[구SS-03] Theory of Radiative Transfer for 3.3-micron CH_4 emissions from the Auroral Regions of Jupiter

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Radiative transfer programs to simulate the 3-micron auroral CH_4 emissions of Jupiter have been developed. The formalism of the radiative transfer calculations including the thermal, fluorescent, and auroral emissions of the CH_4 bands for an atmospheric layer having an optical depth of τ_v is given by:

$\mu dI_v/d\tau_v = I_v - \varpi_v^* J_v - (1-\varpi_v^*)B_v - \varpi_v^* F_{ov}\exp(-\tau_v/\mu_o)/4\pi - hv\varpi_v^* V/4\pi,$

where ϖ_v^* is the single scattering albedo of CH_4 consisting of Einstein A coefficient and collisional deexcitation rate. Other terms are usual radiative transfer parameters appearing in textbooks including the terms for scattered $\varpi_v^* J_v$, thermal$(1-\varpi_v^*)B_v$, and attenuated solar radiations F_{ov} at the certain atmospheric layer. For auroral excitations, we include V, which is the number of excited states per cm^3 persec by auroral particle bombardments. We apply this formalism to the high-resolution spectra of the auroral regions observed with GNIRS/Gemini North, and will present preliminary results for the 3 micron auroral processes of Jupiter.

[구SS-04] Rotational Properties of the Maria Asteroid Family

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We carried out photometric observations of Maria family asteroids during 134 nights spanning from July 2008 to May 2013, and derived synodic rotational periods for 51 objects including obtained periods of 34 asteroids for the first time. In this study, we found that there is a significant excess of fast and slow rotators. The one-sample Kolmogorov-Smirnov test confirms that the spin rate distribution is not consistent with the Maxwellian at a 92% confidence level. From the correlations between rotational period, amplitude of lightcurve, and size, we conclude that rotational properties of Maria family have been changed considerably by the non-gravitational force such as the Yarkovsky and the YORP effect. Using the lightcurve inversion method, we successfully determined the pole orientation for the 13 Maria members, and found the excess of prograde objects versus retrograde with a ratio (N_p/N_r) of 3. This implies that retrograde rotators could have been ejected by the 3:1 resonance to the inner Solar System since the generation of Maria family. We estimate that approximately 37 - 75 kilometer-sized Maria asteroids have entered to near-Earth space every 100 Myr.