THE VERTICAL STRUCTURE AND MICROPHYSICAL PROPERTIES OF METEOROLOGICAL SYSTEMS NEAR JUPITER'S GREAT RED SPOT AS DETERMINED FROM GALILEO/NIMS AND HST/WFPC

K. Baines (1), R. Carlson (1), T. Momary (1) and G. Orton (1)

(1) Caltech/NASA Jet Propulsion Lab
kbaines@aloha.jpl.nasa.gov Fax: +1 818-393-4605

High-spatial-resolution images of the Great Red Spot and its surrounding cloud systems were obtained contemporaneously by the Galileo orbiter and the Hubble Space Telescope (HST) on June 26-27, 1996. We have begun a multi-wavelength study of the vertical structure and particle properties of prominent cloud features using 23-color imagery spanning 0.74 to 5.2 microns obtained by the Near-Infrared Mapping Spectrometer (NIMS) on board Galileo, and complementary six-color imagery obtained by HST/WFPC spanning 0.22 to 0.95 microns. Thus far, we have investigated three regions: (1) the core of the Great Red Spot (GRS), (2) the South Tropical Zone (STrZ) region immediately to the south of the GRS, and (3) the freshly-forming spectroscopically-identifiable ammonia cloud (SIAC) located in the turbulent region to the northwest of the GRS (*c.f.* Baines *et al., Icarus* 159, 74-94, 2002). Large variations in structure and particle properties (both spectral reflectivity – indicative of composition – and particle size) are noted. Using Henyey-Greenstein particle scattering coefficients from Tomasko *et al* (*Icarus* 33, 558-592, 1978), we find that cloudtop pressures vary from 0.19-0.20 bars in the GRS to 0.32-0.35 bars in the SIAC to 0.36-0.40 bars in he STrZ. Aerosols within the SIAC exhibit single-scattering albedos ~0.94 at ammonia-ice-absorbing 2.73 μm, significantly less than aerosols in the other regions. Assuming conservative scattering particles at 0.95, 1.6, 2.1, and 4.03 μm, we find that aerosols in the SIAC are somewhat larger that GRS particles which in turn are significantly larger than STrZ particles. Specifically, fits to cloud opacity as function of wavelength yield an inverse power law of ~0.62 for the SIAC, ~0.70 for the GRS and ~1.30 for the STrZ. For the GRS, normal ortho/para hydrogen fits the data somewhat better than fits using equilibrium hydrogen, indicating a relatively deep origin for this large anti-cyclonic system