Changes in F Ring Brightness

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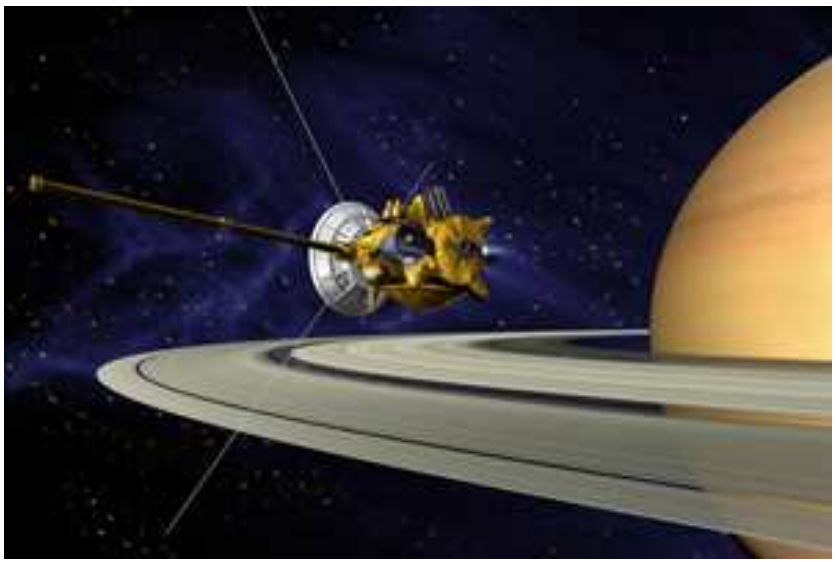
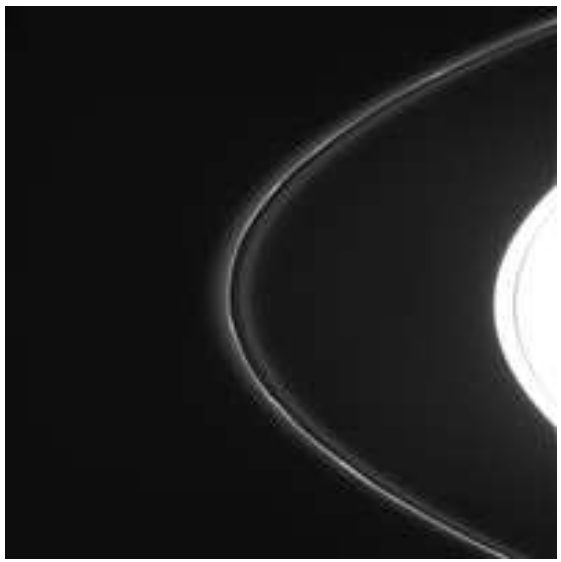
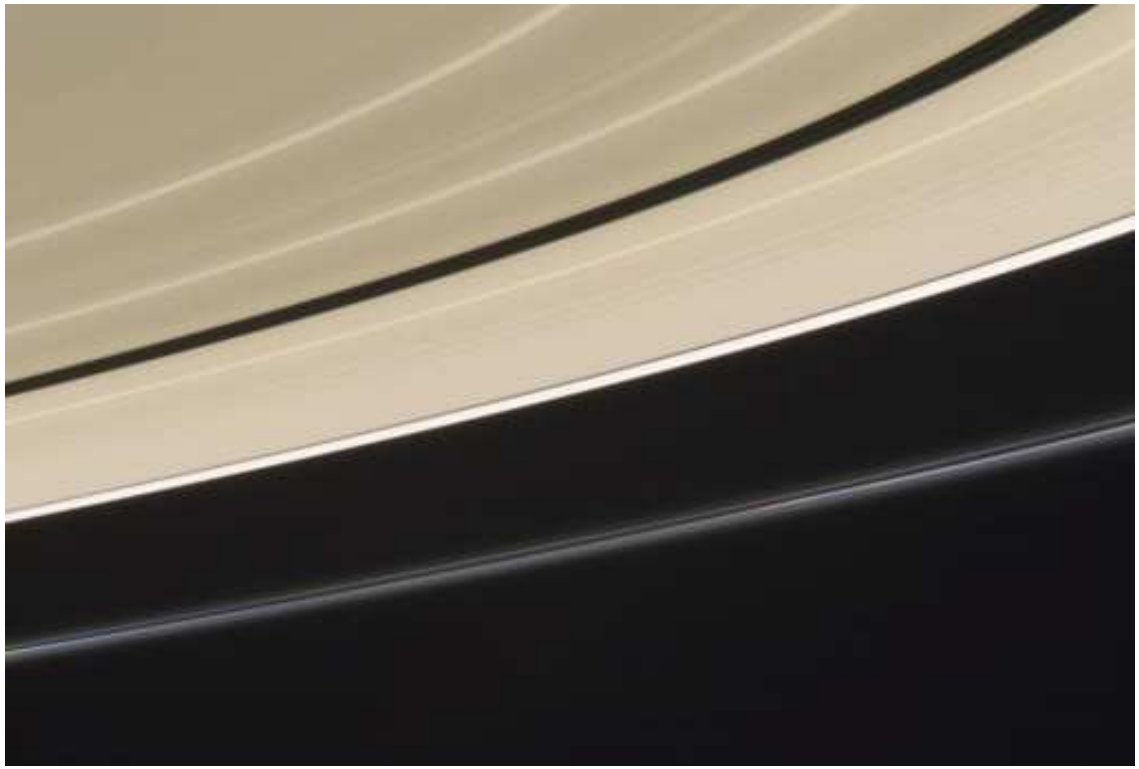




Introduction

- F-ring dynamics: temporal changes due to Prometheus' influence
- Change in dynamics results in a change of brightness
- From the analysis of the brightness it is possible to determine the size of the particles that compose the ring
- Dust particles tend to forward-scatter light more than large particles

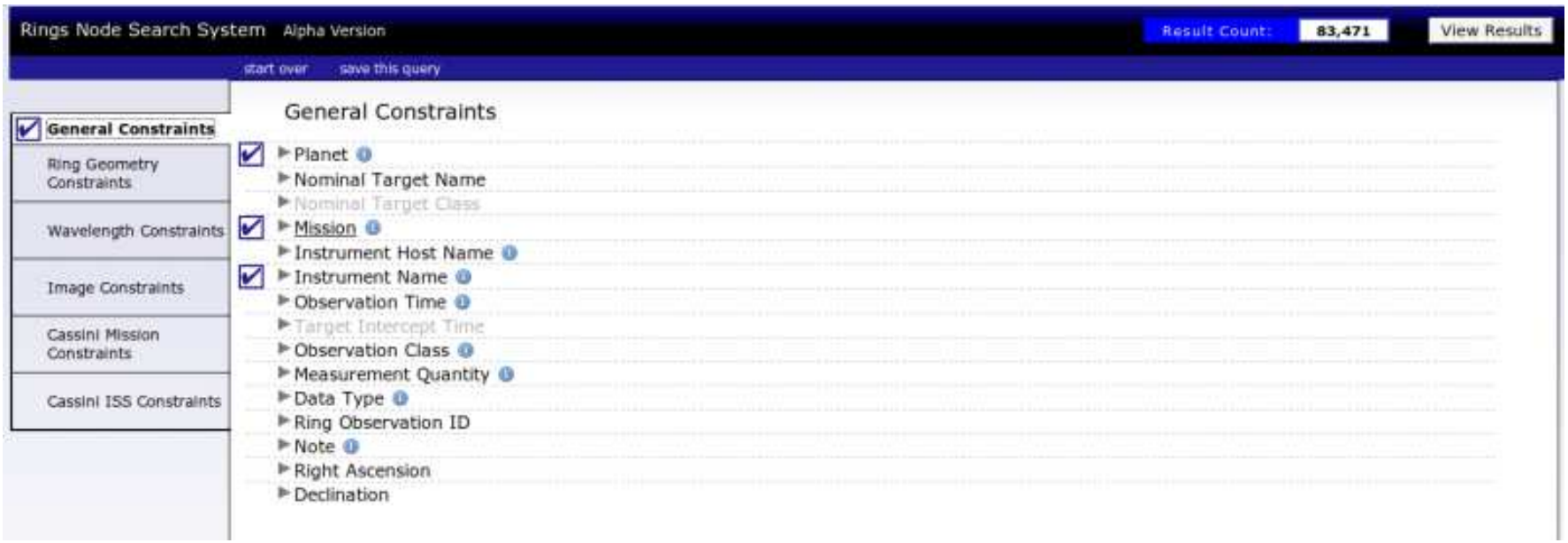


Objectives

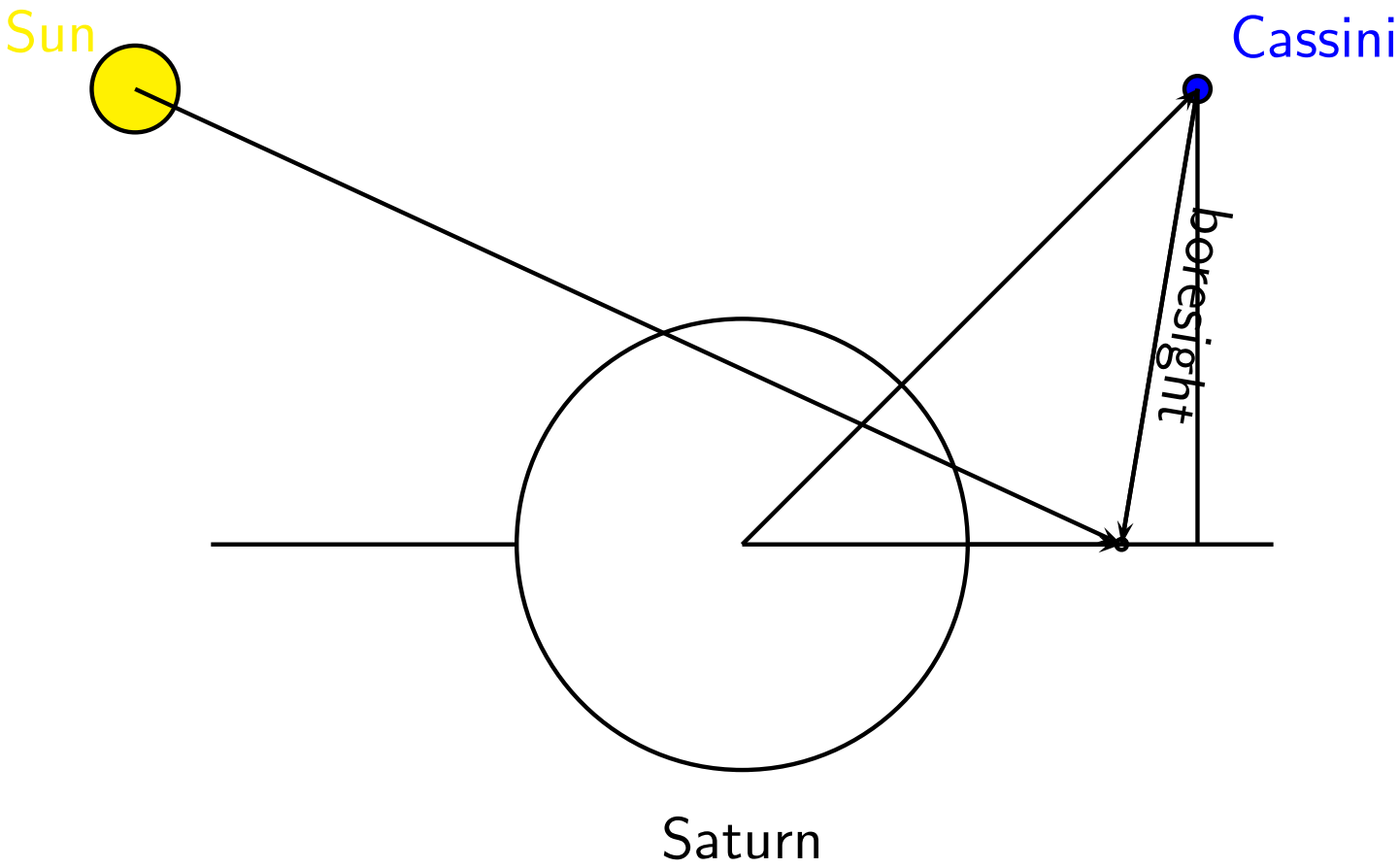
- Primary goal: compare the F ring brightness from Voyager and Cassini images
- Secondary goals
  - Learn how to find images using PDS Rings Node interface
  - Calibrate Cassini images
  - Plot equivalent width $\times$ phase angle

Finding data

- PDS Ring Node Demo interface
- Determine correct parameters
  - Spacecraft
  - Camera
  - Target
  - Filter

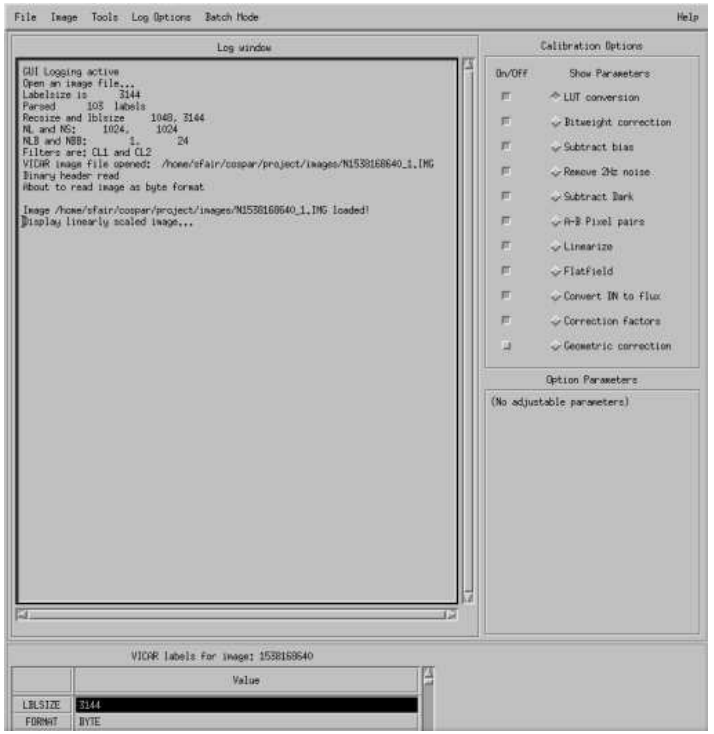


Determining phase angle and resolution using SPICE



Calibration

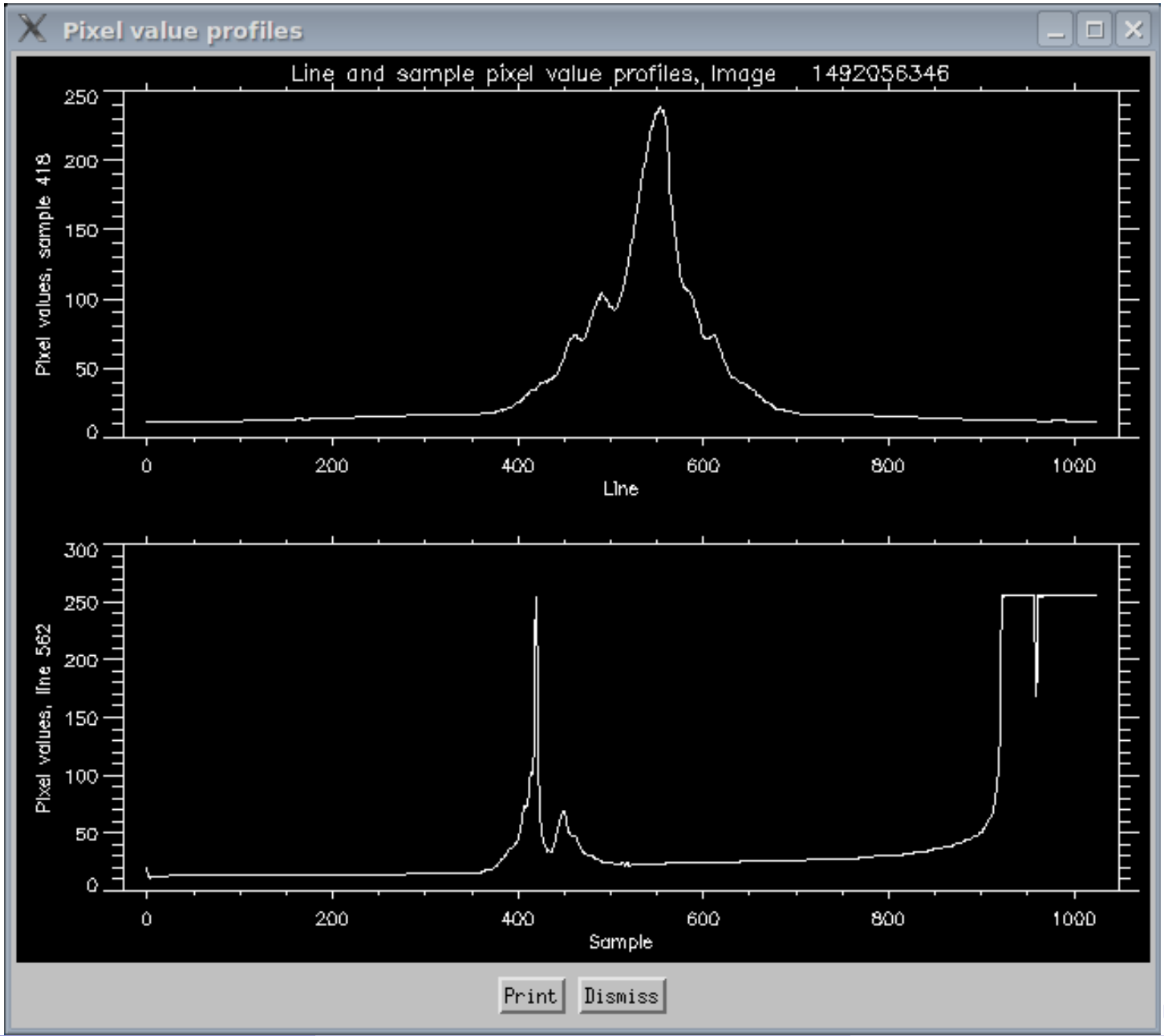
- CISSCAL: Cassini Imaging Science Subsystem Calibration
  - IDL interface
  - Download calibration volumes
  - Choose the appropriate calibration options



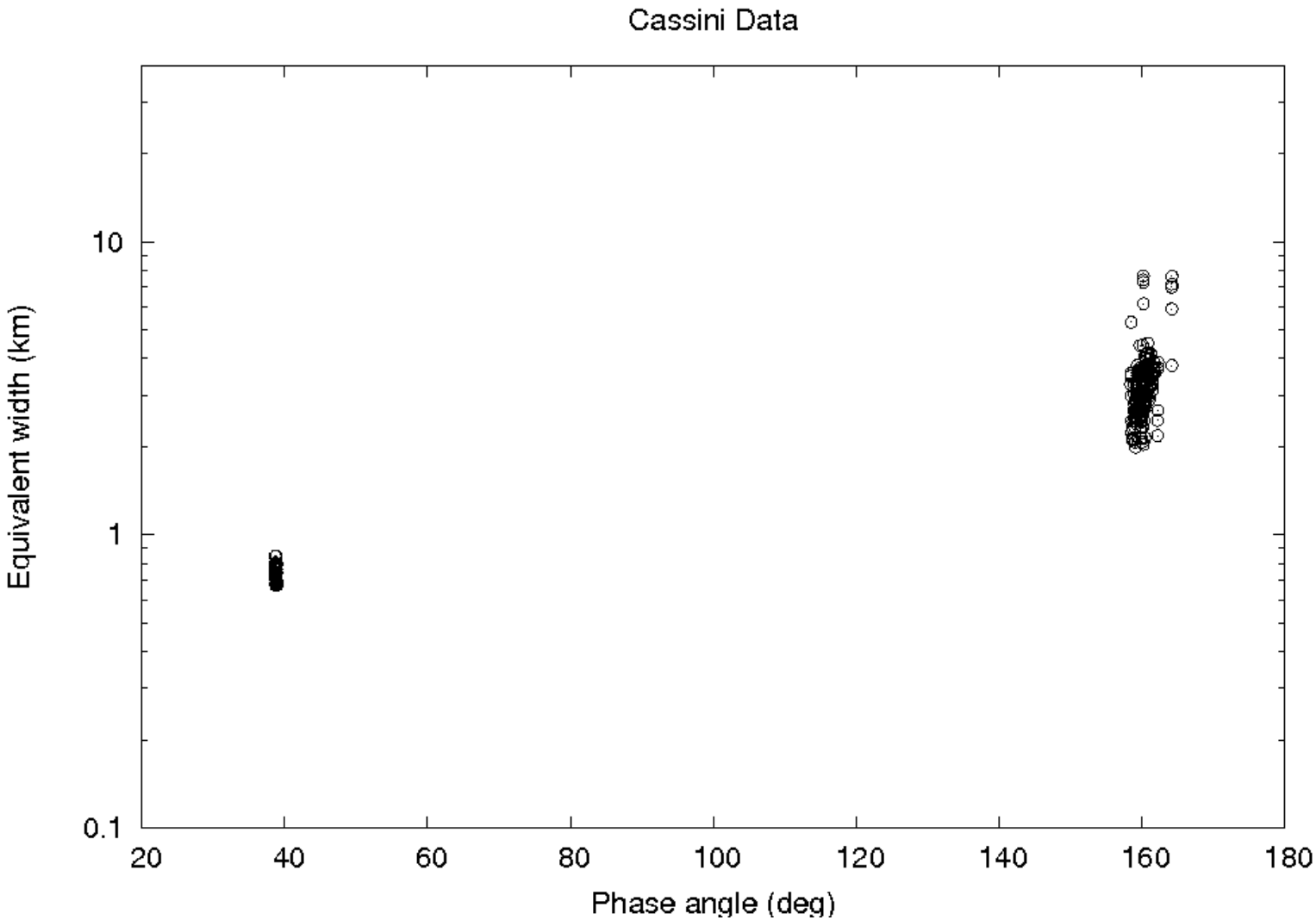
Calculating equivalent width using IDL

- We use the integrated area under the radial profile or equvalent width that is defined by
$$\int I/F(a)da$$
- The equivalent width is expected to be independent of resolution and smear and it provides a consistent measure of the total light reflected by the F Ring
- We plot the line 512 of the image, so we integrate in one interval of the image: sum the values and multiply by the resolution of the image
- We determine the "Equivalent Width": $\sin(B)\int I/Fdr$ (where B is the ring opening angle, assumed constant)

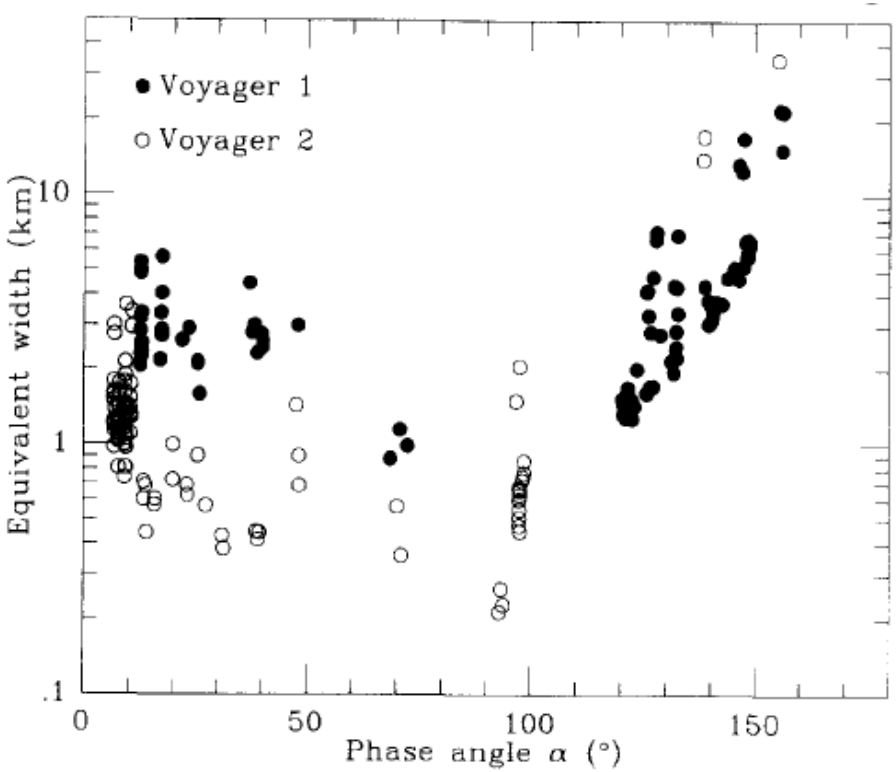
Calculating equivalent width using IDL

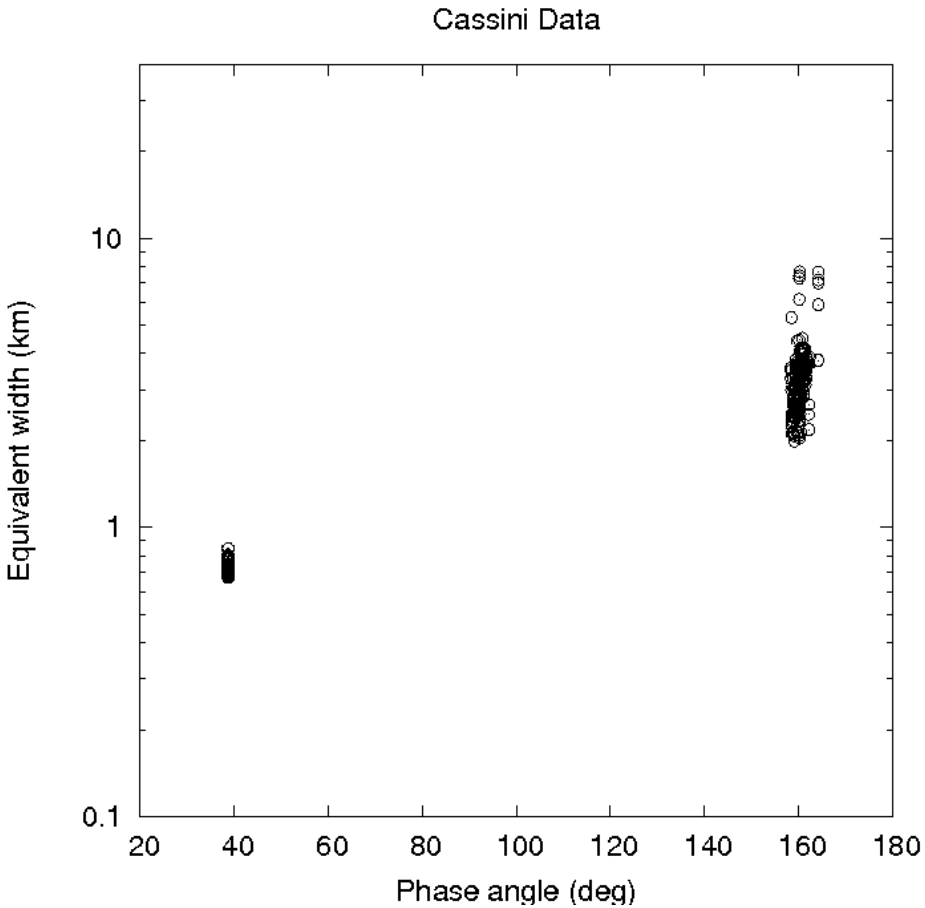


Results


Cassini Data
Equivalent width (km)
10
1
0.1
20
40
60
80
100
120
140
160
180
Phase angle (deg)

Comparative results





Next steps

- Increase the number of analyzed images
- Encompass a bigger range of phase angles
- Include more filters
- Determine the dust fraction in the F ring region
- Determine the reason for the drop in brightness, especially if we expected a climb

Acknowledgements

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