

Observing the Tenuous Atmosphere of Europa via the Hubble Space Telescope

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Abstract: Europa is of considerable interest to astronomers and planetary scientists due to the presence of large amounts of water ice and, potentially, liquid water. Additionally, within the last decade, it has been discovered to possess a tenuous exosphere produced by sputtering of the icy surface; this atmosphere appears to consist predominantly of molecular oxygen generated by radiolysis of water (McGrath et al, 2009). However, the exact composition, density, and geospatial distribution of the atmosphere has not yet been fully determined. By using images gathered by the PR 130 diffraction prism mounted on the Hubble Space Telescope's Advanced Camera for Surveys, we hope to gain more information about Europa's atmosphere, by studying both the actual images, and their associated spectra.

Methodology: HST images of Europa taken by the ACS were retrieved from the Space Telescope Science Institute database; observations 11186 (fig 1) and 11085 formed the bulk of the datasets, along with 11325, which is an observation of 61 Cygni taken for calibration purposes. The images were taken using the PR 130L prism filter, which is most sensitive in the 1300-1900 angstrom range- the region where oxygen emission lines are expected. The images were compiled, average, and analyzed using a series of custom written IDL programs. Additionally, a spectral plot was extracted by rebinning the images and measuring the resulting profile. Special attention was paid to 11085, as it contained images of Europa while eclipsed by Jupiter, potentially allowing view of light from emissions of the atmosphere itself.

Results and Conclusions: Both the images from 11085 (both sunlit and eclipsed) and 11186 possess similar emission features (fig.2). The emission features are notably less distinct in 11186 than in 11085, thought this may be due to differences in image quality, and not intrinsic to the atmosphere of Europa itself.

While the presence and distribution of emission lines from oxygen cannot be confirmed until the wavelengths have been calibrated (currently ongoing), the data nonetheless appears promising.

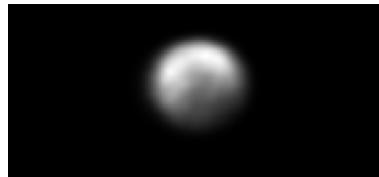
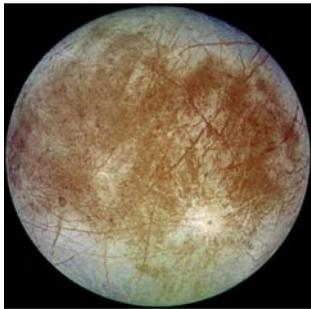


Fig. 1

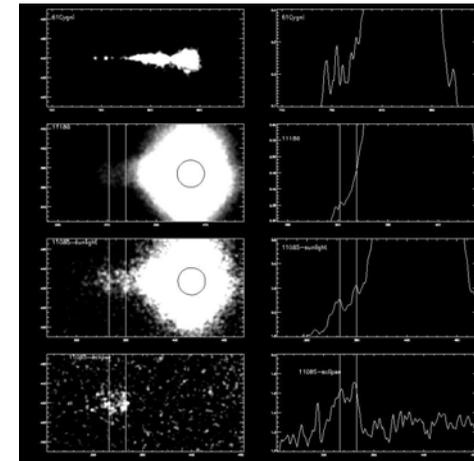


Fig. 2

References: McGrath, M.A., Hansen, C.J., and A.R. Hendrix. "Observations on Europa's Tenuous Atmosphere". *Europa*. University of Arizona (in press). 2009