

RECOVERING LOST PIONEER 10 AND 11 IMAGE DATA: A PROJECT UPDATE. T. Stryk, Roane State Community College, Harriman, Tennessee, United States 37849 (strykt@roanestate.edu).

Introduction: Conceived in the late 1960s and built in the early 1970s, Pioneers 10 and 11 constituted the first attempt to directly explore the solar system beyond the asteroid belt. Given that their primary purpose was to be a pathfinder for later missions, they were designed to be as simple as possible, and their instrumentation was primarily geared to making in-situ particle and fields measurements in the asteroid belt and near Jupiter that would ensure the safety of later missions. They were spin-stabilized, which made them well suited for this type of work but ill-suited for remote sensing [1]. Still, both Pioneers carried three remote sensing instruments. The Imaging Photopolarimeter (IPP) was a scanning photometer that built up an image by scanning one line at a time, using the spin of the spacecraft to sweep across the target, collecting both red and blue channel data. The IPP also had a very low resolution polarimetry channel. The Infrared Radiometer on each spacecraft made two channel infrared maps of Jupiter and (in the case of Pioneer 11) Saturn, while the Ultraviolet Photometer made low resolution, two channel ultraviolet scans.

The data from these instruments of significantly higher resolution than anything available at the time and show the targets at phase angles that were previously unseen. Given that the targets include Jupiter, Io, Saturn, and Titan – worlds that undergo temporal changes visible even at low resolution, preserving these datasets for comparison with data from later missions and with ground based instruments is clearly to be desired. Additionally, Pioneer 11 obtained relatively high resolution images of Jupiter from above the North Polar Region, a feat that has not been repeated. However, due to the cost at the time of preserving data in digital form (especially at the time of the Jupiter flybys, which occurred in 1973 and 1974, respectively), the only datasets available at the NSSDC and elsewhere are in image form on photographic film except for the low resolution polarization data. While the quality of the film images is generally quite good, not having the digital data prevents the quantitative analysis needed for most scientific purposes.

Project Status: The combined datasets include about 300 pairs of images from the Jovian system and about 70 images from Saturn, as well as an unknown number of infrared scans. Only a handful of IPP images have been recovered thus far, including the best image of Io obtained by Pioneer 11 (Fig. 1) and used by Francis Graham in a 1985 paper [2]. Others

include an image of Ganymede from Pioneer 10 and some Pioneer 11 images of Saturn's rings. No Infrared Radiometer data has been found.



Figure 1: Pioneer 11 image D7, showing Io from above its north pole. The version on the left is processed from a film print, while the version on the right was made using the original digital data.

It is possible that these datasets have not been preserved. In this case, the goal of this project will be to create a repository of what digital fragments do exist as well as high quality scans of the best photographic versions. Still, there is a chance that the datasets do still exist, and the most likely place appears to be in an archive located at NASA's Ames Research Center, which served as home to the Pioneer project. Plans have been made to search those archives in mid-January 2010. The preliminary results of this search will be presented in this poster along with some results from the data already recovered.

References:

- [1] Fimmel, R. O. et al. (1980) *Pioneer: First to Jupiter, Saturn, and Beyond*, NASA SP-446.
- [2] Graham, F. and B. Hapke. *Bulletin of the American Astronomical Society*, 17, 693.