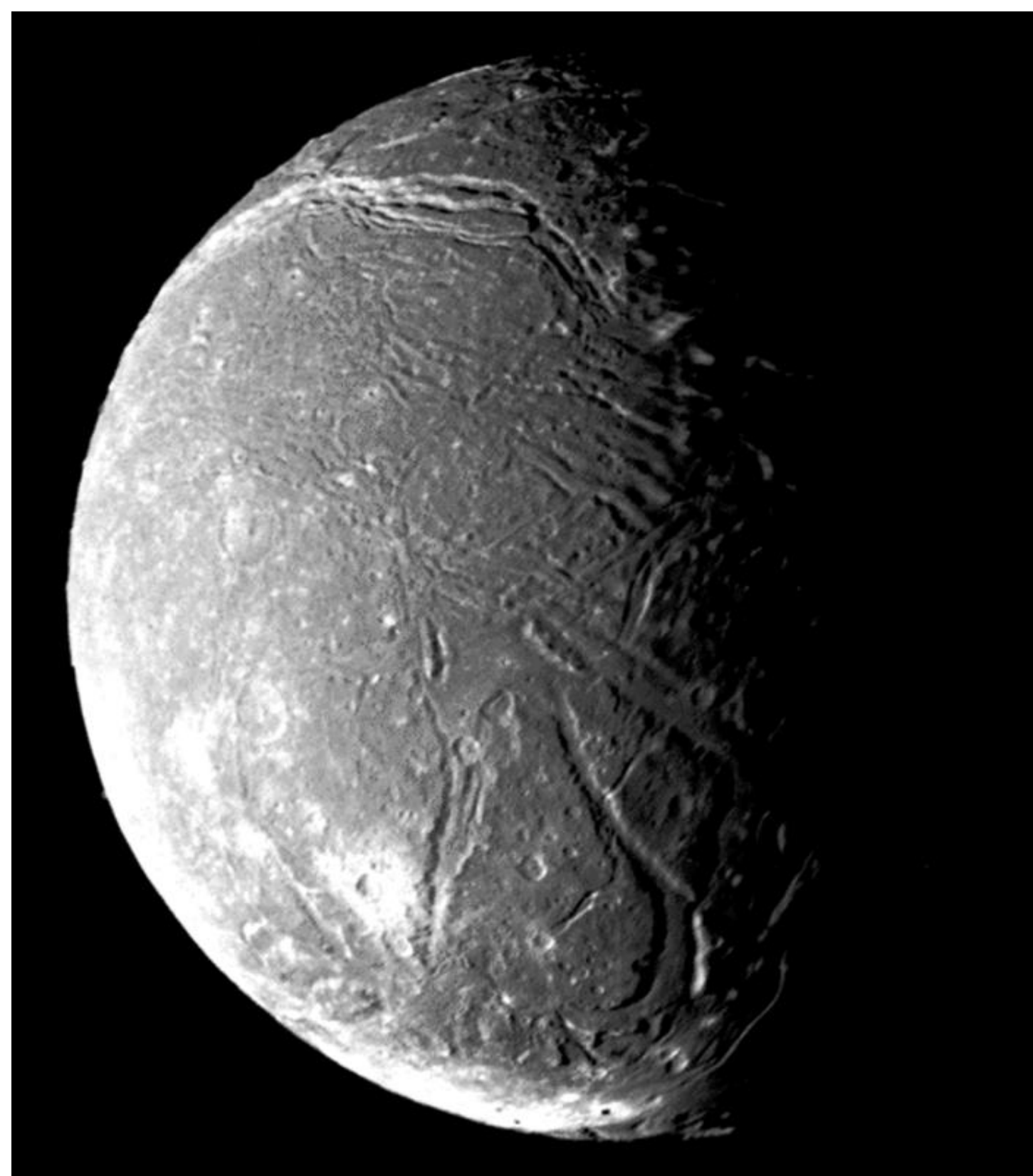


Advanced Digital Elevation Modeling Capability applied to Voyager images

Principal Investigator: Dr. Tom Nordheim (3225)

Dr. Chloe-Beddingfield-Cartwright (SETI), Dr. Steven Vance (3225), Dr. Cynthia Phillips (398H)

Program: Spontaneous Concept

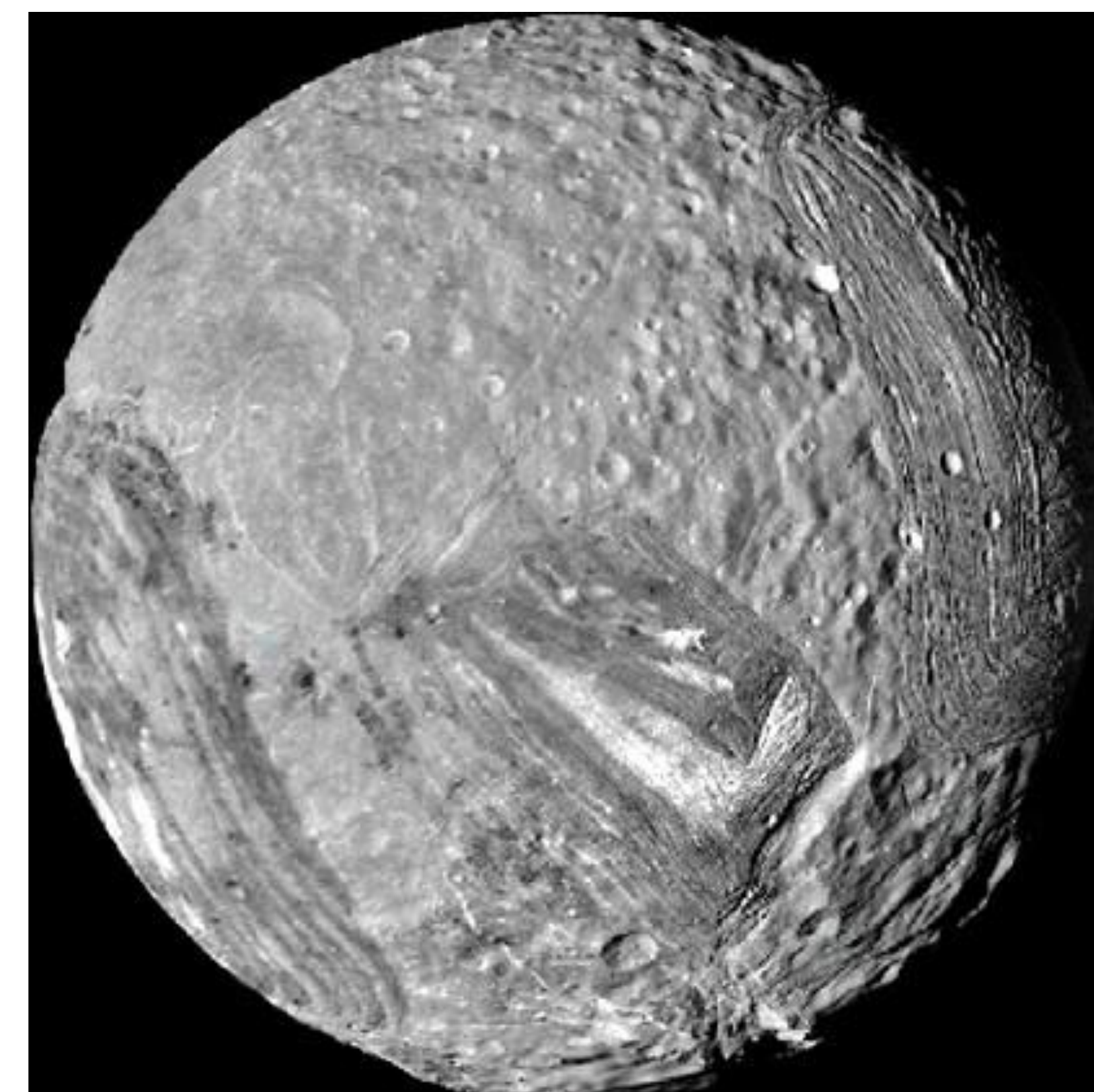


The Uranian moon Ariel as seen by Voyager 2

Project Objective:

The Voyager 2 flyby of Uranus provided the first, and to date only, imaging of its moons. Exploration of these potential ocean worlds is a key motivation for mission concepts that are currently being formulated. **The Voyager flyby dataset continues to be one of the most important tools for understanding ice giant moons.**

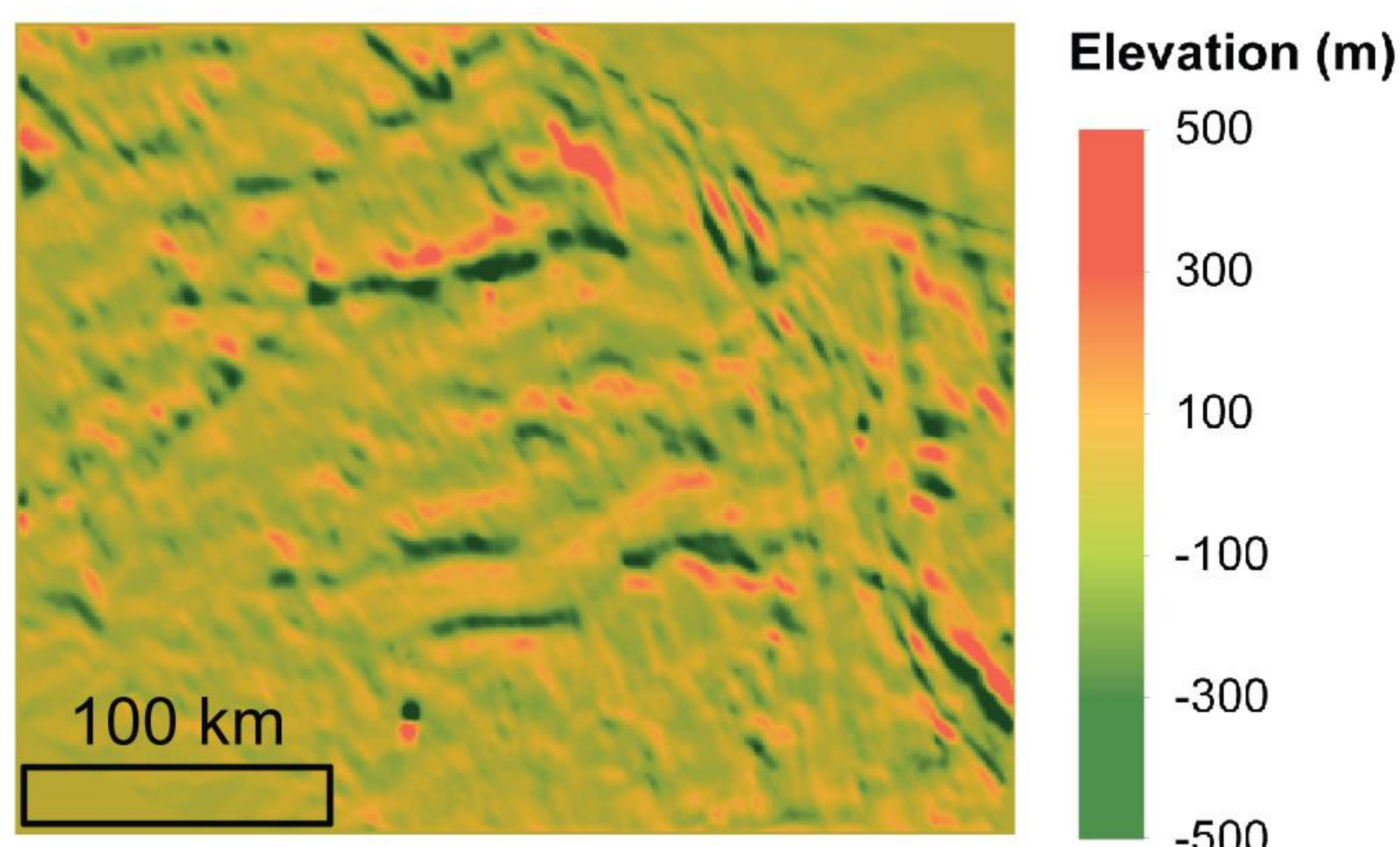
Digital Elevation Model (DEM) generation for these objects is particularly challenging due to the low quality, limited coverage, and limited number of stereopairs. **Our goal is to optimize advanced DEM generation techniques to the Voyager 2 dataset and to apply it to the Uranian moons Ariel and Miranda.**



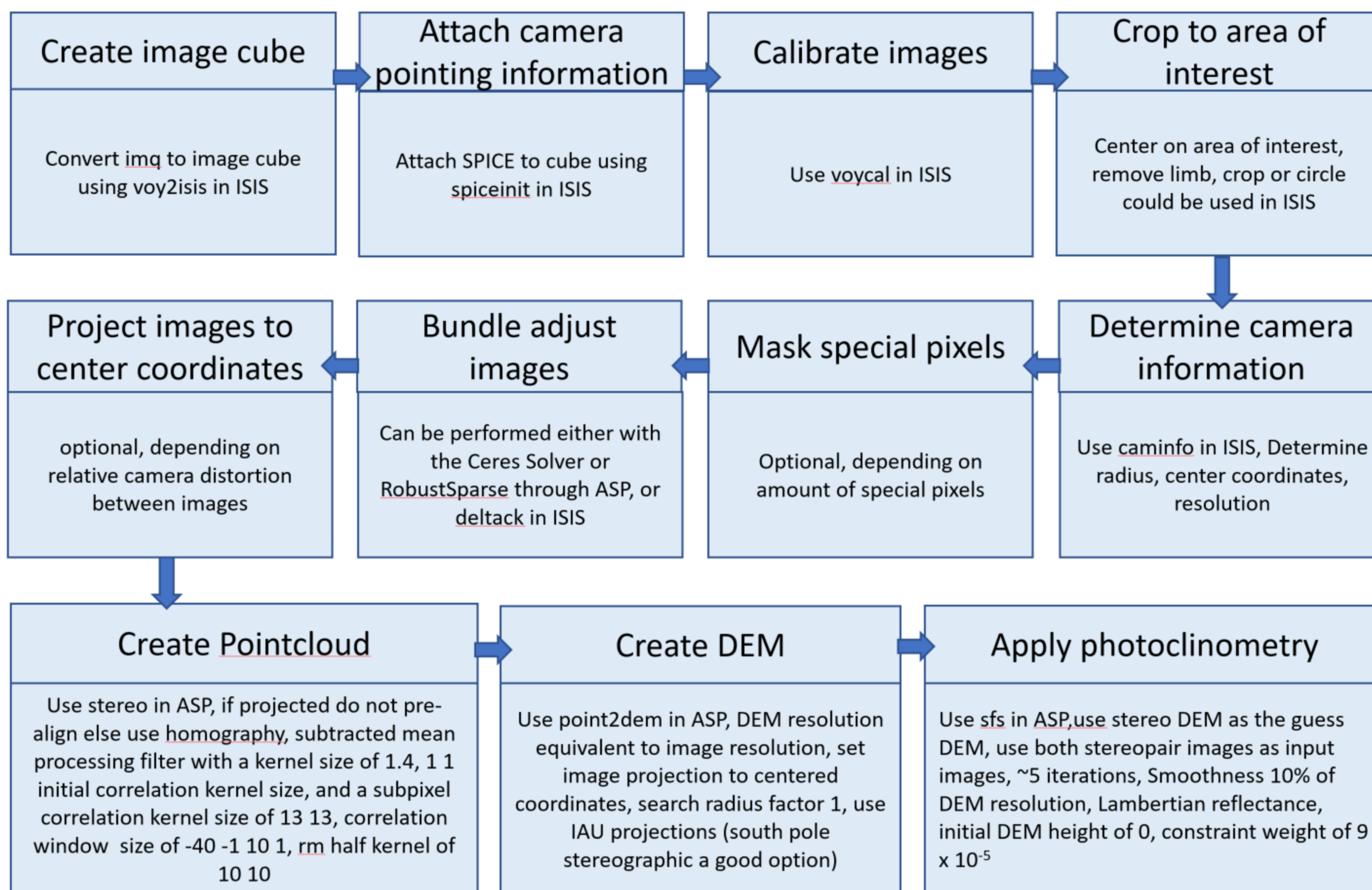
The Uranian moon Miranda as seen by Voyager 2

FY18/19 Results:

We have developed a workflow for producing DEMs from the Voyager flyby dataset based on the freely available Ames Stereo Pipeline and ISIS3 software. This approach combines both stereophotogrammetry and photoclinometry (shape from shading) to produce high quality elevation estimates. Using this workflow, we have generated DEMs of regions on respectively, Miranda and Ariel.



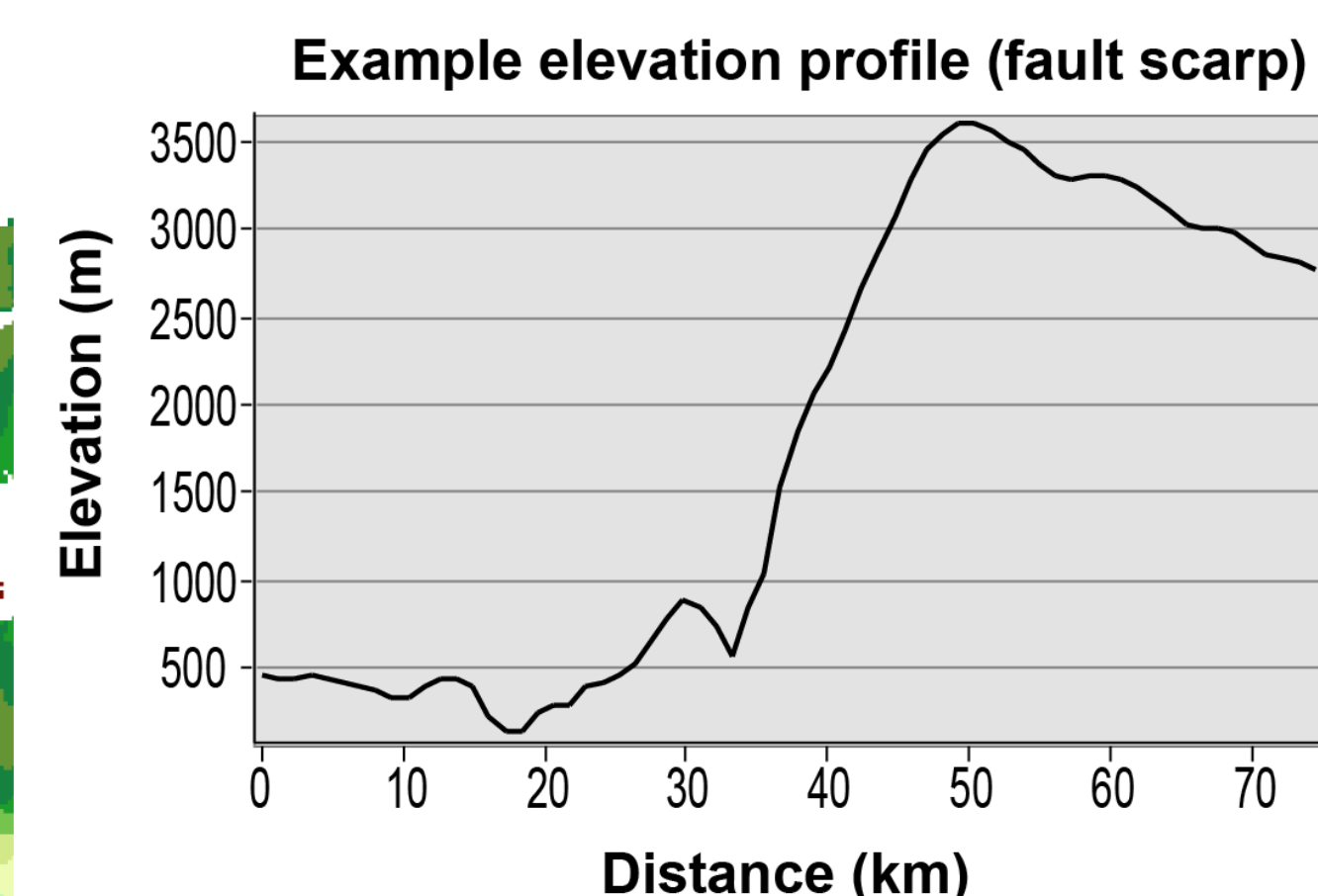
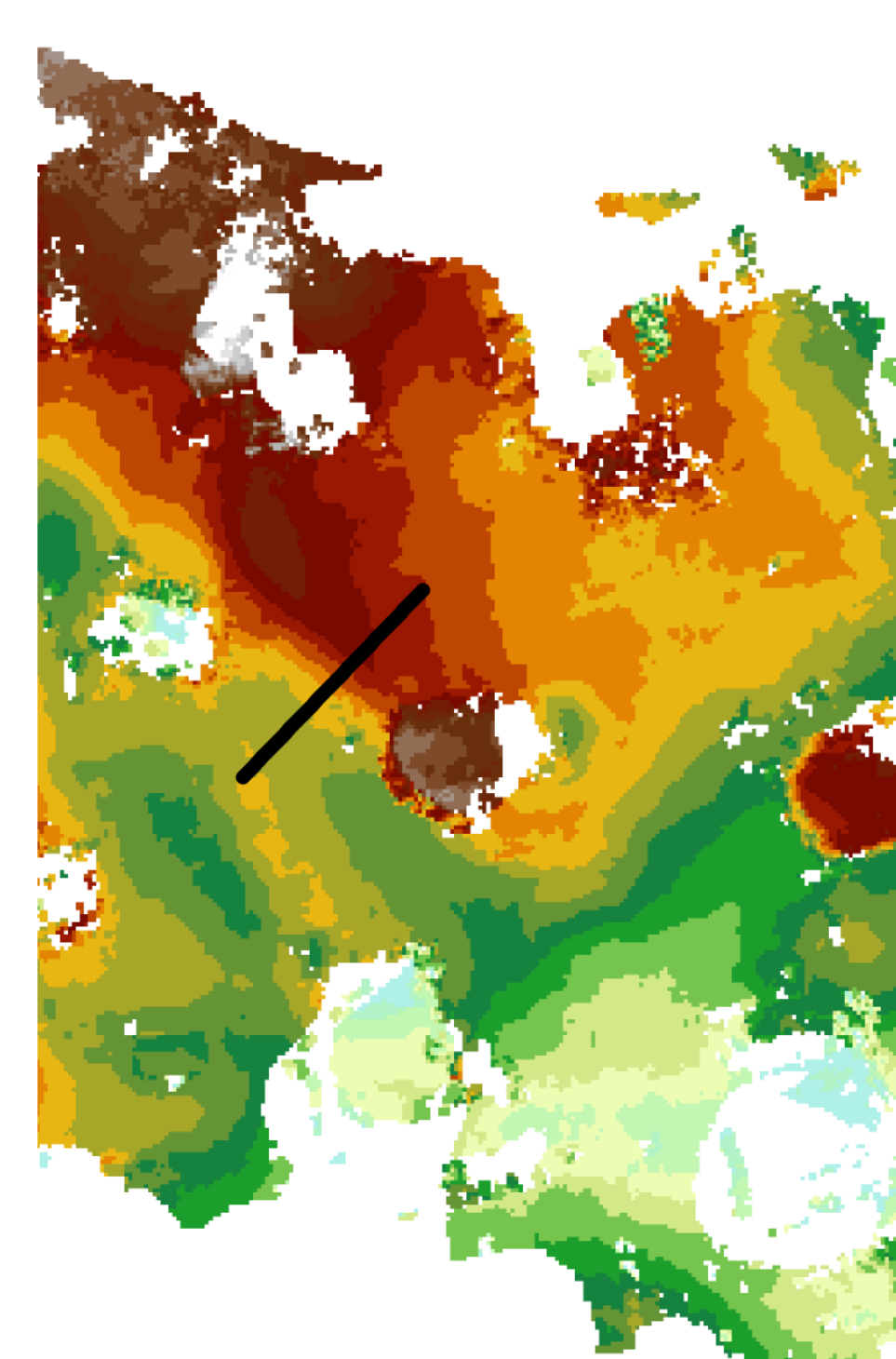
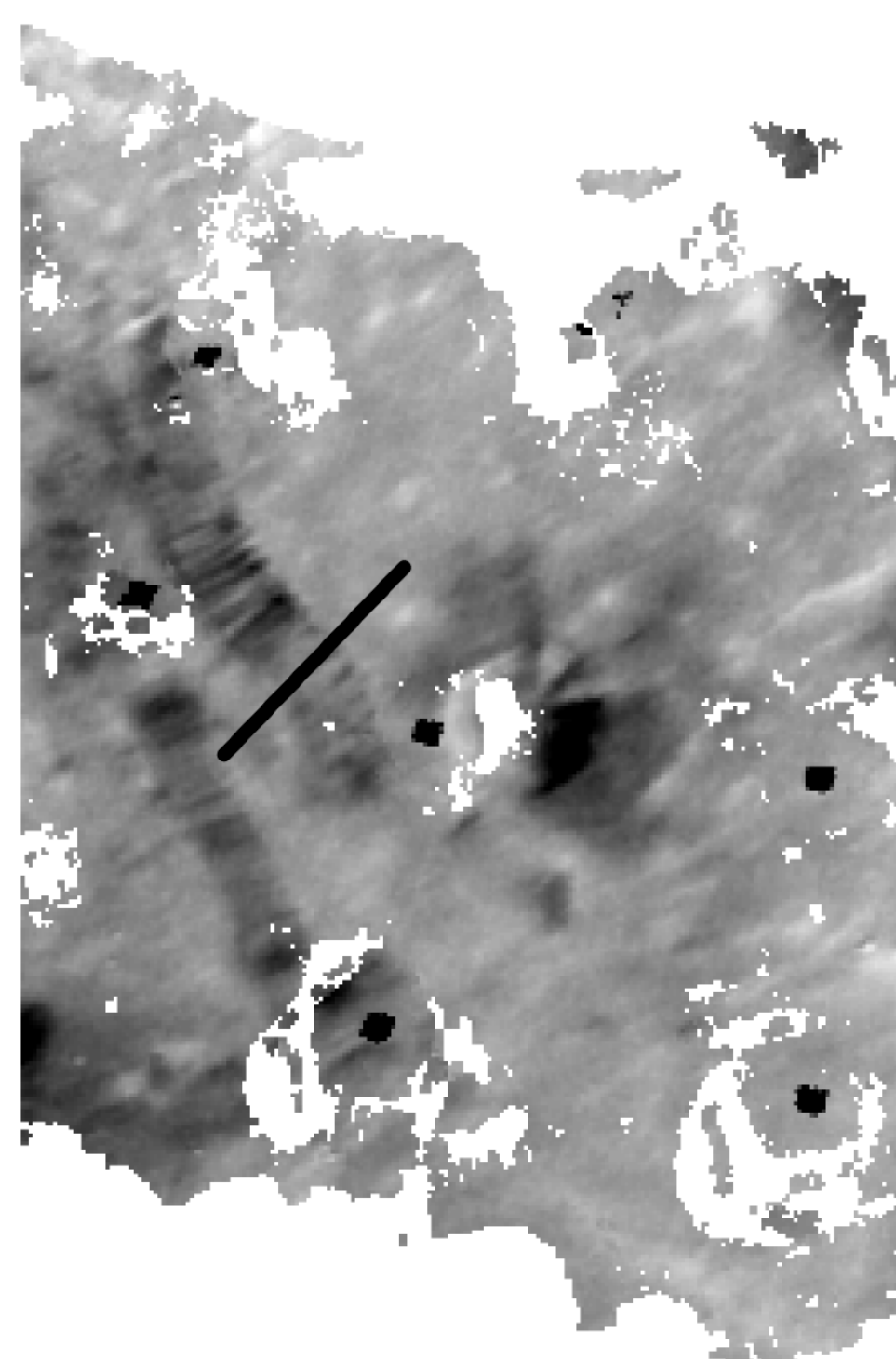
Stereo-Photoclinometry DEM of a series of graben on Ariel



Workflow for the generation of DEMs from the Voyager 2 flyby observations of the Uranian moons

Benefits to NASA and JPL:

We have established an advanced image analysis workflow that will produce DEMs from the challenging Voyager 2 dataset. **This capability will be leveraged in science investigations of the possible ocean worlds Miranda and Ariel.** The findings of these investigations can serve to inform future Ice Giant missions currently being formulated.



Stereo DEM of the region between the Arden and Inverness Coronae on Miranda showing evidence of highly tectonized terrain.