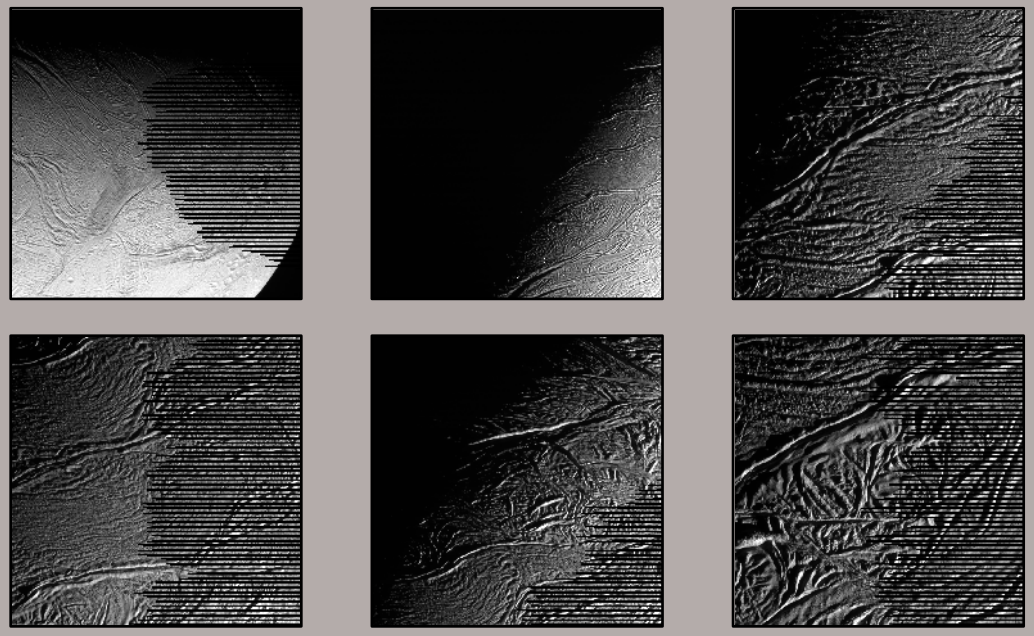
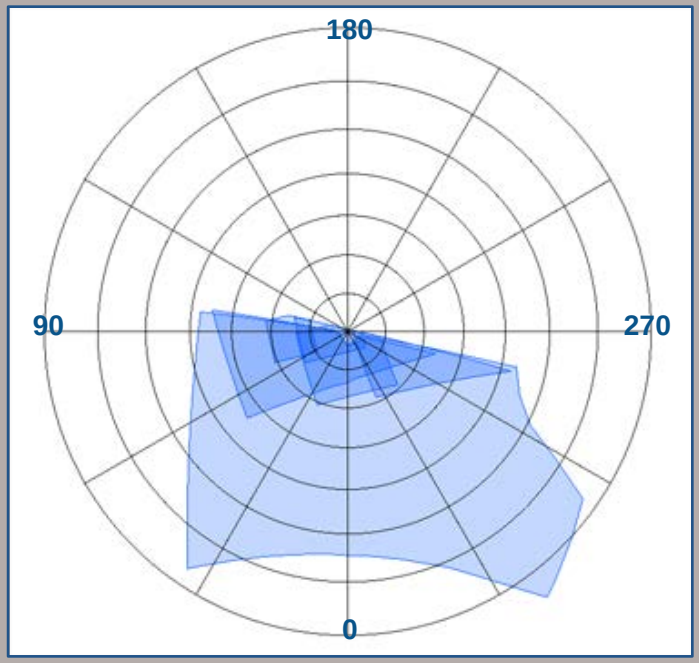
Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

- **Level 1**
  - Ingestion into ISIS3 (ciss2isis)
  - A priori SPICE (spiceinit)
  - Radiometric Calibration-I/F (cisscal)
  - Fill-in gaps with averages of surrounding pixels (lowpass)
  - 'Trim' off sides to remove 1-2 pixel noise (trim)
  - View footprints in QMOS (camstats, footprintinit)

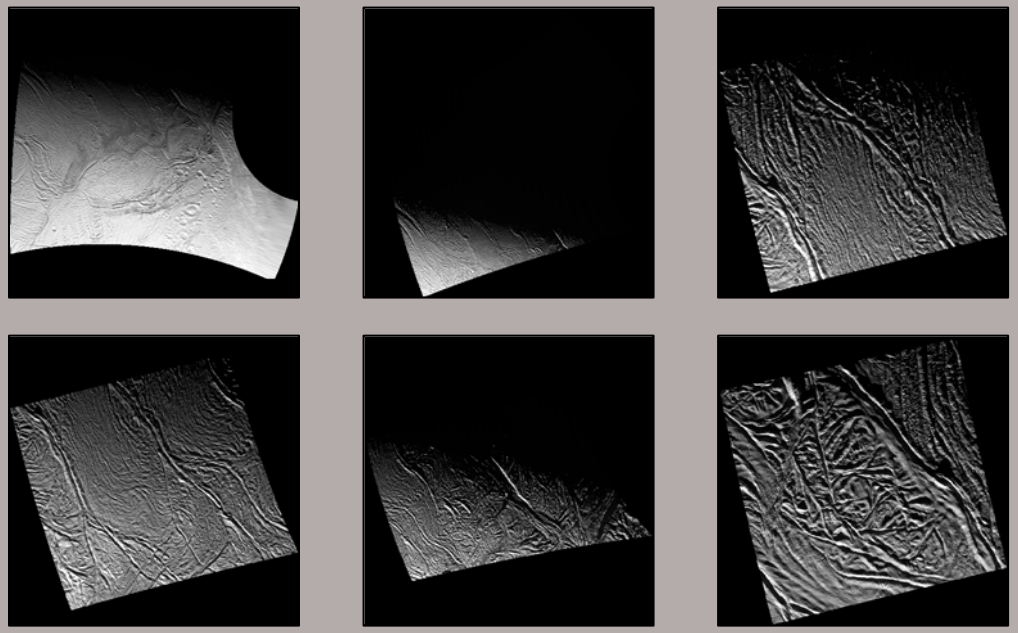
Images:
N1602275390_1
N1604169204_2
N1597183216_2
N1597183061_2
N1597182896_2
N1597182735_2

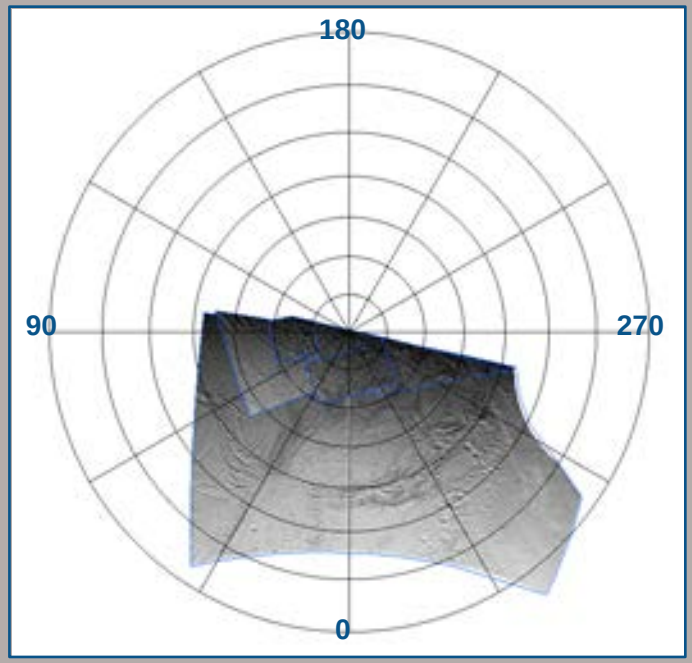


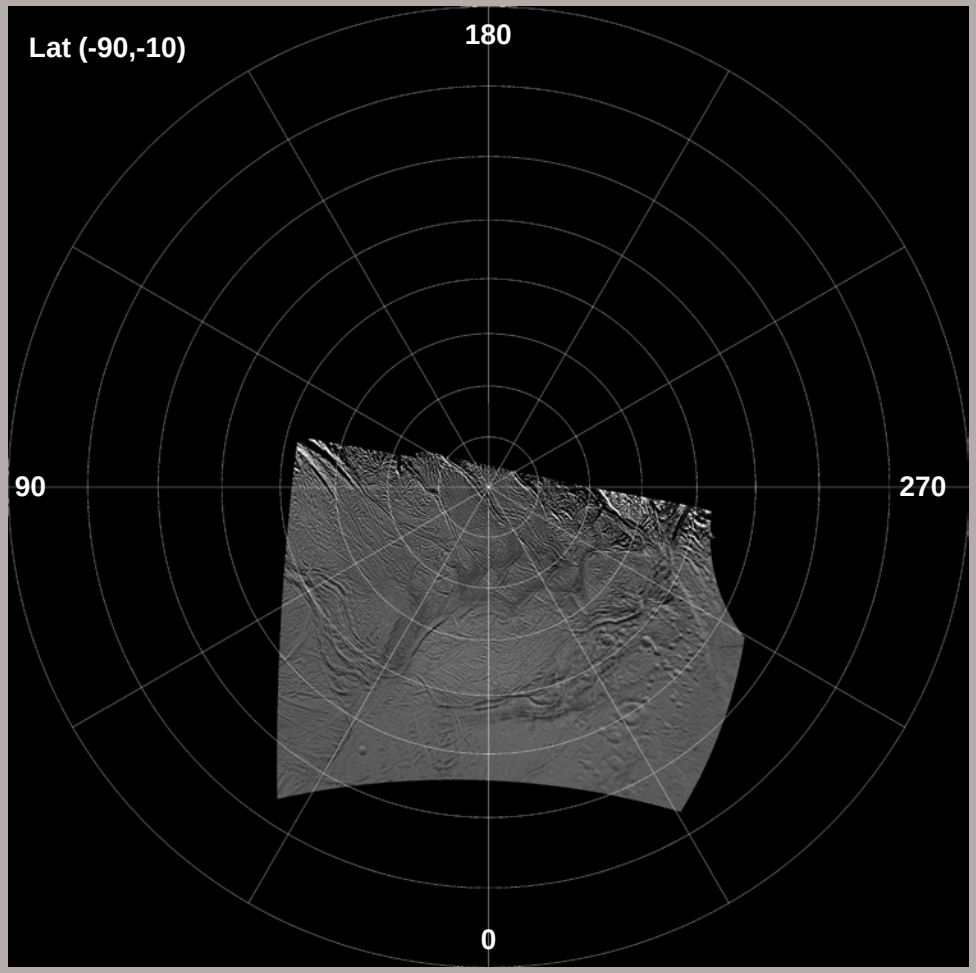


Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

- **Level 2**
  - Define a Map (maptemplate)
  - Map Project (cam2map)
  - Mosaic to create an uncontrolled mosaic (automos)
  - Check out an existing control network (qnet)
  - Adjust camera pointing (jigsaw)
  - Map Project with updated 'Level1' labels (cam2map)
  - Mosaic to create a controlled mosaic (automos)






Lat (-90,-10)
180
90
270
0

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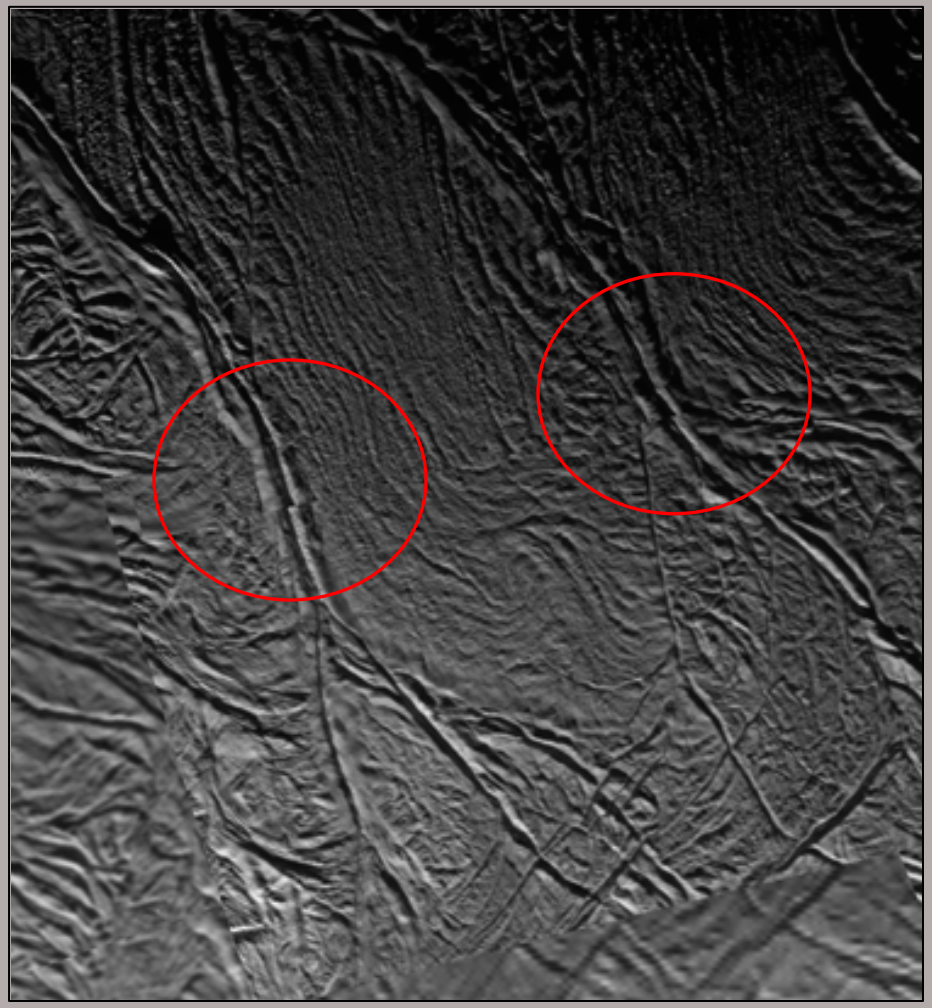
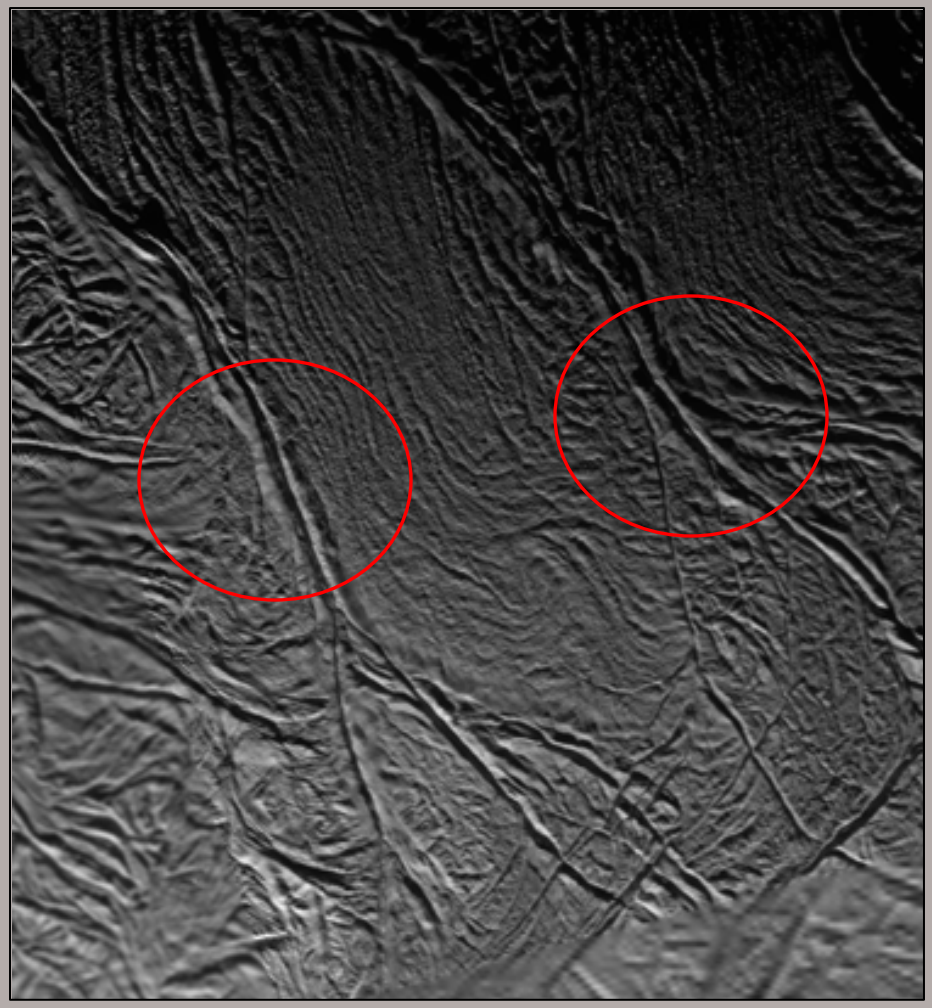
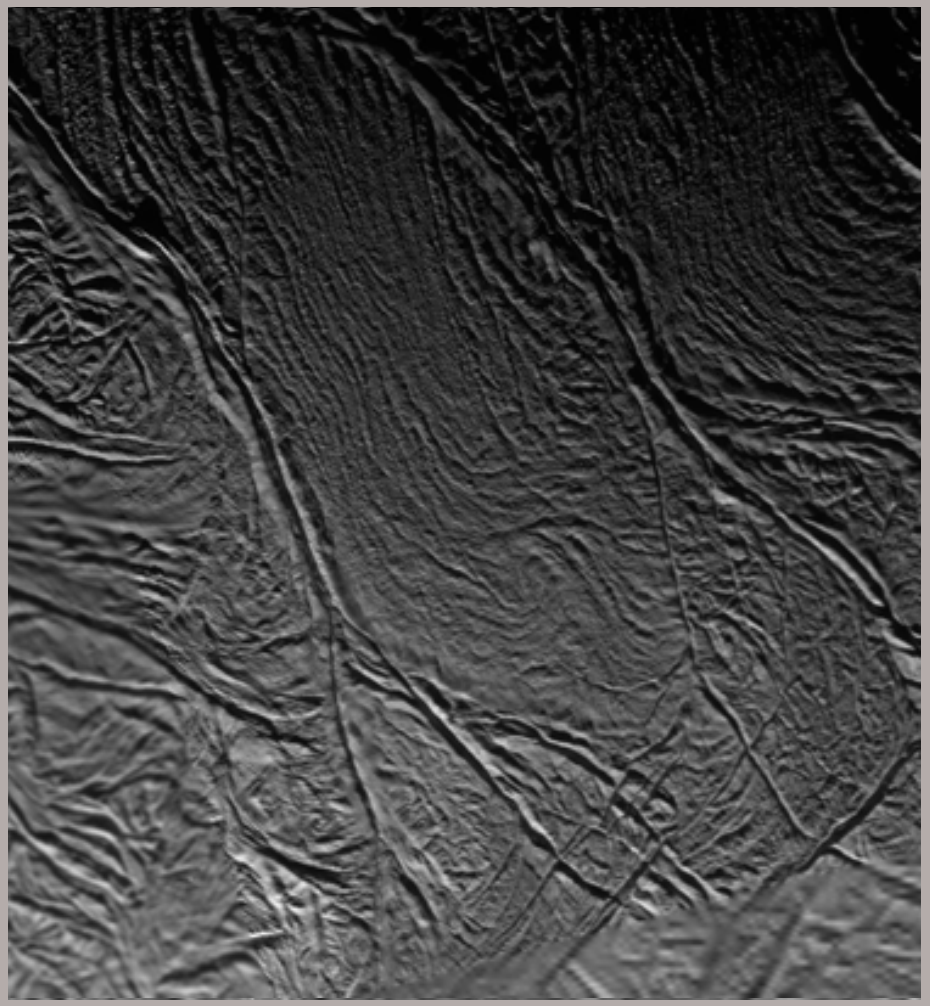
Uncontrolled (before JIGSAW)



Controlled (after JIGSAW)

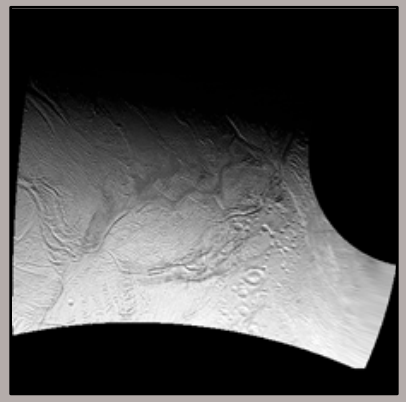




Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

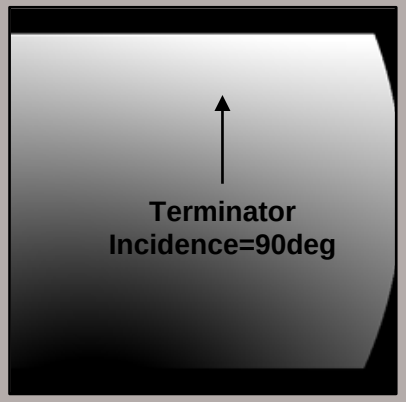
- **Level 3**
  - **Normalize limb darkening (photomet-LunarLambert)**
  - **"Trim" limb and deep terminator areas (photomet)**

Image = N1602275390_1

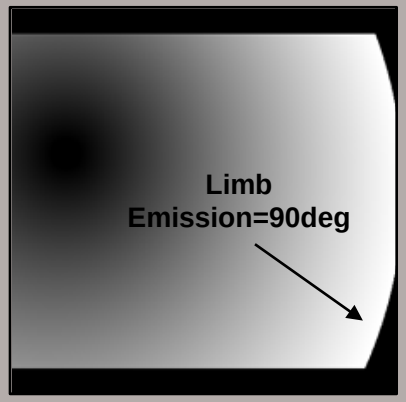


Input

Phase Angle
Average=72.96



Incidence Angle

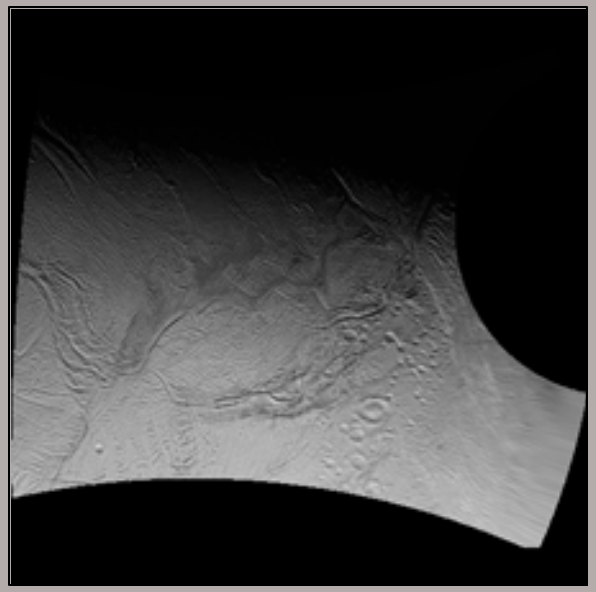


Emission Angle

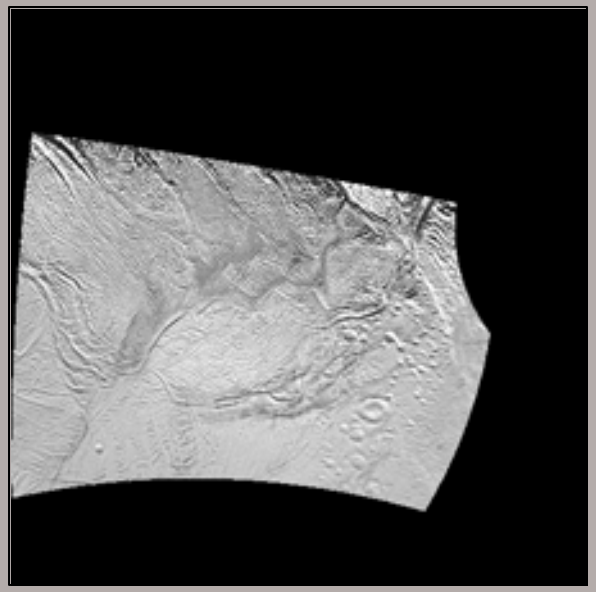
Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

Used 'photomet' to trim at maxemission=80 maxincidence=85

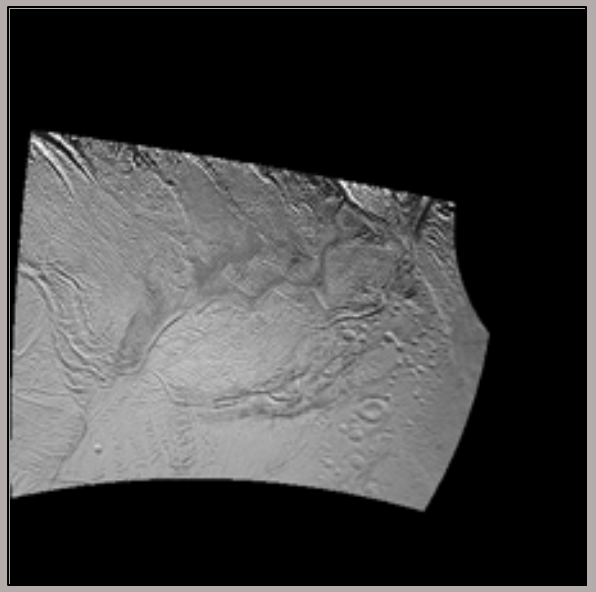
Input



LunarLambert L=0.3



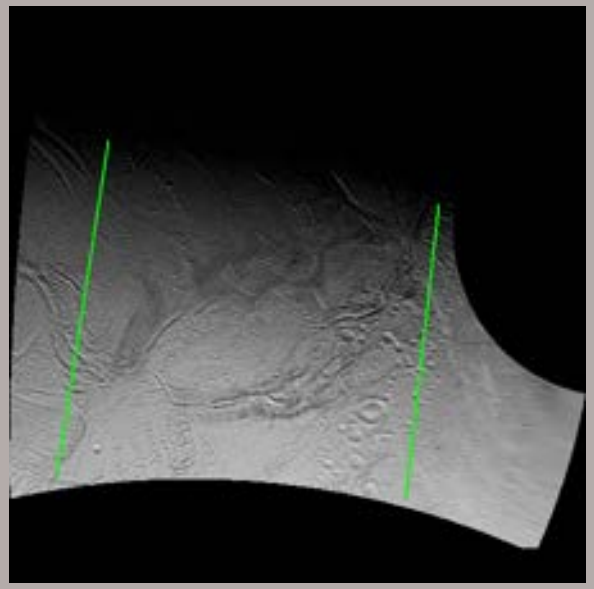
LunarLambert L=0.9



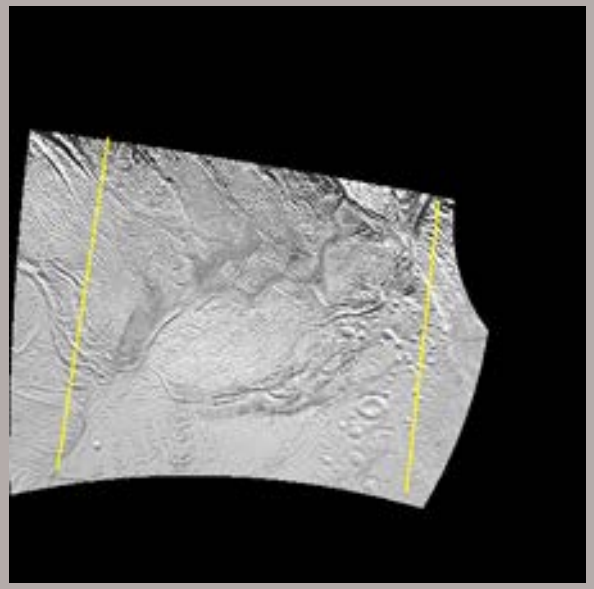
Display Range = 0 – 1.0 DN

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

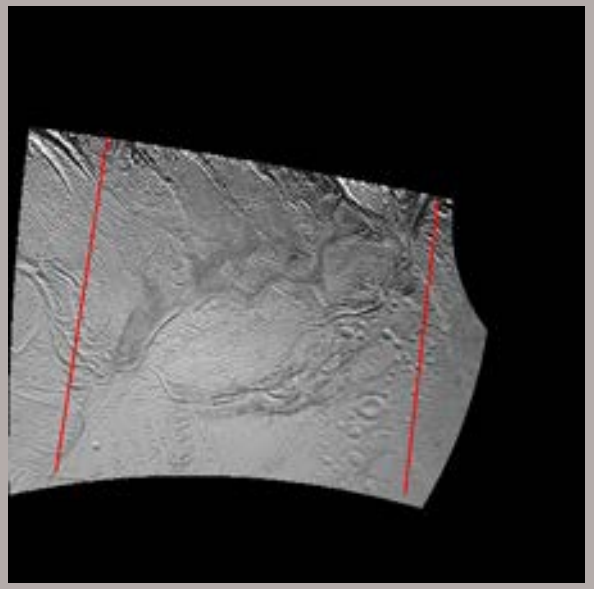
Input



LunarLambert L=0.3



LunarLambert L=0.9



Measure 'Qview' 2D Plots of DN brightness across the direction of phase angle gradient

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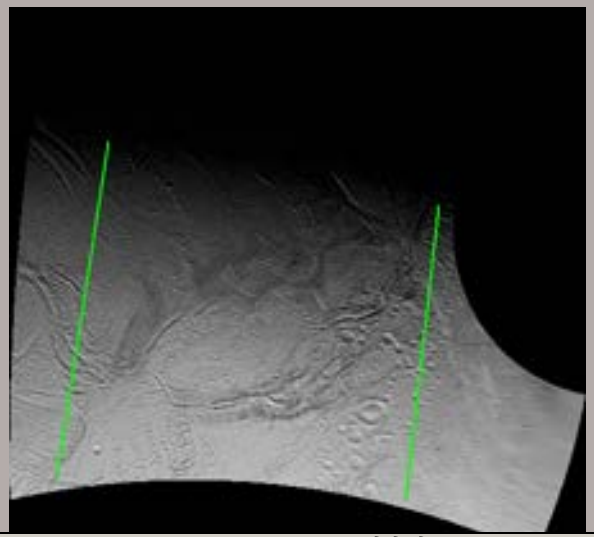
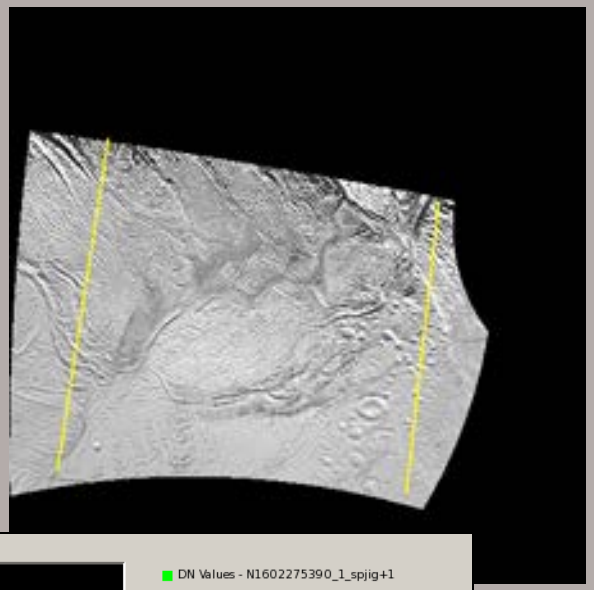
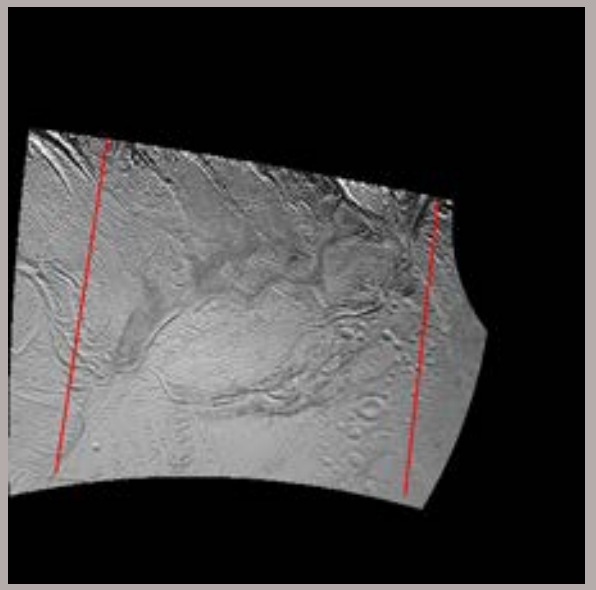
Input

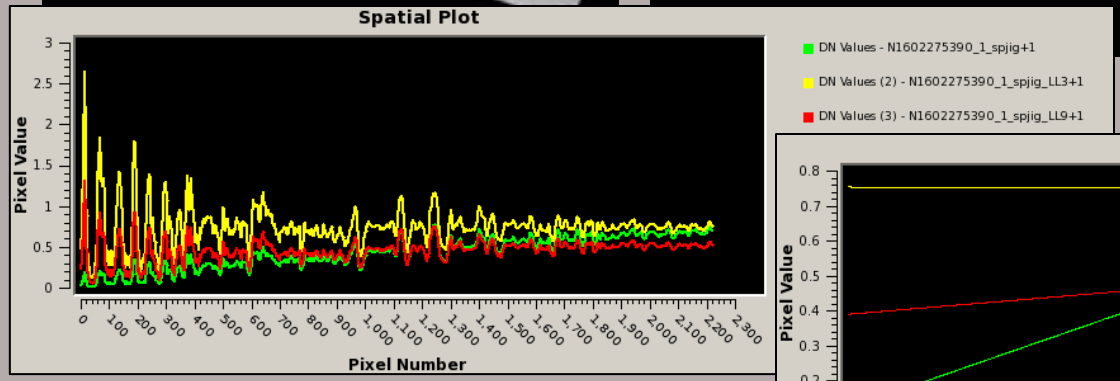
LunarLambert L=0.3

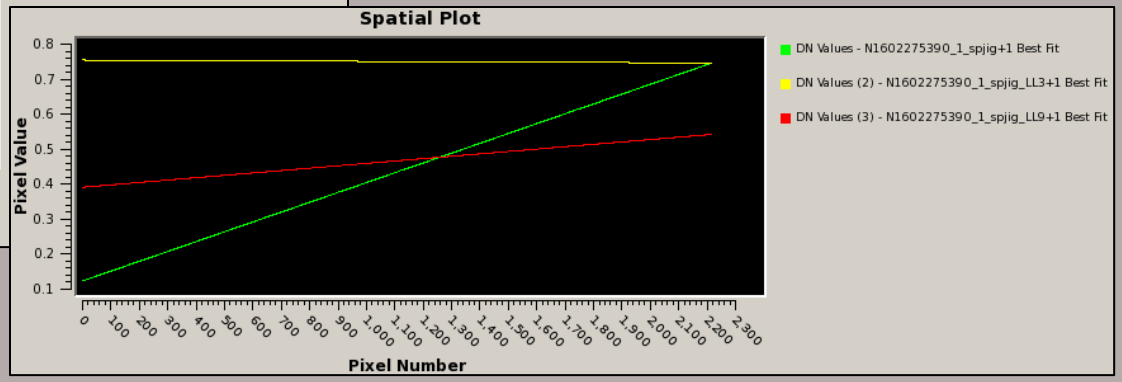
LunarLambert L=0.9











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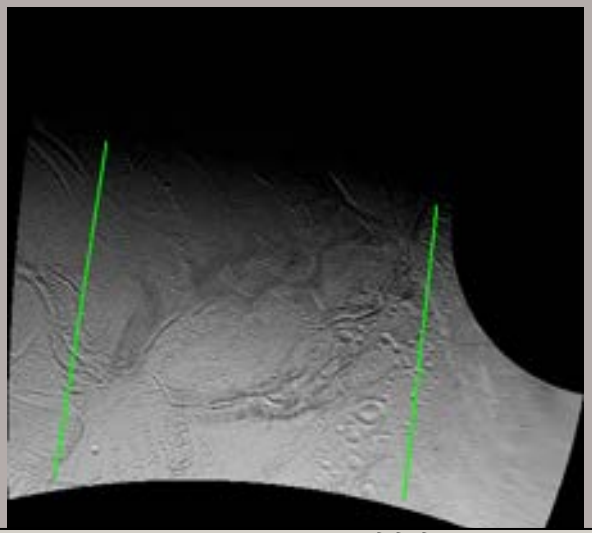
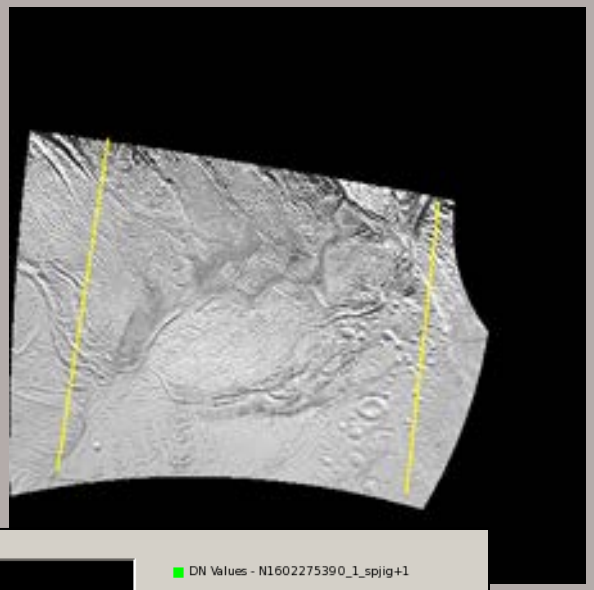
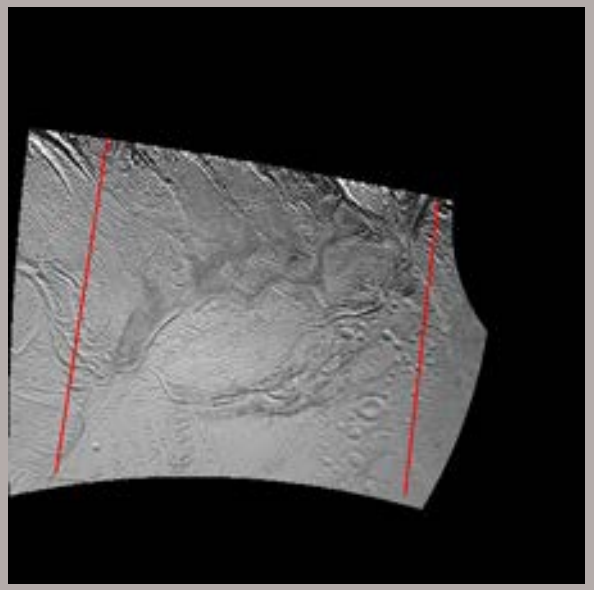
Input

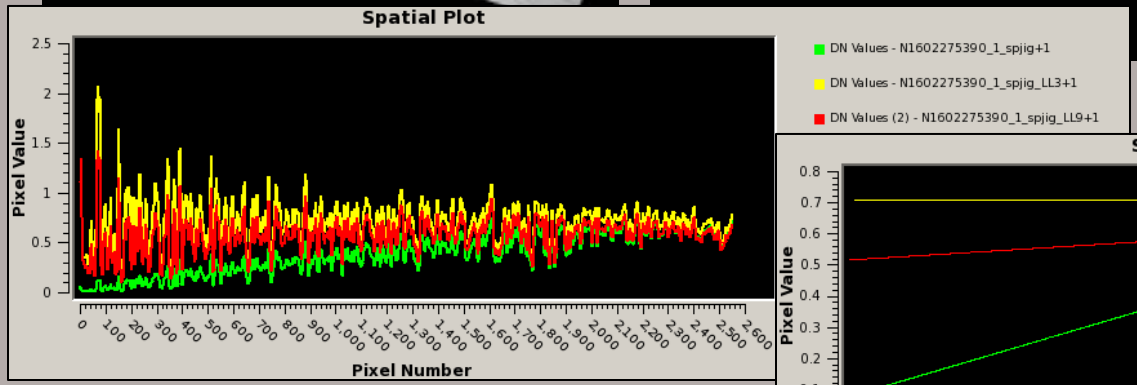
LunarLambert L=0.3

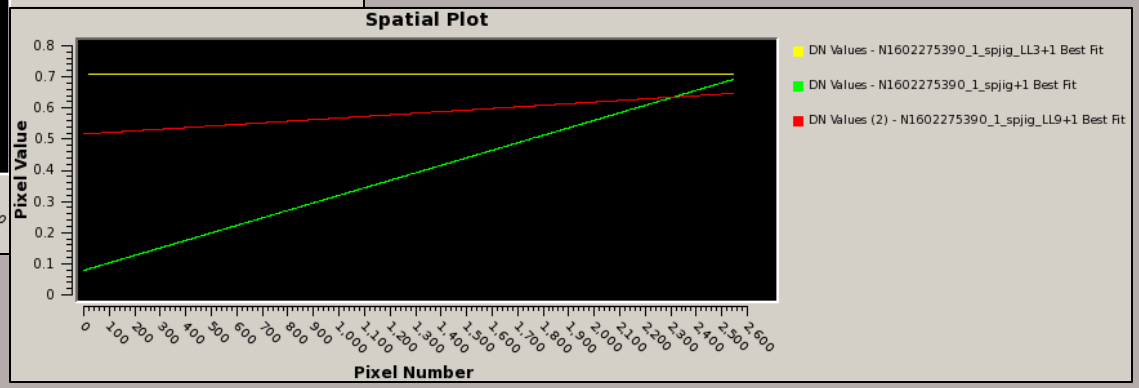
LunarLambert L=0.9











Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

HANDS ON….
Let's get started!

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

1. 'cd' to the **Enceladus_ISS** directory
2. Open a second terminal window (make sure you are in the same directory…."pwd")
3. Find the command-line script: **enc.scr**
4. cat enc.scr (to display the contents on the screen)
5. "Batchlist" discussion first….
6. Then follow along and type (or copy/paste) the commands as seen in enc.scr in the 2nd window

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

Batchlist Parameter for ISIS Command Lines:

*Allows the user to run a single ISIS application multiple times on a list of input parameters:

http://isis.astrogeology.usgs.gov/documents/CommandLine/CommandLine.html

---

Type 'ls' to look at contents of your directory

- cat root.lis

"root.lis" is a single column ascii file containing the 'root' filenames

1st command in enc.scr (Ingestion; PDS to ISIS):

- ciss2isis **-**batchlist=root.lis from=**\$**1**.**LBL_label to=**\$**1.cub

2nd command (load NAIF/SPICE kernel information onto labels)

- spiceinit **-**batchlist=root.lis from=**\$**1.cub

root.lis

N1597182735_2
N1597182896_2
N1597183061_2
N1597183216_2
N1602275390_1
N1604169204_2

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

Prep applications for 'QMOS'

- camstats -batchlist=root.lis from=\$1.cub attach=true

Create footprint info; define footprint boundary at limb and terminator

- footprintinit -batchlist=root.lis from=\$1.cub maxemission=85 maxincidence=85

Radiometric Calibration

- cisscal -batchlist=root.lis from=\$1.cub to=\$1_cal.cub fluxunits=I/F

Fill-in truncated 'NULL' lines and 'speckled' HRS noise

- lowpass -batchlist=root.lis from=\$1_cal.cub to=\$1_fill.cub samples=3 lines=3 filter=outside replacement=center

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

'Trim' two pixels along all four sides (results are assigned to NULL; not 'cropped')

- trim -batchlist=root.lis from=\$1_fill.cub to=\$1_tr.cub
  top=2 bottom=2 left=2 right=2

- qview *390*.cal.cub *390*tr.cub (display versions of one of the images)

Create a "Map" Template

- maptemplate map=sp.map projection=POLARSTEREOGRAPHIC
  clat=-90 clon=180 targopt=user targetname=ENCELADUS
  resopt=mpp resolution=200

- cat sp.map

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

sp.map should look like:

```
Group = Mapping
        ProjectionName     = PolarStereographic
        CenterLongitude    = 180.0
        CenterLatitude     = -90.0
        TargetName         = Enceladus
        EquatorialRadius   = 256600.0 <meters>
        PolarRadius        = 248300.0 <meters>
        LatitudeType       = Planetocentric
        LongitudeDirection = PositiveEast
        LongitudeDomain    = 360
        PixelResolution    = 200.0 <meters/pixel>
End_Group
```

Project the images to Polarstereographic

- cam2map -batchlist=root.lis from=\$1_tr.cub to=\$1_sp.cub map=sp.map pixres=map

- ls *sp.cub > sp.lis

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

- qmos (Display footprints)
  - Select sp.map for Map Template
  - Open the cube file list: sp.lis
- Select "View"
- Select "Show Resolution Column"
- Sort "Resolution" column in descending order
- Export "Cube List" ordered by group
  - mosorder.lis

Create the uncontrolled mosaic

- automos fromlist=mosorder.lis mosaic=enc_uncontrolled.cub minlat=-90 maxlat=-10 minlon=0 maxlon=360 grange=user

- qview enc_uncontrolled.cub

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

- Qnet (Interactive view of existing control net)
  - Load Cube List: tr.lis
  - Load Network: control.net

Run jigsaw to adjust 'camera pointing' of images relative to each other

- jigsaw fromlist=tr.lis cnet=control.net onet=jig.net **update=yes** errorpropagation=yes **file_prefix=jig**

- Check out two jigsaw output files
  - 'jig_bundleout.txt'
  - 'jig_residuals.csv'

Set 2: ISS mosaic of Enceladus' south pole: with/without control & photometry

Project a 2nd time with the updated labels from jigsaw

- cam2map -batchlist=root.lis from=\$1_tr.cub to=\$1_spjig.cub map=sp.map pixres=map

Create the controlled mosaic

- automos fromlist=mosorder_jig.lis mosaic=enc.cub minlat=-90 maxlat=-10 minlon=0 maxlon=360 grange=user

Check out the Controlled v.s. Uncontrolled

- qview enc_uncontrolled.cub enc.cub

- cat lunlam.pvl

```
Object = PhotometricModel
Group = Algorithm
      Name = LunarLambert
      L  = 0.3
   #  L  = 0.9
End_Group
End_Object

Object = NormalizationModel
Group = Algorithm
     Name   = Albedo
     Incref = 0.0
     Incmat = 0.0
     Thresh = 30.0
     Albedo = 1.0
End_Group
End_Object
```

Normalize the brightness with photomet

- photomet -batchlist=root.lis from=\$1_spjig.cub to=\$1_ll.cub frompvl=lunlam.pvl maxemission=80 maxincidence=85

Create final controlled/photometrically normalized mosaic

- automos fromlist=mosorder_ll.lis mosaic=enc_ll.cub minlat=-90 maxlat=-10 minlon=0 maxlon=360 grange=user

Overlay a map grid

- grid from=enc_ll.cub to=enc_grid.cub boundary=yes latinc=10 loninc=30 linewidth=3