INVESTIGATING THE FORMATION OF MIRANDA'S INVERNESS CORONA. E. J. Leonard[1], C. Beddingfield[2,3], C. M. Elder[1], T. A. Nordheim[1], R. J. Cartwright[2], C. Cochrane[1], and L. Regoli[4]. [1]Jet Propulsion Laboratory, California Institute of Technology (Erin.J.Leonard@jpl.nasa.gov), [2]SETI Institute, [3]NASA Ames Research Center, [4] John Hopkins University Applied Physics Laboratory, Baltimore, MD

Introduction: Miranda, a mid-sized icy moon of Uranus, displays a patchwork of old and surprisingly young surface regions in the images returned by Voyager 2 [1]. The lack of impact structures in some regions suggest a period of relatively recent geologic activity (<1 Ga) [2]. Fractures, ridges, scarps, and a relative dearth of craters larger than about 10 km diameter, point to a history of significant tectonic resurfacing. This resurfacing is also evidenced by the coronae--three large (>200 km in diameter) ovoid to rectangular structures on Miranda's surface (in the limited images obtained by Voyager). Previous work on the coronae hypothesize that they formed through extensional tilt-block style tectonism or cryovolcanic processes [3, 4]. Here we seek to constrain potential formation mechanism for Inverness Coronae, the youngest corona on Miranda [5]. By determining the formation mechanism for the most recent resurfacing on Miranda, we may be able to constrain the recent state of the ice-shell.

Specifically, in order to investigate the formation of the coronae, we will first create a mosaic of all of the Voyager 2 imaging data of Miranda. We will then create a detailed geologic map of Inverness Corona and the surrounding region, and analyze the observations. Understanding the formation of the corona is critical to understanding Miranda's recent geologic past. Similarly, the dichotomy of Miranda's very young terrains directly adjacent to ancient ones is similar to Saturn's moon Enceladus [1, 6], which was found by the Cassini mission to be currently active [7, 8]. Such comparisons suggest Miranda could also be recently or is currently geologically active and possibly harbors even more exciting features which will remain obscured until the next mission to the Uranian system.

Methodology: In order to constrain the formation of Inverness Corona on Miranda through geologic observations, we first create a georeferenced image mosaic of the region (Figure 1). Then, we will create a geologic map in ArcGIS. The purpose of this mosaic and map is to investigate the structure and kinematic origin of Inverness Corona.

Mosaic Creation. The Voyager 2 performed a flyby of Miranda while in the Uranus system. The Narrow Angle Camera (NAC) imaged Miranda at a range of resolutions with eight at a regional resolution (200-500 m/pixel; Table 1). We first download the images in Table 1 in .imq format from USGS Pilot. We then process the images in using ISIS 3 functions "voy2isis" and "spiceinit". The Voyager 2 images contain reseaux so we remove them using the ISIS 3 functions "findrx" and "remrx". After the reseaux are removed, we calibrate the images using the ISIS 3 function "voycal". In order to correct for some aberration within the NAC, we apply a modulation transfer function (MTF) to the image using the ISIS 3 function "kernfilter". Lastly, we update the location of each image using the ISIS 3 function "deltack" to adjust the pointing in order to make the georeferencing of each image in ArcGIS easier. We center the image mosaic on image c2684623, where the South Pole was located in the original camera pointing.

Table 1: Images for Miranda Mosaic

Image Number	Resolution (m/pixel)
c2684629	237
c2684626	247
c2684623	258
c2684620	270
c2684617	284
c2684614	298
c2684611	314
c2684608	330

Geologic Map of Inverness Corona. After the completion of the image mosaic, we will create a geologic map of the Inverness Corona region. Previous geologic maps of Miranda that include Inverness Corona [e.g., 1, 5, 9] are all at the global scale and not detailed enough for a thorough investigation into the potential formation mechanism. Thus, we will create a geologic map at the finest scale allowable by the resolution of the image, ~1:5M.

The geologic units in our detailed geologic maps will include units based on the relative brightness of the terrain within the corona and the crater density and morphology outside of the corona. The focus of the geologic map will be to identify and classify the structures within the corona—including ridges, troughs, crater rims, and scarps. Identifying these structures will aid determining if there are kinematic indicators within the corona.

Initial Results and Future Work: We have created the georeferenced image mosaic of Miranda (Figure 1). This image mosaic applies an MTF filer which sharpens the images by correcting some distortion within the Voyager 2 NAC. Next, we will begin the geologic mapping and analysis of any identified kinematic indicators.

The observations gained from the new, detailed geologic map will be key to understanding the formation of Miranda's Inverness Corona.

Acknowledgments: Portions of this research were carried out at the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

References: [1] Smith, B. A. et al. (1986), *Science, 233*, pp. 43–64. [2] Zahnle et al., (2003), *Icarus, 163*, pp. 263–89. [3] Pappalardo et al. (1997), *JGR*, *102*, 13369-79. [4] Schenk et al. (1991), *JGR*, *96*, 1887-1906. [5] Croft and Soderblom (1991), *Uranus*, *U. A. Press*, 561-628. [[6] Beddingfield and Cartwright (2020), *Icarus* 343, 113687. [7] Porco et al. (2006), *Science*, *311*, 1393-1401 [8] Spencer et al. (2006), *Science*, *311*, 1401-1405. [9] Greenberg et al., (1991), *Uranus*, *U. A. Press*, 693-735

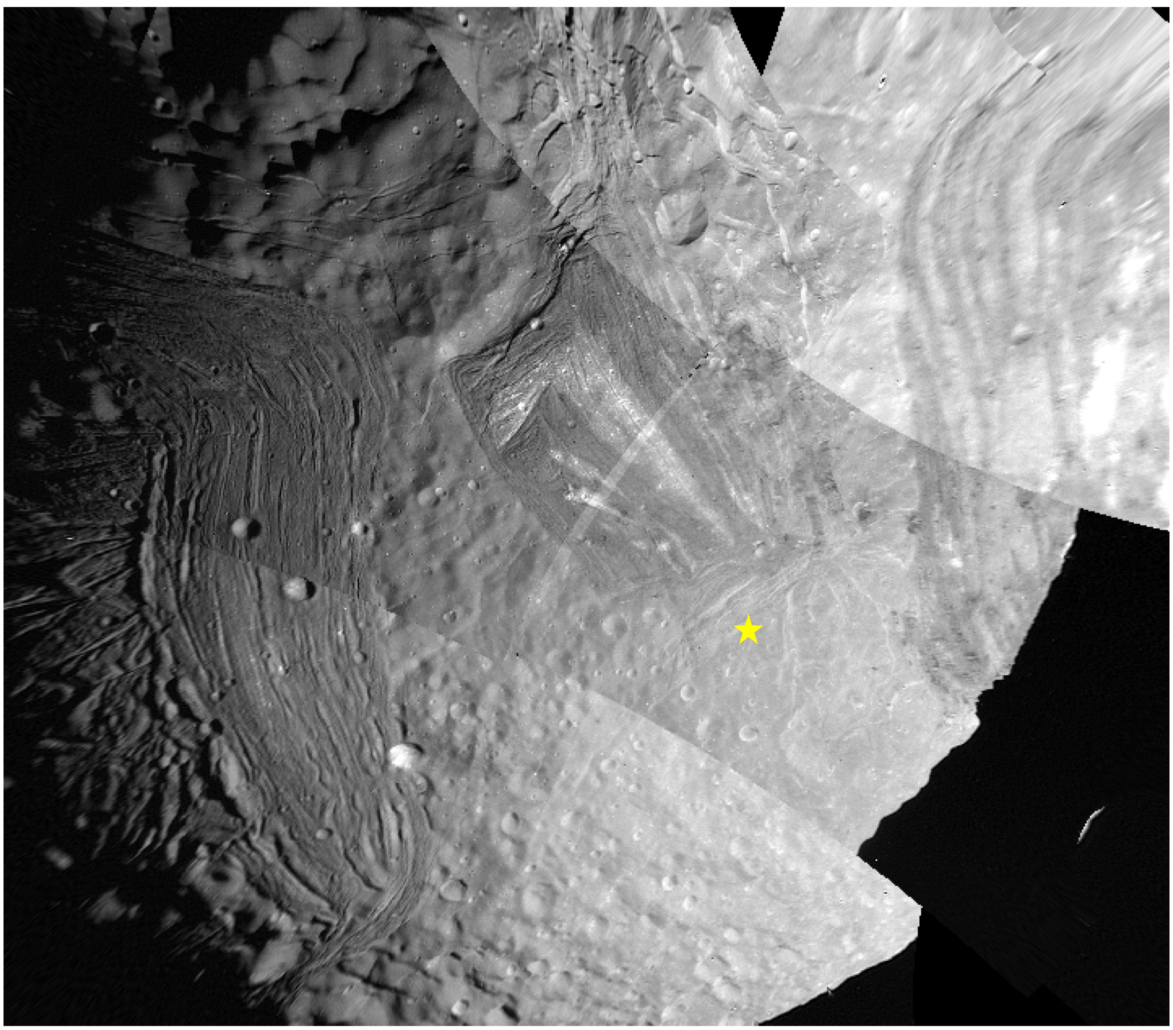

Figure 1. Georeferenced global mosaic of Miranda created using the images in Table 1. The South Pole is denoted with a yellow star.