Satellite Ecology, an Attempt for Linking Remote Sensing and Ecology for River Basin Studies (Understanding for each and integrated ecosystem using remote sensing, 6th International Symposium on Integrated Field Science)

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1. Background

Frequent revisit with low spatial resolution satellites such as NOAA/AVHRR, and Terra and Aqua/MODIS clarified various global environmental issues. However, there are few methods to verify the accuracy of actual events on the ground. According with remarkable progress of satellite sensors moving into 21st century, it becomes possible to validate ground-based ecological processes using fine resolution satellites.

2. Satellite Ecology Program

The 21st Century COE (Center Of Excellence) Program, Satellite Ecology has been launched in 2004 at Gifu University. The target was to find the linkage between remote sensing, ecosystem ecology and micrometeorology for studying ecosystem structure and function in the mountainous landscape of central Japan. This Program aims at creating a comprehensive yet practical science "Satellite Ecology" by making regional carbon monitoring by satellite remote sensing technology which has advanced drastically. Characteristics of this Program are, meso-scale regional study, carried on mountainous landscape, complex of various ecosystems, and interdisciplinary collaboration.

3. Study area and intensive sites

The study area, Daihachiga river basin covers 60 km^2 of catchment area, 1,000m of altitude gap, includes deciduous broadleaved (DB) forests, evergreen coniferous (EC) forests, agriculture fields, and some residential areas. Two carbon flux towers were set up, one for DB forest and another for EC forest, which measure carbon dynamics between atmospheric and terrestrial layers. Inside study area, several permanent plots are settled for ecological study. Ecological observation tower was built in DB forest at 1,400 m asl., where we can directly measure several physiological phenomena of canopy.

4. Some findings

Landcover classification was carried out using multiple remote sensors such as aerial hyperspectral image by CASI, QuickBird, ALOS/AVNIR-2, Terra/ASTER, and Terra/MODIS. (2) Forest phenology analysis using MODIS/NDVI clarified difference of seasonal pattern. (3) Several ground validation methods for MODIS/NDVI were proposed. (4) LAI changes of agriculture field were estimated. (5) As the results, prototype regional carbon dynamics was calculated using land surface model into MM5.