Annual Changes of Growth Condition of Forests in Russia (Understanding for each and integrated ecosystem using remote sensing, 6th International Symposium on Integrated Field Science)

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Phenological changes of ecosystem are closely related to the changes of natural environment, such as water, temperature, soil and solar radiation. Growth condition of vegetation and soundness of ecosystem can be evaluated, if the seasonal changes of the photosynthesis are continuously monitored. Based on these ideas, we studied to get historical information about seasonal changes of Siberian forest by satellite remote sensing data.

Authors developed the processing method named LMF (Local Maximum and Fitting) and LMF-KF (Local Maximum and Kalman Fitting), which modeled the seasonal changes by time series satellite data. It is assumed that the seasonal change for each pixel is modeled by the sum of cyclic functions and model parameters are determined by the 10 day composite satellite data. Subsequently, the technique was developed to produce a new image using model parameters for each pixel. We call this processing the LMF-KF model processing. After the LMF-KF processing to NOAA Pathfinder data for 20 years (1981-2001), we could get "clear" (cloud-free and noise-free) images with 10 days interval for both NDVI and LST. Because both the NDVI and LST are obtained from the LMF-KF processing, there are many possibilities to monitor environmental conditions in vegetated area.

The seasonal changes are well observed on the NDVI and LST individually. However, the combination of NDVI and LST shows much clear idea of the growing season and the trend of vegetation condition of each pixel. For example, we may think that the LST greater than 5 degree C or 1 degree C is the growing season and the accumulation of the NDVI during the period is related to the vegetation growth.

As the conclusion, the LMF-KF processing could successfully create cloud and noise free images of NDVI and LST with 10 days interval for 20 years from the NOAA Pathfinder data. The combination of NDVI and LST is a unique and effective methodology for studying forest conditions in this region. These data can be used for further studies on carbon fixation, such as NPP estimation in this region.