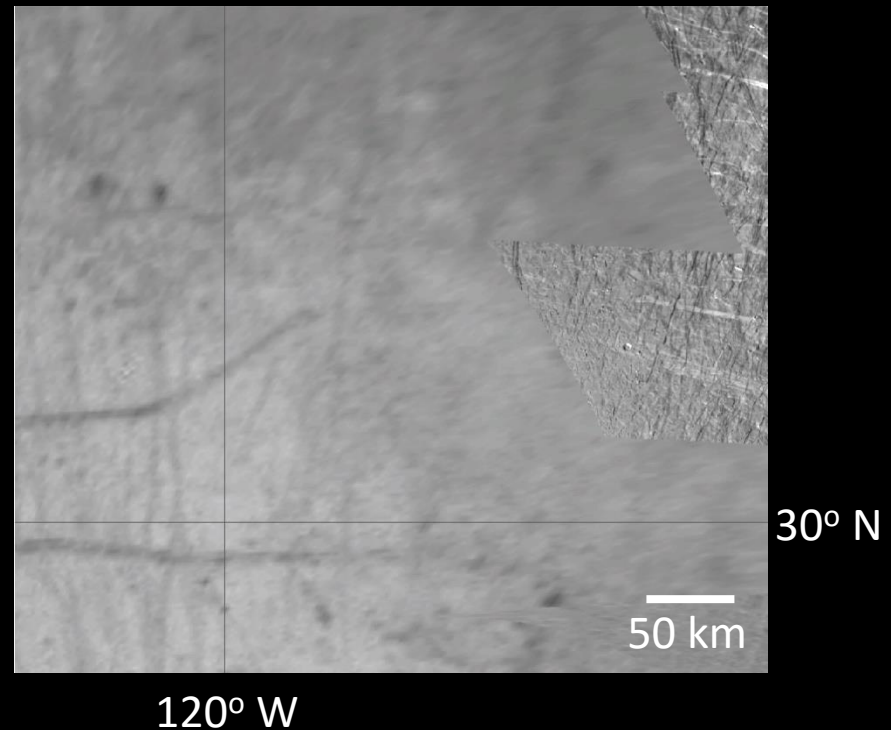
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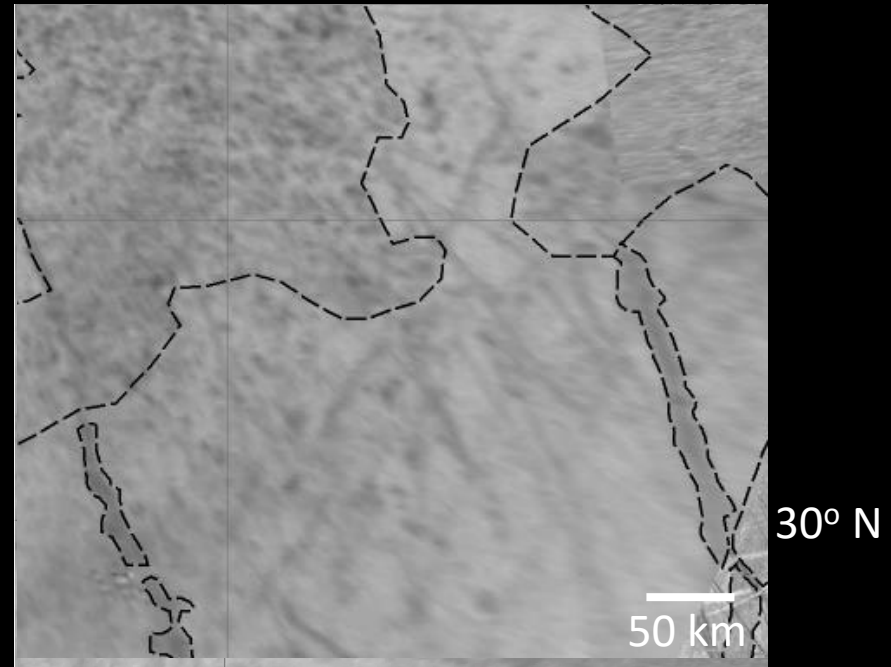
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- High Albedo Chaos – disrupted terrain with a relatively uniform high albedo



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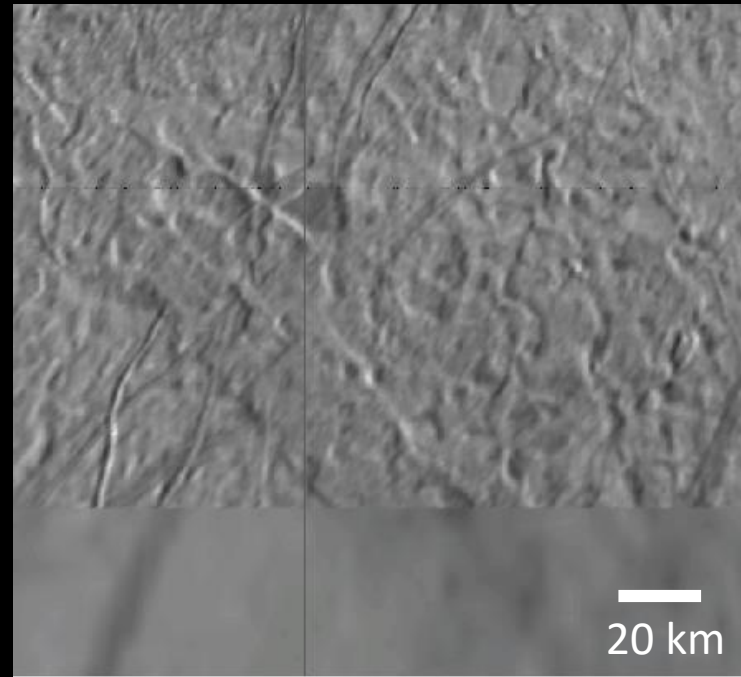
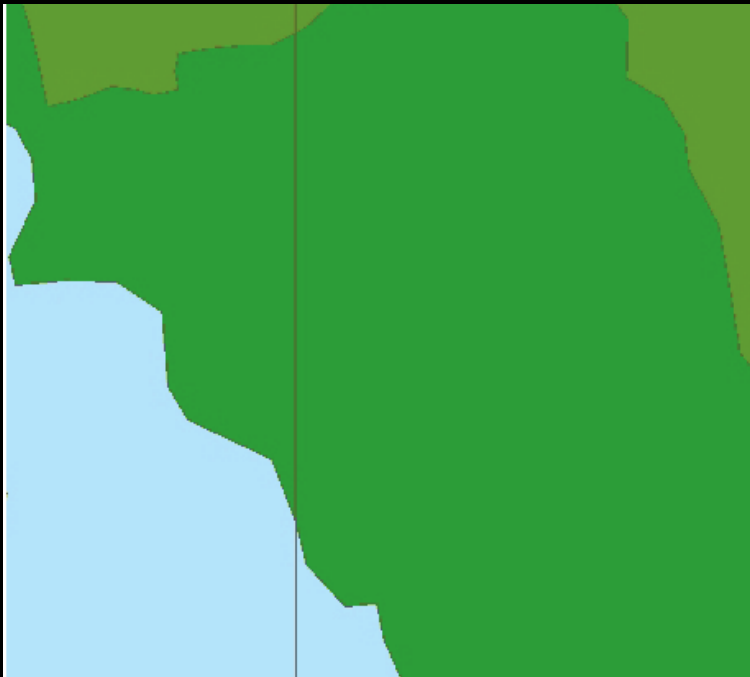
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120° W

Chaos Units

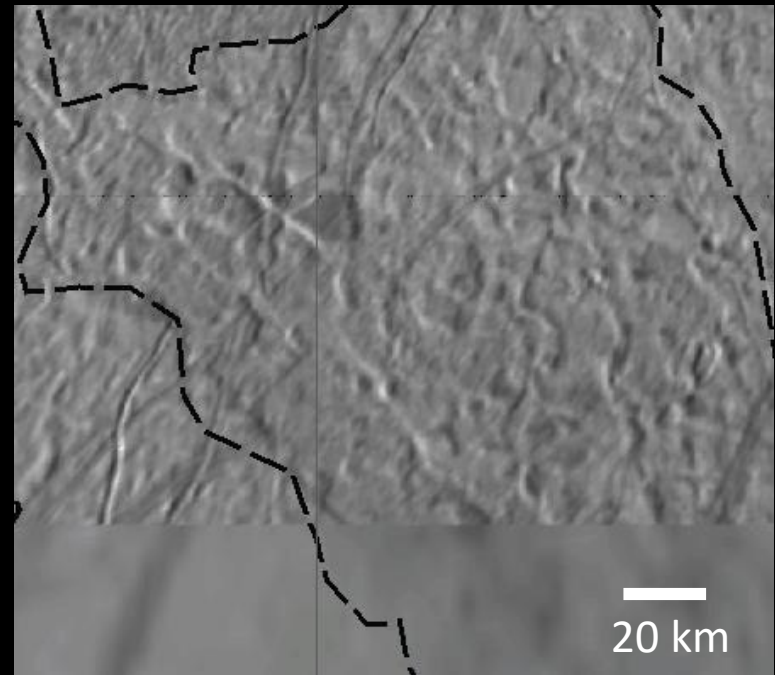
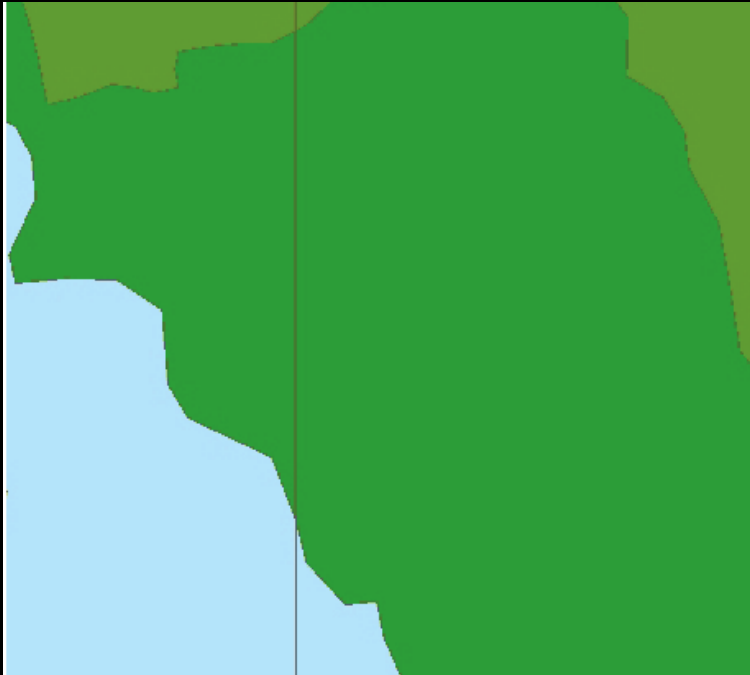
- Knobby Chaos – disrupted terrain with rough and blocky texture. Occurs mostly in the high latitudes.



30° E

Chaos Units

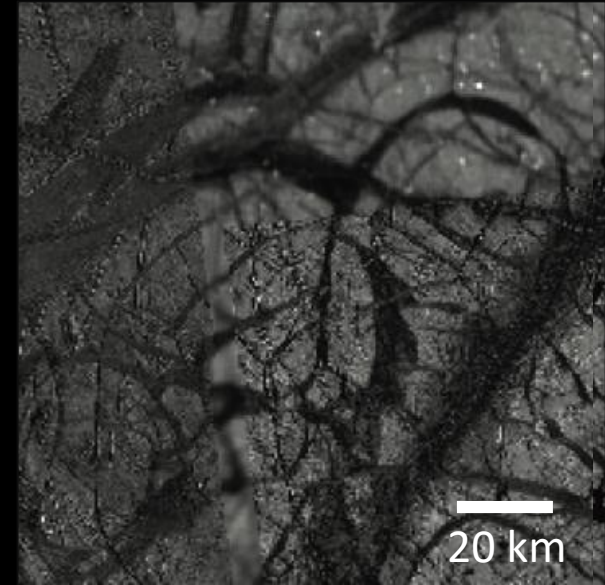
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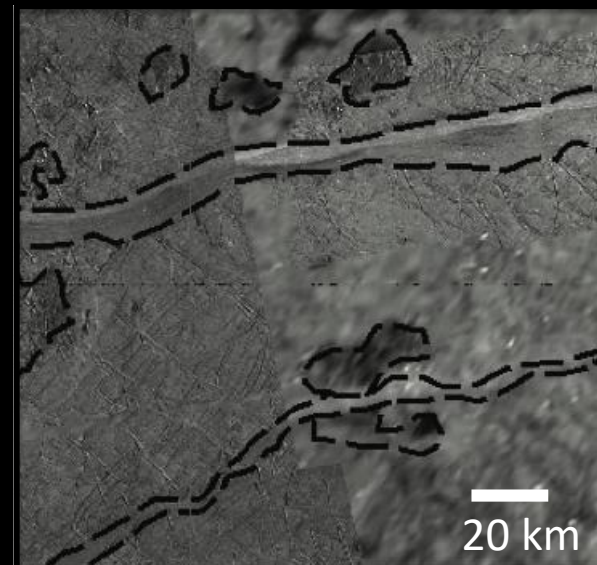
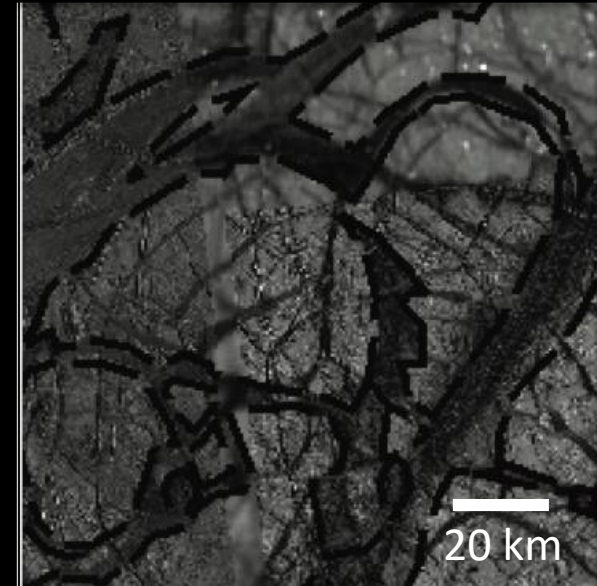
Band Unit

- Bands – linear to curvilinear zones with an abrupt albedo change compared to the surrounding terrain. Greater than 15 km in width.



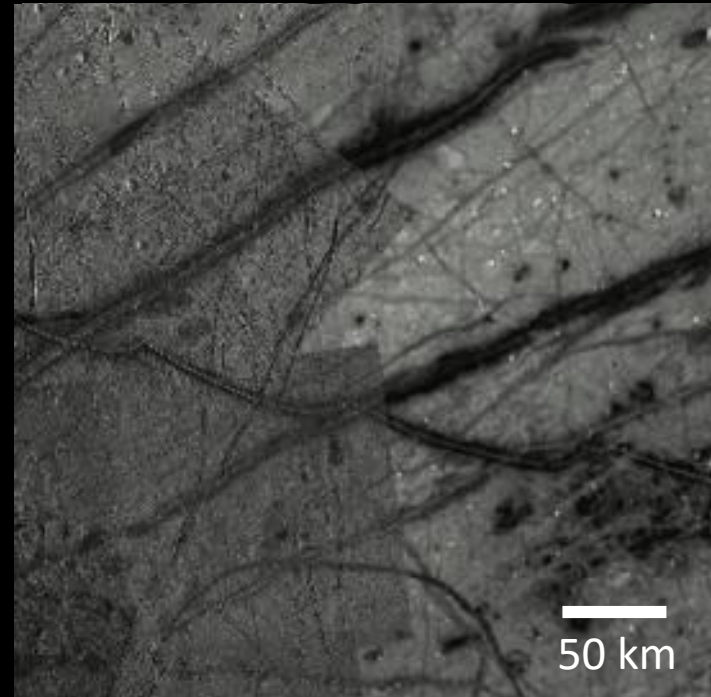
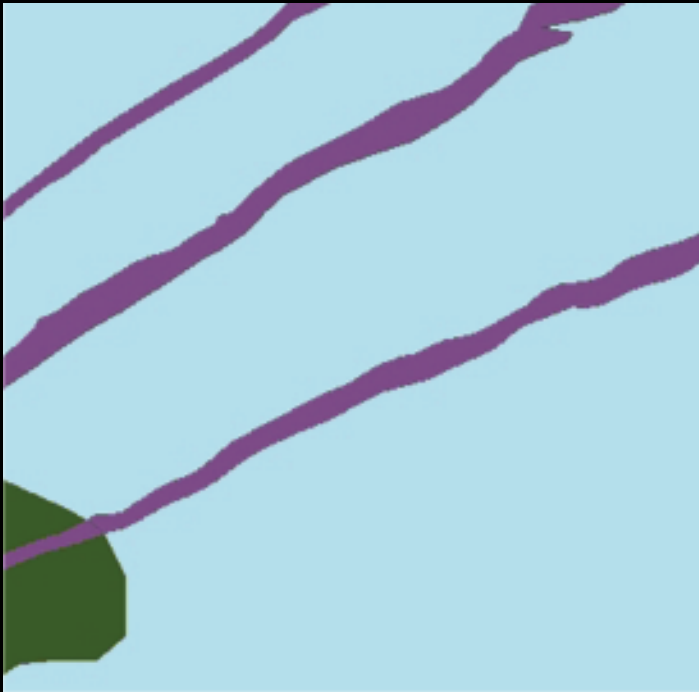
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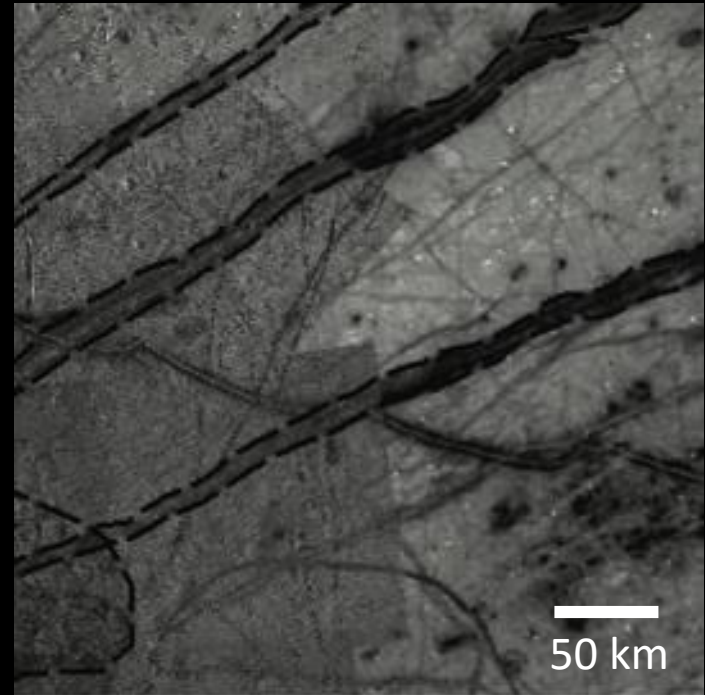
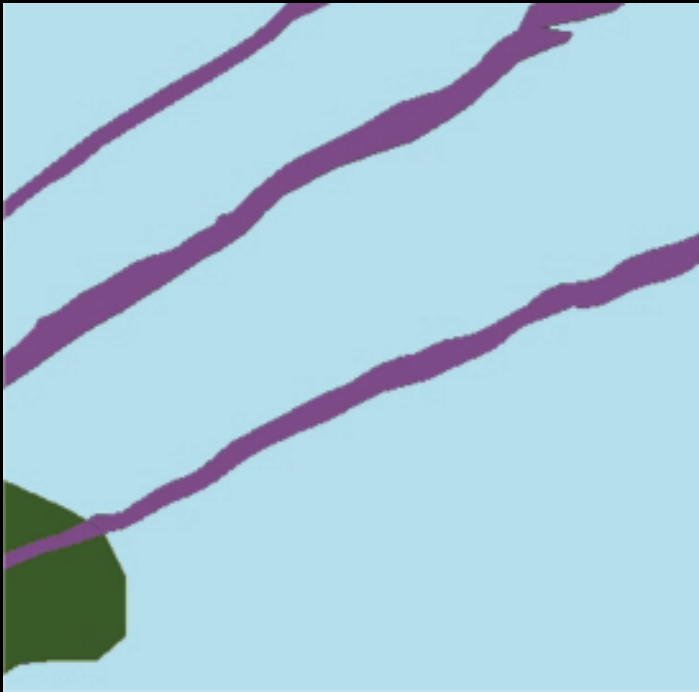
Ridged Plains Unit

- **Ridged Plains** – terrain characterized by subparallel to cross-cutting ridges and troughs at an unresolvable scale in the global resolution images. This unit has the greatest geographical distribution of all the units.



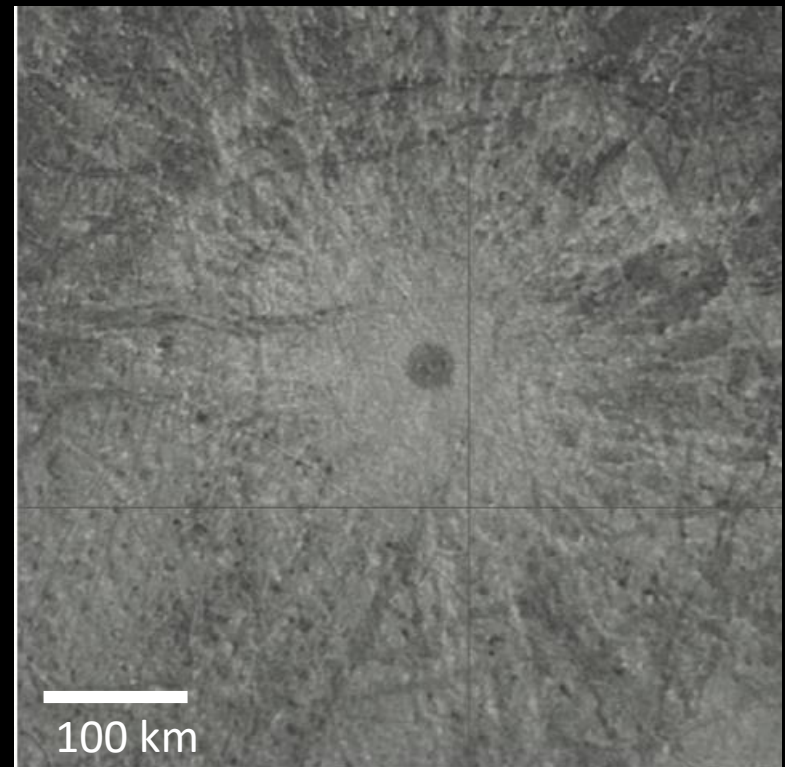
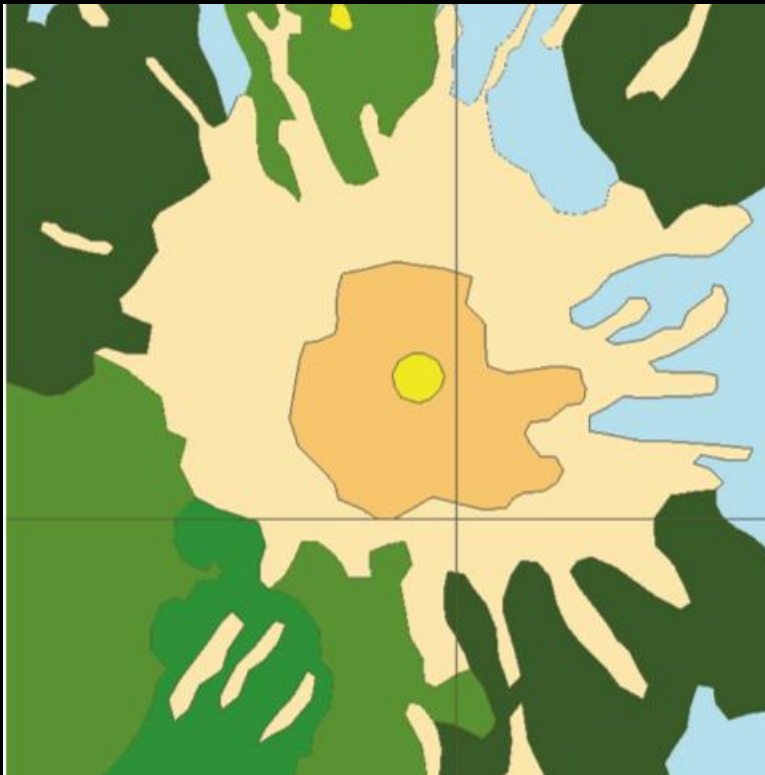
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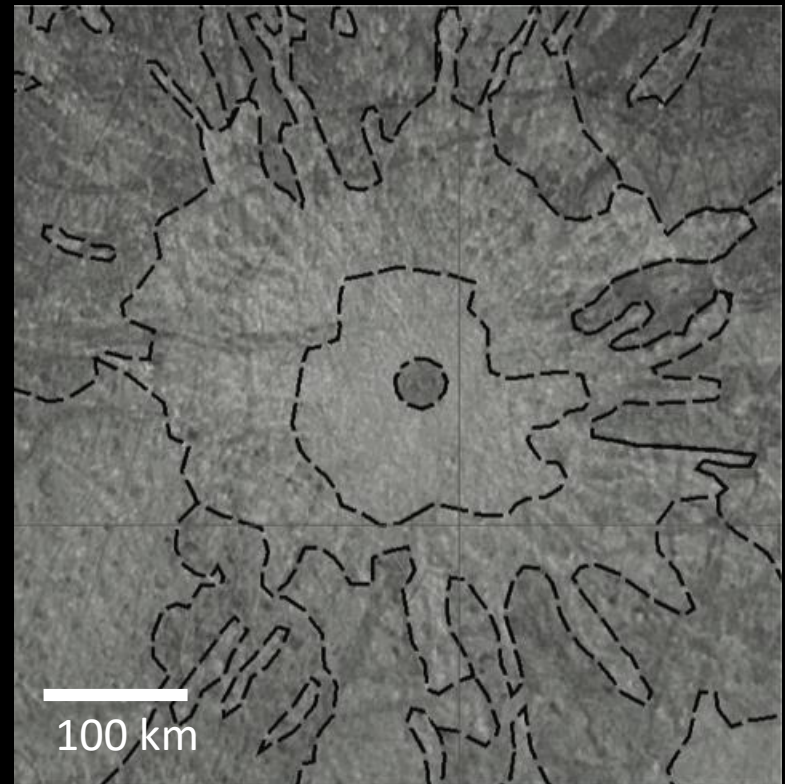
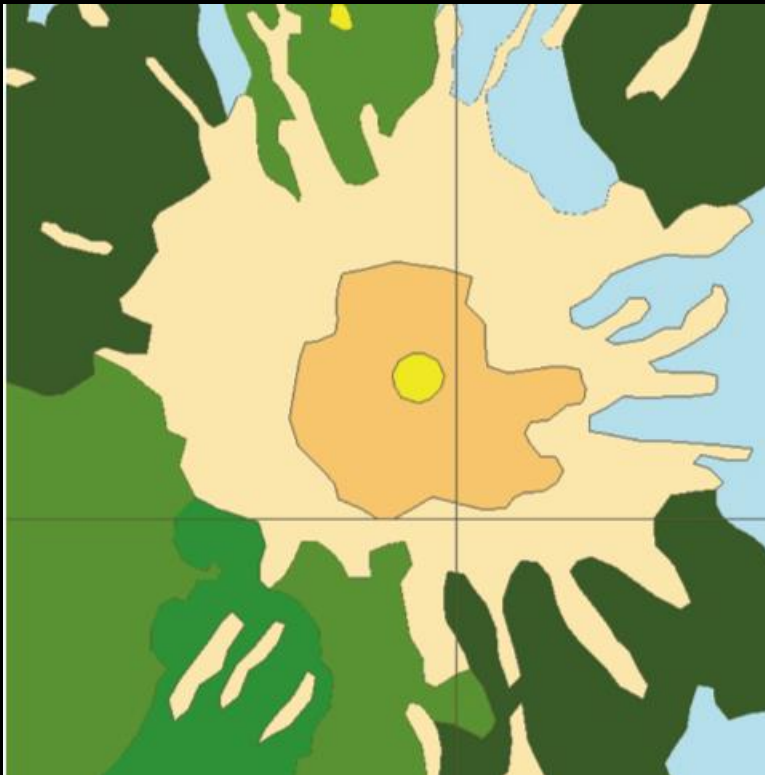
Crater Units

- Crater – quasi-circular topographic low with raised rim
- Continuous Crater Ejecta – deposits of hummocky material around the crater
- Discontinuous Crater Ejecta – deposits of high albedo material associated with crater rays



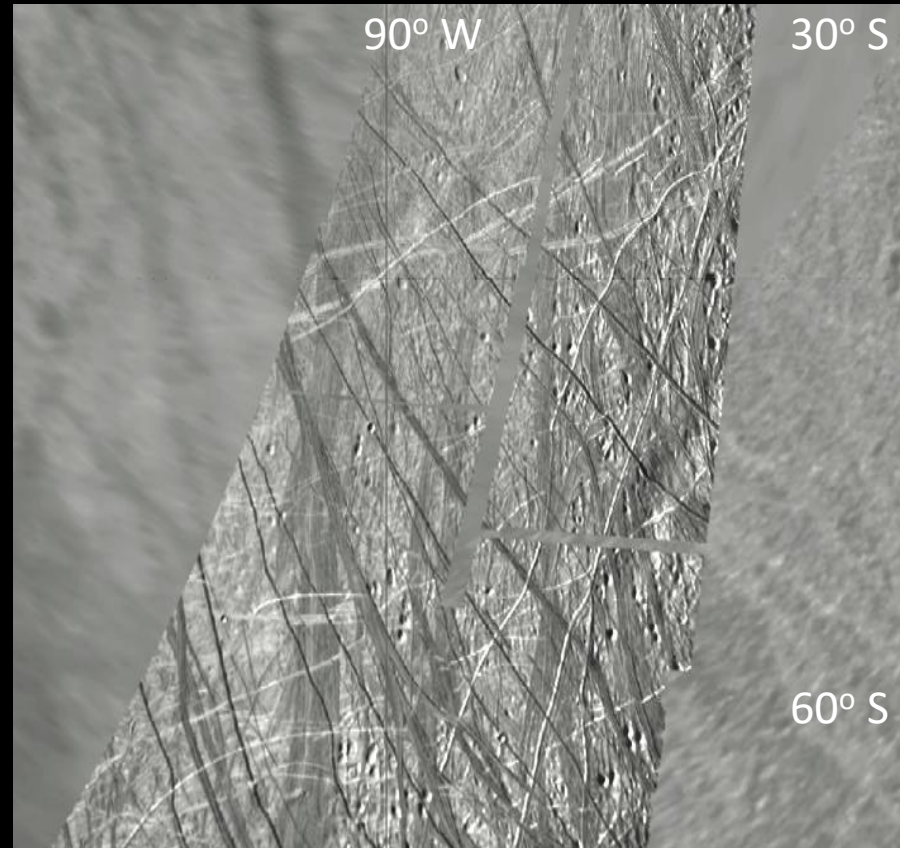
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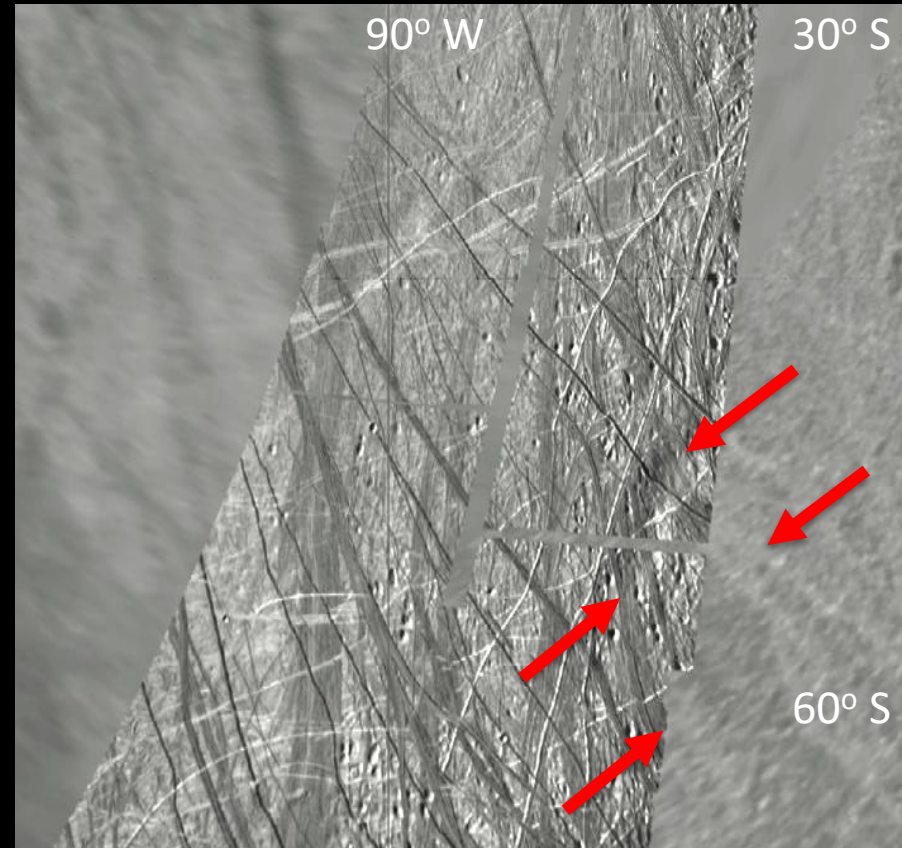
Complications

- Examples
 - Incidence and Emission angle differences
 - Image seam mismatch
 - Resolution variety



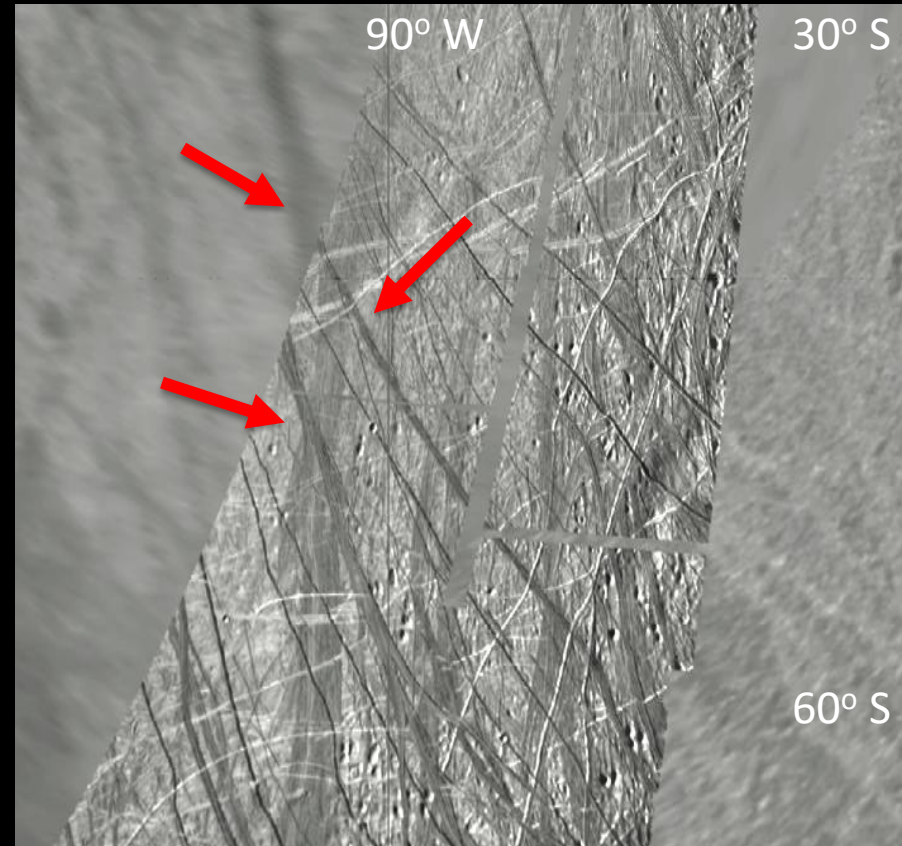
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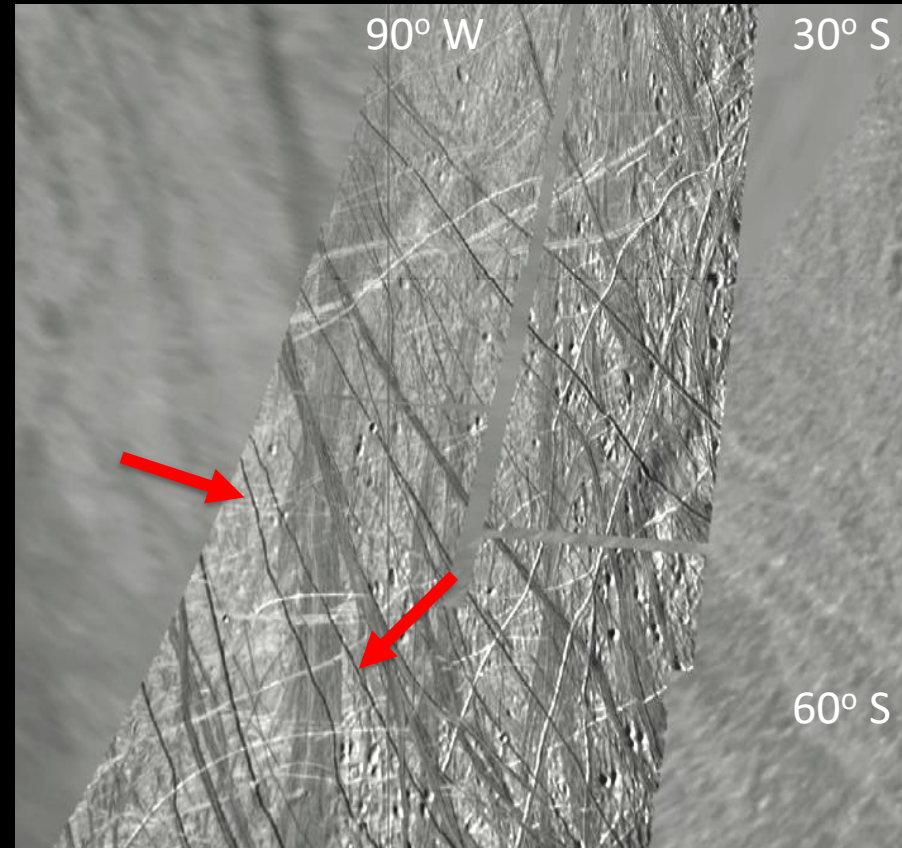
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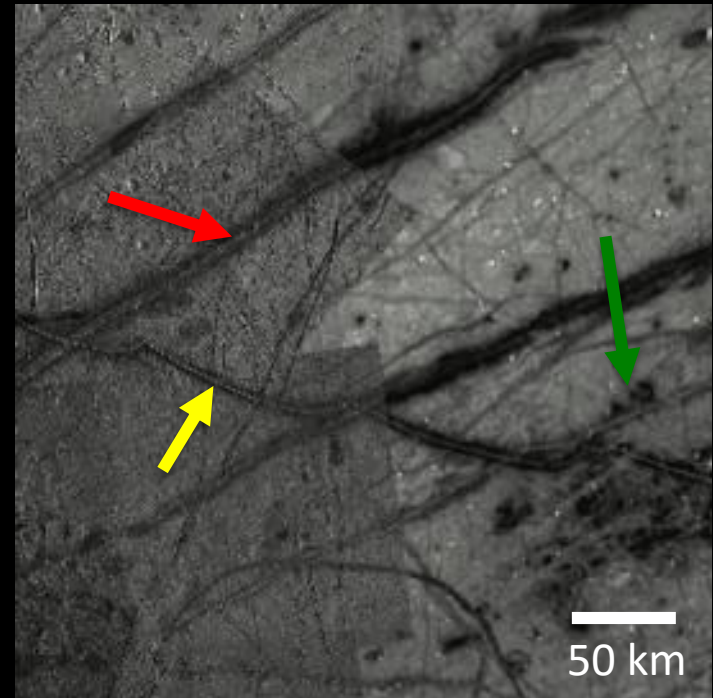
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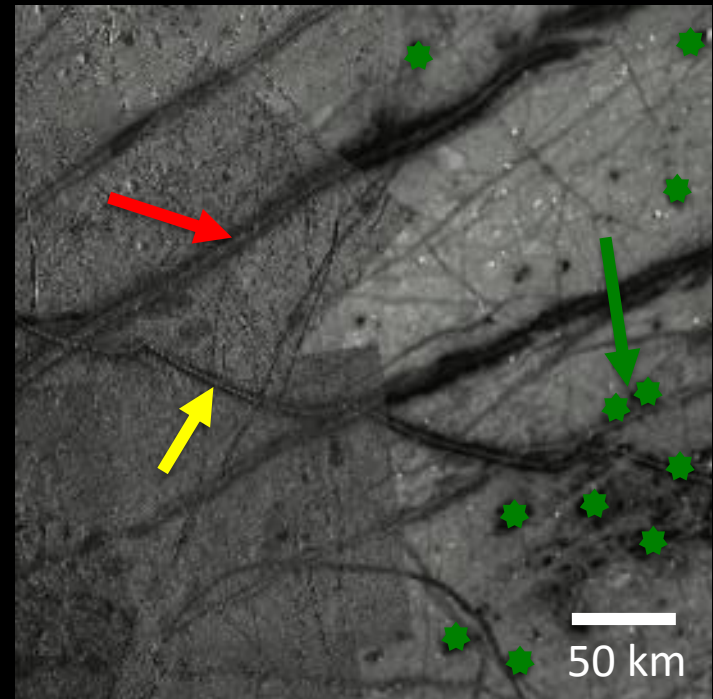
Still To Do

- Bands vs. Ridges with Low Albedo Mantling
- Linear Features
 - Thin Bands (<15 km in width)
 - Ridges
 - Cycloids
- Microchaos/Pits/Domes

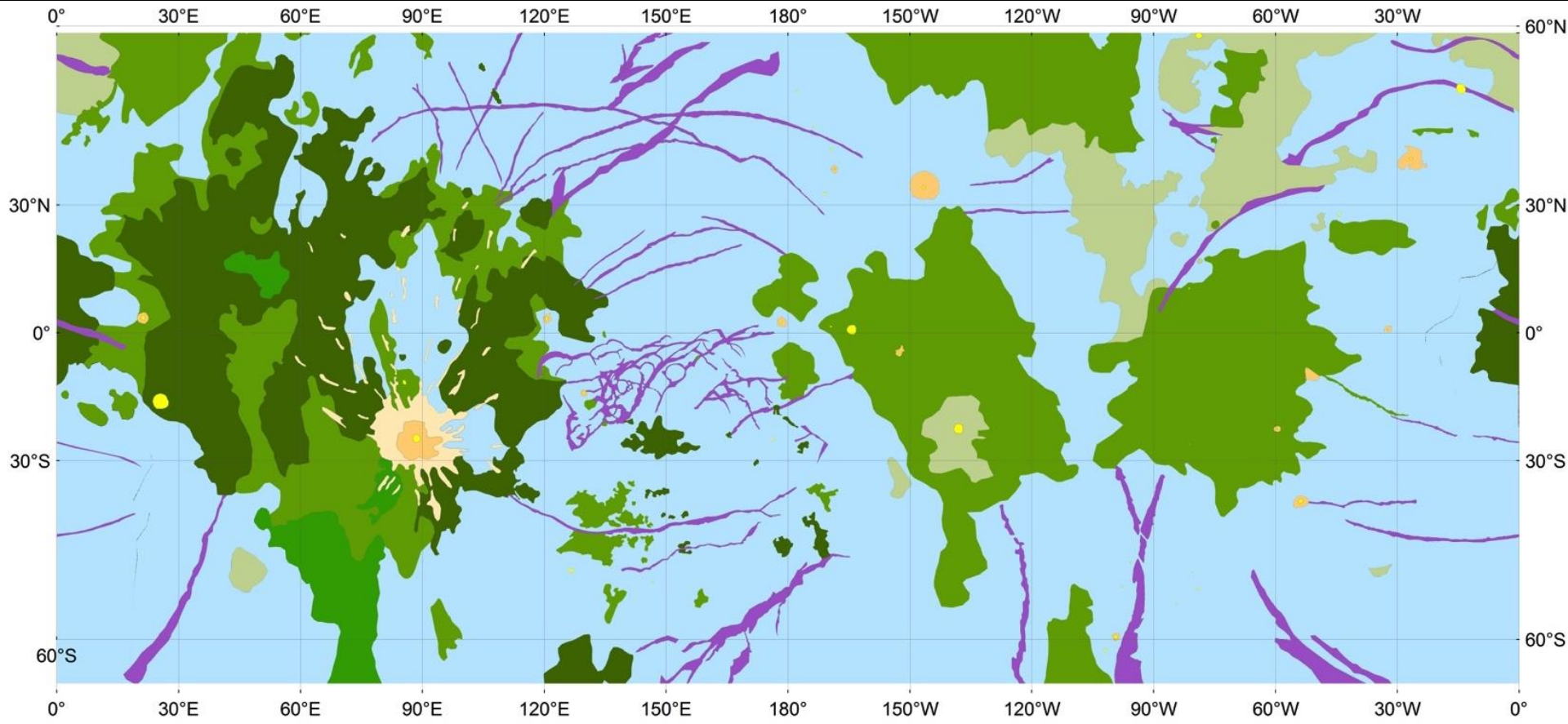


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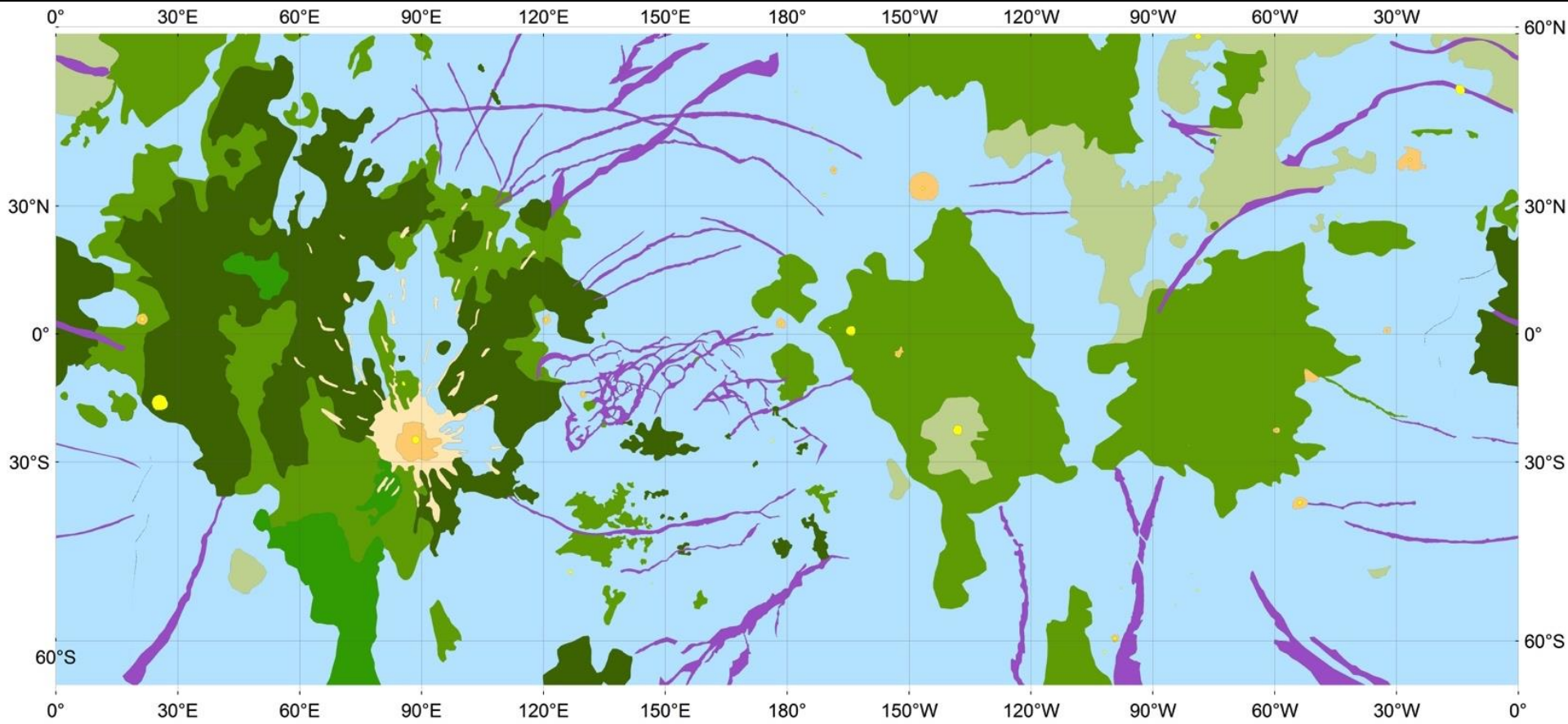
Questions and comments are welcome!



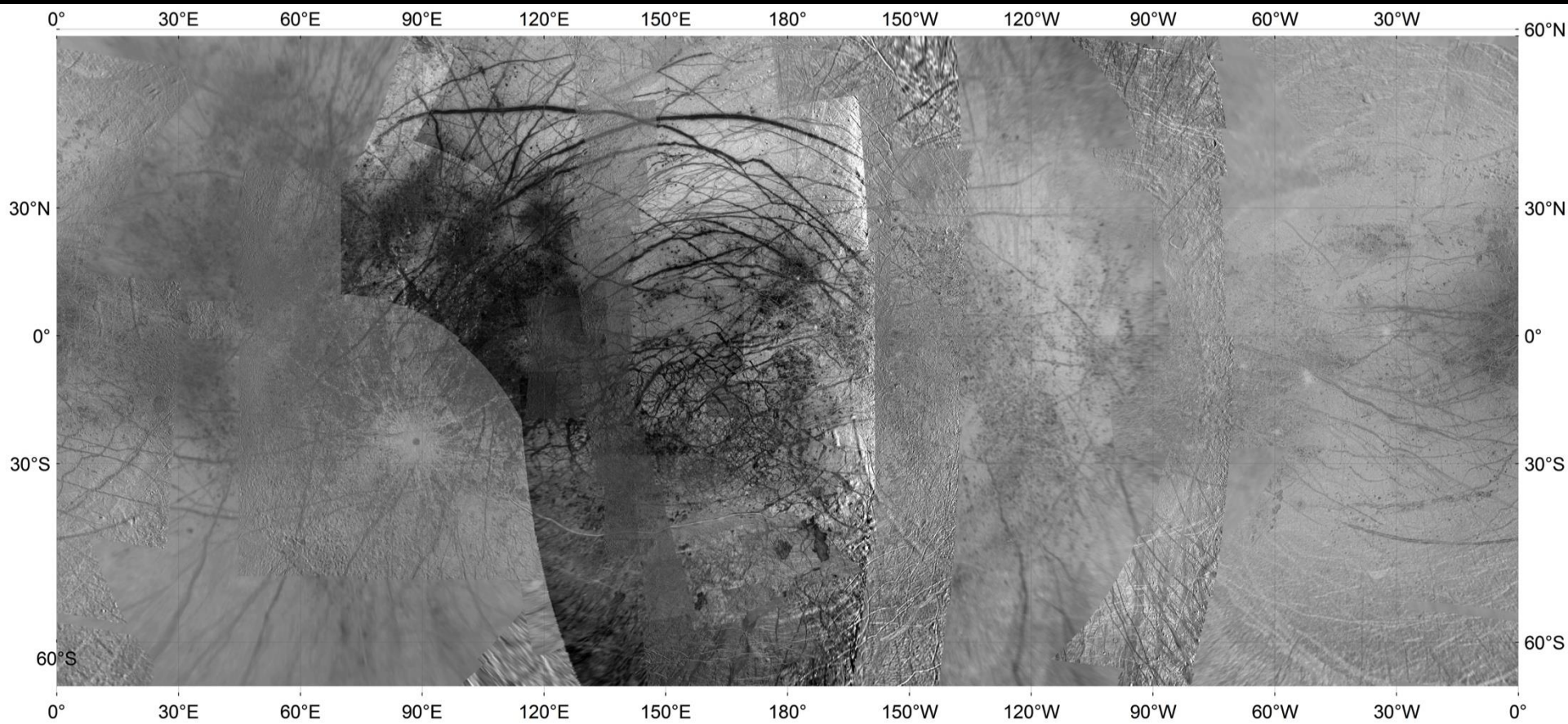
We especially would like to thank **Trent Hare** (Map and Arc help), **Cory Fortezzo** (Map and Arc help), **Marc Hunter** (Arc help), **Tammy Becker** (Image help) and **Geoff Collins** (SuperMosaic)

Extra Slides

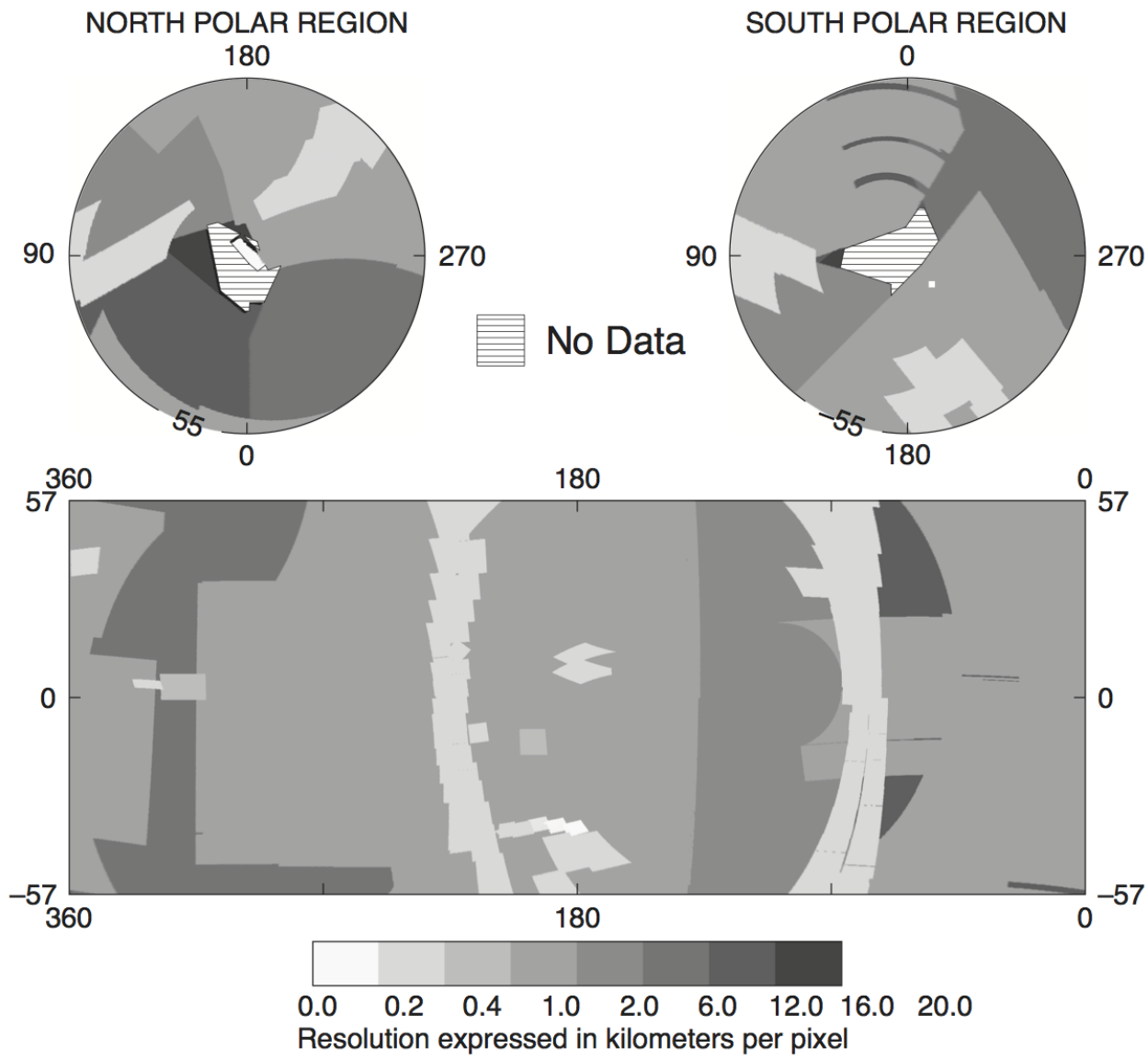
Our Map



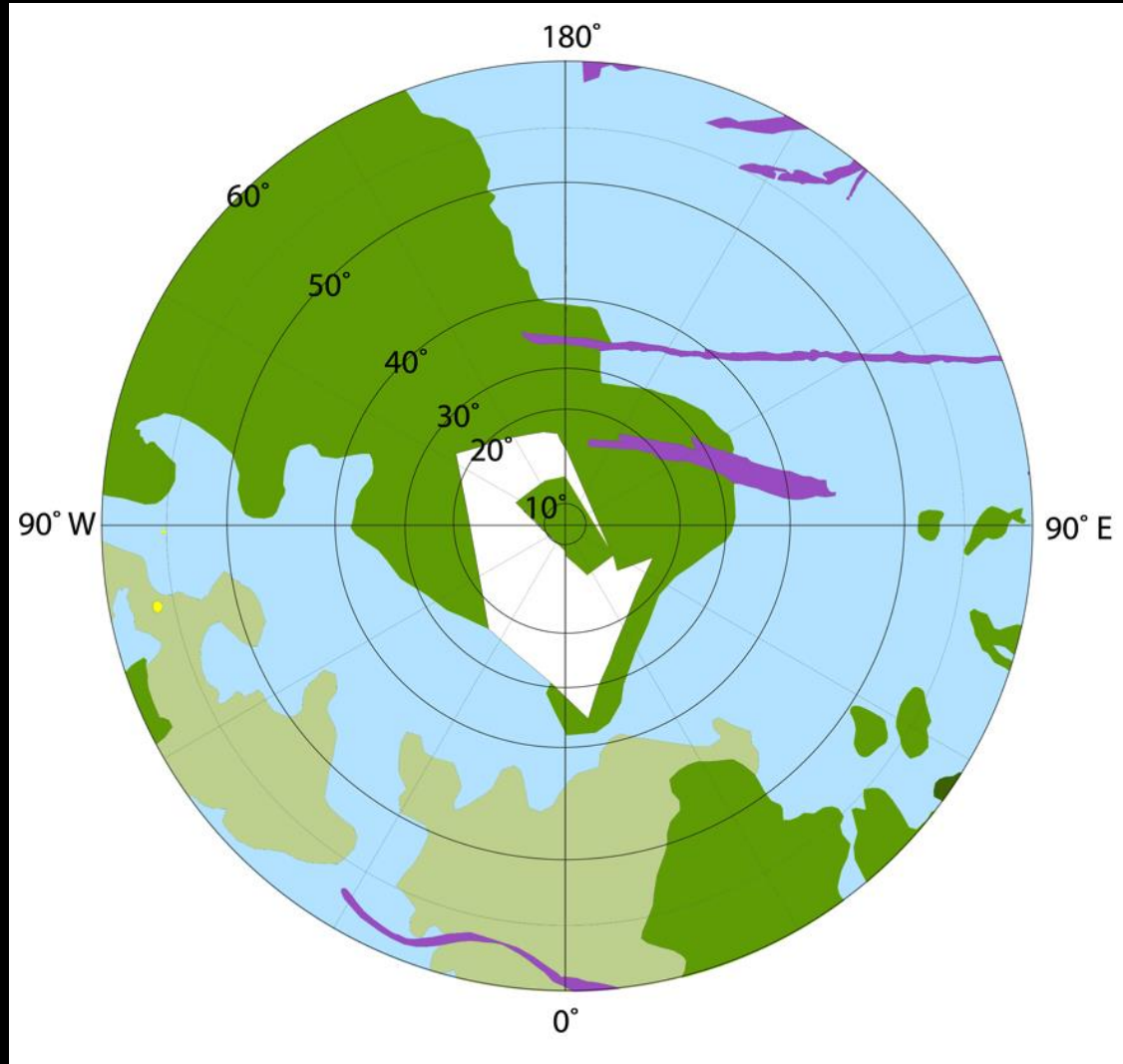
Europa



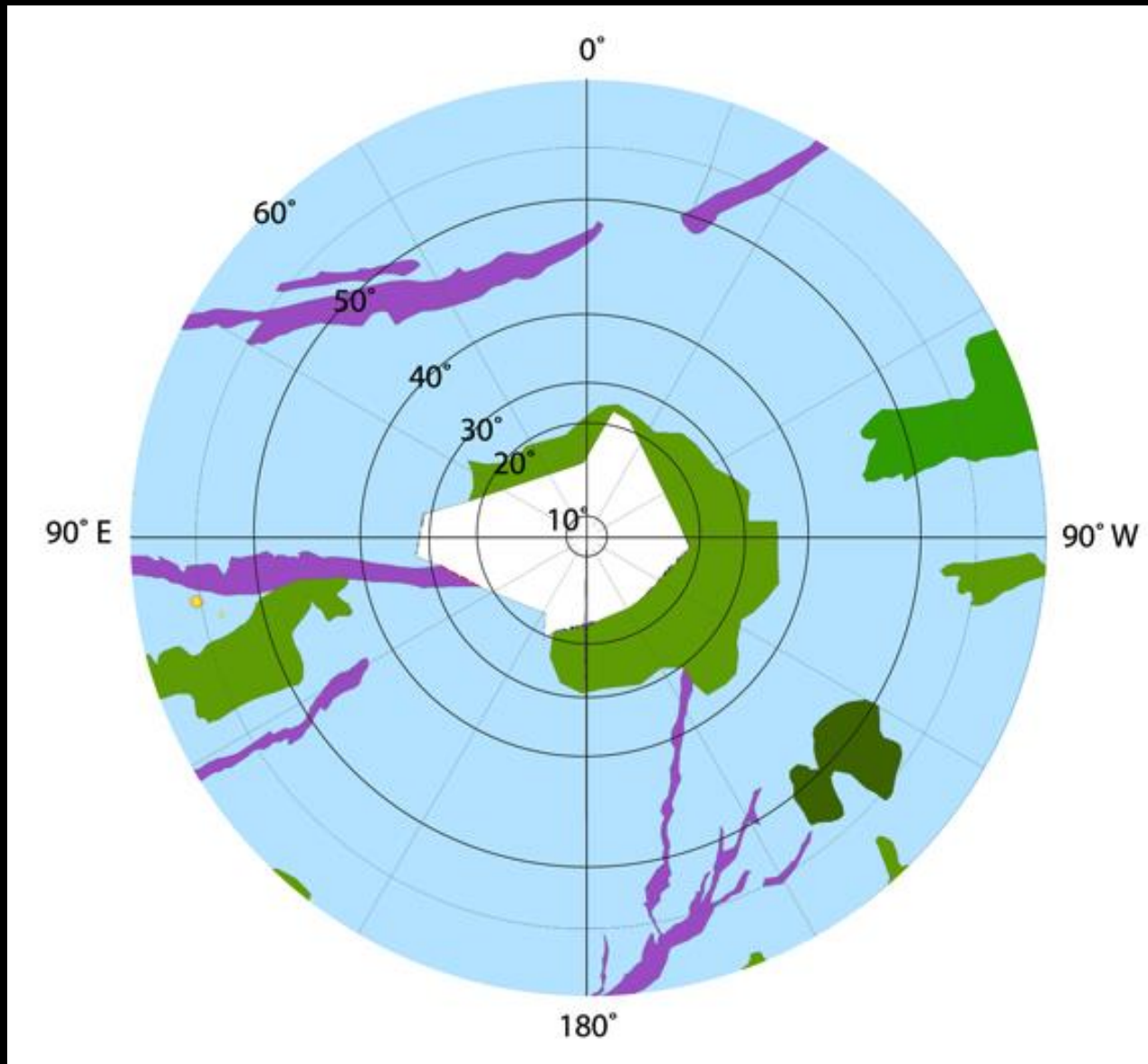
Resolution Map



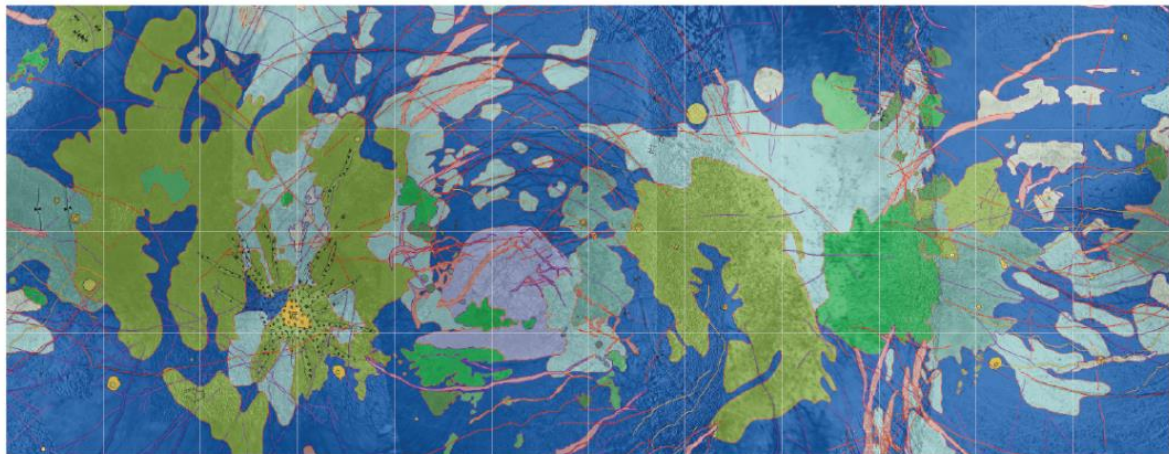
North Pole



South Pole



Bunte et al. 2015 Map



Legend

LinearFeatures

<all other values>

TYPE

- undifferentiated linea
- ridges
- flexus
- crest of crater rim
- depression margin
- dome margin
- trough (type 1)

GeoContacts

TYPE

- boundary
- certain
- approximate

TYPE

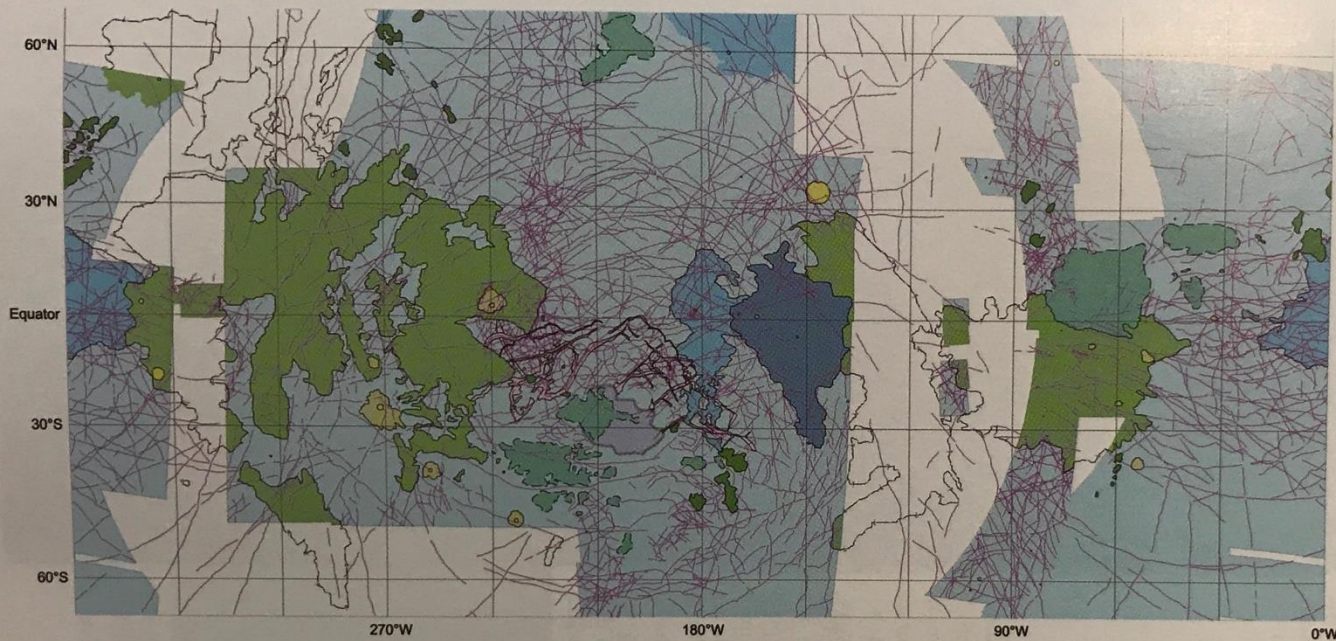
- secondary crater chain

GeoUnits

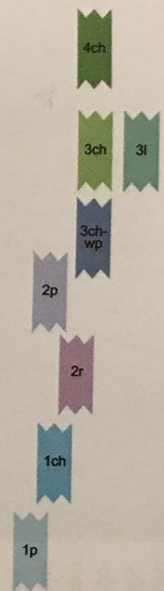
Unit

- Pb
- Pl
- Pr
- b
- c
- ce
- ch
- chb
- chf
- chm
- chs
- chu
- s

Doggett et al. 2009 Map



Correlation of Map Units



- Crater floor and rims
- Crater ejecta
- Chaos 4 units (4ch)
- Chaos 3 units (3ch)
- Lenticulated Terrain units (3l)
- Western Powys Regio Chaos (3ch-wp)
- Argadnel Regio south unit (2p-ar)
- Band Material
- Ridge Material (2r)
- Chaos 1 units (1ch)
- Plains Material (1p)
- Low resolution/no definite units mapped

- Contact Types**
- Approximate
 - Certain
 - Gradational approximate
 - Queried
 - Gradational

Differences

- Chaos Subunits
- Microchaos