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Observation of spectral reflectance of boreal forest in Alaska for GCOM-C/SGLI

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The ”Second-generation Global Imager (SGLI)” of the satellite ”Global Change Observation Mission (GCOM)-C”, planned in 2014 or 2015, is a multi-viewing angle optical sensor. The sensor observes the reflected radiation from the land surface at 45 degree slant viewing angles (forward and backward along the orbit) in addition to the nadir. This function enables us to consider the Bidirectional Reflectance Factor (BRF) of the forest, and to construct robust 3D forest radiative transfer models for the simulation of the forest structure included Leaf Area Index (LAI) and above-ground biomass. To acquire *in-situ* BRF data of the forest for the validation of GCOM-C/SGLI data, we carried out the survey of BRF at a boreal forest in Alaska.

A black spruce forest, a typical boreal forest in Alaska, located in the Poker Flat Research Range (PFRR) of University of Alaska Fairbanks (210 m MSL) was targeted. Since the forest homogeneously extends about 500 m wide and the terrain is relatively even, this forest site is highly suitable for the validation of the remote sensing measurement. The tree stand ($>$ 1.3m) density was about 4000 tree/ha.

The observation of the BRF was taken place around the noon of July 7 and 8, 2010 from the top of the tower (17 m) that was constructed in the forest by the JAMSTEC and IARC Collaboration Study (JICS). We measured the reflected irradiance from the forest by the spectroradiometer (MS-720; EKO Instruments) changing the viewing angle from 20 to 70 degrees and -20 to -70 degrees (off-nadir angle; positive and negative angles mean forward and back scatter angles, respectively) with 5 degrees step in the principal plane and the orthogonal (cross) plane. The global radiation was simultaneously measured by the other spectroradiometer for the calculation of the reflectance.

The BRF in the principle plane showed a kind of bowl-shape distribution with its minimum and maximum at approximately 30 and -70 degrees in visible and near-infrared bands, respectively, that is, the forward scatter was generally smaller than the back scatter. However the Normalized Difference Vegetation Index (NDVI) showed larger value in the forward scatter than in the back scatter. The observation in snow-cover season is planned in March 2011.

Keywords: boreal forest, 3D radiative transfer model, leaf area index, BRDF, black spruce, satellite remote sensing