J-1 A study on the monitoring and assessment of terrestrial ecosystem structure and its dynamics with satellite remote sensing

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Spatial structures of terrestrial ecosystems such as vegetation species and biomass distribution are essential parameters in functional evaluation of terrestrial ecosystems. The objective of this research is to develop remote sensing methods for assessing spatial structures and dynamics of terrestrial ecosystems. The following studies have been conducted.

(1) Measurements of ecosystem structures using optical sensors

First for the measurement of forest structural parameters, a method has been developed for measuring tree heights using an airborne laser scanner. Secondly as an advanced processing method of satellite imagery, a method has been studied for estimating ratios of sub-pixel categories. Thirdly as a way to obtain ground-truth spectral data, an imaging spectrometer capable of measuring spectral reflectance at each point in an image has been developed.

(2) Study on the estimation of vegetation characteristics with an airborne synthetic aperture radar

We have observed forests in Tomakomai (42.43'N, 141.34'E) with an airborne SAR for two years. The biophysical properties were also measured at the 26 sampling locations at the same period. Our airborne SAR provides dual-frequency (L- and X- bands), full polarimetric data with a high resolution of 1.5 m. We demonstrate that the discrimination between spieces using polarimetric or multi-temporal SAR data is possible. Moreover we show that the backscattering coefficient on L band VV and HV polarization data has good correrations with the diameter at breast height and tree hight. Furthermore the relation between the total volume per ha and the backscattering coefficient for a species (picea glehnii mast) is obtained. We also discuss the seasonal change of the forests using the airborne SAR data on February, July, and October.

(3) The method of the vegetation classification using remote sensing