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This program was a one-year extension of an earlier Planetary Atmospheres program grant, covering the period 1 August 1996 through 30 September 1997. The grant was for supporting work to complement an active program observing planetary atmospheres with Earth-orbital telescopes, principally the Hubble Space Telescope (HST). The recent concentration of this work has been on HST observations of Jupiter’s upper atmosphere and aurora, but it has also included observations of Io, serendipitous observations of asteroids, and observations of the velocity structure in the interplanetary medium.

The observations of Jupiter have been at vacuum ultraviolet wavelengths, including imaging and spectroscopy of the auroral and airglow emissions. The most recent HST observations have been at the same time as in situ measurements made by the Galileo orbiter instruments, as reflected in the meeting presentations listed below. Concentrated efforts have been applied in this year to the following projects:

- The analysis of HST WFPC 2 images of Jupiter’s aurora, including the Io footprint emissions. We have performed a comparative analysis of the Io footprint locations with two magnetic field models, studied the statistical properties of the apparent dawn auroral storms on Jupiter, and found various other repeated patterns in Jupiter’s aurora.

- Analysis and modeling of airglow and auroral Ly α emission line profiles from Jupiter. This has included modeling the auroral line profiles, including the energy degradation of precipitating charged particles and radiative transfer of the emerging emissions. Jupiter’s auroral emission line profile is self-absorbed, since it is produced by an internal source, and the resulting emission with a deep central absorption from the overlying atmosphere permits modeling of the depth of the emissions, plus the motion of the emitting layer with respect to the overlying atmospheric column from the observed Doppler shift of the central absorption. By contrast the airglow emission line, which is dominated by resonant scattering of solar emission, has no central absorption, but displays rapid time variations and broad wings, indicative of a superthermal component (or corona) in Jupiter’s upper atmosphere.

- Modeling of the observed motions of the plumes produced after the impacts of the fragments of Comet S/L-9 with Jupiter in July 1994, from the HST WFPC 2 imaging series.

Listed on the following pages are the publications in refereed journals resulting from this work, and abstracts of talks at meetings that have been given during the period of this grant.

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Publications:


Meeting Abstracts:


“Jupiter Aurora Results from the GALILEO Ultraviolet Spectrometer Experiment”, W.R. Pryor, C. Hord, C. Barth, I. Stewart, W. McClintock, K. Simmons, J. Ajello, K. Tobiska, R. West, G.


