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New FUV observations of Ganymede's aurora with increased signal-to-noise

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Abstract

Observations of Ganymede's aurora are invaluable for the characterisation of the interaction between the moon magnetosphere and the Jovian magnetosphere it resides within. In the FUV region, the auroral morphology and variability at Ganymede may be studied by imaging the atomic oxygen emissions at 130.4 nm and 135.6 nm. Additionally, the ratio of intensities of these two emissions allows the relative abundances of atomic and molecular oxygen within the atmosphere to be constrained. A comparison of the 135.6 nm / 130.4 nm intensity ratios measured on the leading and trailing hemispheres of Ganymede is of particular interest: since Ganymede is tidally locked to Jupiter, its trailing hemisphere receives a larger flux of ions from the Jovian plasma than its leading hemisphere, potentially leading to large variations in atmospheric composition and production mechanisms.

Ganymede has previously been observed in the FUV by the Hubble Space Telescope (HST) instruments GHRS, STIS and ACS [1, 2, 3]. The 135.6 nm / 130.4 nm intensity ratio on Ganymede's trailing hemisphere has been extracted from the GHRS and STIS spectra described in [1] and [2], and suggests that the atmosphere is dominated by O_2. However, no measurement of the emission ratio from the leading hemisphere has been published. We have obtained new observations of Ganymede's leading and trailing hemispheres using the HST Cosmic Origins Spectrograph (COS). The enhanced sensitivity of COS relative to that of STIS leads to a factor of ten increase in the signal-to-noise ratio in this data compared to the STIS spectra previously used to calculate the oxygen emission ratios. Hence, we can report more accurate line ratios, leading to more reliable models of the aurora and atmosphere at Ganymede. STIS images of the aurora on both hemispheres were obtained during the same campaign to give context to the spectral measurements.

References

[1] Hall, D. T., Feldman, P. D., McGrath, M. A. and Strobel, D. F.: The far-ultraviolet oxygen airglow of Europa and Ganymede, Astrophys. J., Vol. 499, pp. 475–481, 1998.

[2] Feldman, P.D, McGrath, M. A., Strobel, D.F., Moos, H. W., Retherford, K. D. and Wolven, B. C.: HST/STIS ultraviolet imaging of polar aurora on Ganymede, Astrophys. J., Vol. 535, pp. 1085–1090, 2000.

[3] McGrath, M. A., Jia, X., Retherford, K., Feldman, P. D., Strobel, D. F. and Saur, J.: Aurora on Ganymede, J. Geophys. Res., Vol. 118, pp. 1–12, 2013.