SPECTRAL COMPARISON AND STABILITY OF RED REGIONS ON JUPITER

A. A. Simon (NASA Goddard Space Flight Center), R. W. Carlson (JPL/Caltech), and A. Sanchez-Lavega (Universidad del País Vasco)

Summary: A study of absolute color on Jupiter from Hubble Space Telescope imaging data shows that the Great Red Spot (GRS) is not the "reddest" region of the planet. Rather, a transient red cyclone visible in 1995 and the North Equatorial Belt both show redder spectra than the GRS (*i.e.,* more absorption at blue and green wavelengths).

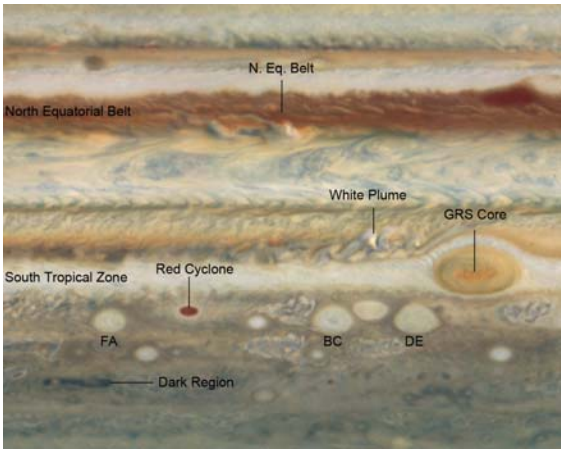

Figure 1. Quasi-true color map of Jupiter from HST, February 1995.

Spectral Variation: Spectral data acquired over multiple epochs and many wavelengths show that most regions on Jupiter are remarkably stable in color; temporal analysis indicates that the darkest regions of the NEB are relative constant in color from 1995 to 2008, while the slope of the GRS core may vary slightly. No region is truly black or white, but all show some absorption at UV and blue wavelengths, see Fig. 2. The most intense coloration is not in the Great Red Spot, but in the North Equatorial Belt, particularly dark cyclonic barges, and in rare transient cyclonic vortices at other latitudes, such as the 1995 Red Cyclone. Regions with quite different cloud structure can show similar color, while regions with similar structure can vary in coloration.

Composition: Multiple factors (variable composition or particle processing history) are likely involved in producing color; the best spectral match seems to require the presence of both NH_4SH and C_2H_2-NH_3 interactions, while various levels of irradiation or thermal processing may also explain some of the color variation, see Fig. 3. In addition, there is slight evidence that P_4 or a similar phosphorus-bearing compound is necessary to explain spectral variations at wavelengths beyond 600 nm; further spectral data are required, however.

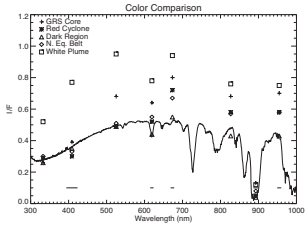

Figure 2. Absolute I/F Spectra

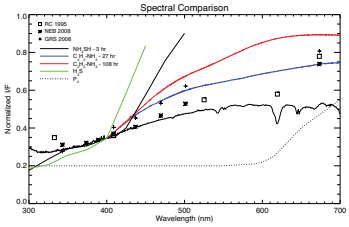

Figure 3. Laboratory Spectra

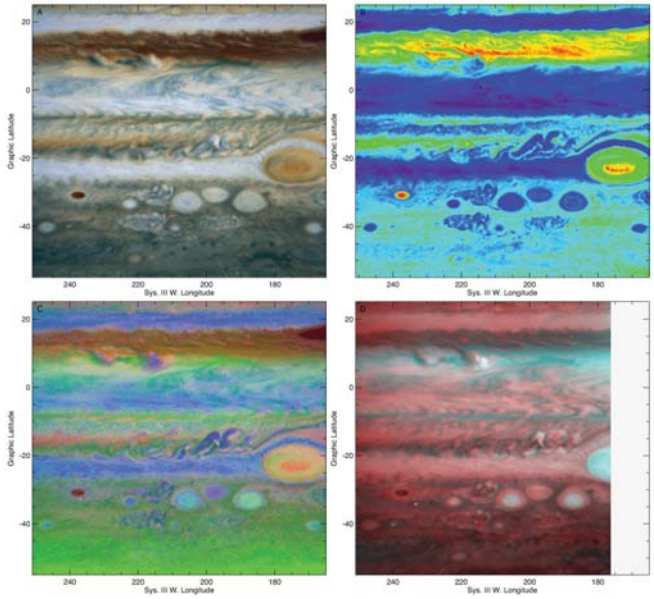

Figure 4. Variations between red regions are evident in A) quasi-true color, B) ratio of 673/410 nm, C) principal components, D) methane band/cloud height

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