ESTIMATES OF BOREAL FOREST VEGETATION RATE BASED ON ELECTROMAGNETIC RADIATION

IRINA PASKO, Maxim Chernetsky, Anatoliy Shevyrnogov

Institute of Biophysics, Siberian Branch of Russian Academy of Sciences, Krasnoyarsk, Russia, e-mail: mycat@mail.ru

Applications of electromagnetic methods have greatly enhanced ability to monitor and manage in the areas of forestry. Accurate measurements of regional and global scale vegetation dynamics (phenology) are required to improve models and understanding of inter-annual variability in terrestrial ecosystem carbon exchange and climate–biosphere interactions. Study of vegetation phenology is required for understanding of variability in ecosystem. Remote sensing of the Earth traditionally has used reflected energy in the visible and infrared and emitted energy in the thermal infrared and microwave regions to gather radiation that can be analyzed numerically or used to generate images whose tonal variations represent different intensities of photons associated with a range of wavelengths that are received at the sensor. This sampling of a (continuous or discontinuous) range(s) of wavelengths is the essence of what is usually termed multispectral remote sensing. In this paper, monitoring of vegetation dynamics using remote sensing of the Earth is presented. Vegetation variability (vegetation rate) in different climatic areas is investigated. Original software using IDL interactive language for processing of satellite long-term data series was developed. To investigate growth dynamics vegetation rate inferred from remote sensing was used. All estimations based on annual time series of Moderate Resolution Imaging Spectroradiometer (MODIS) imagery. Vegetation rate for Enhanced Vegetation Index (EVI) and Normalized Difference Vegetation Index (NDVI) was calculated using MODIS data. Time series covers 9 years, from 2000 to 2008. Comparison of EVI and NDVI derived growth rates has shown that NDVI derived rates reveal spatial structure better. Using long-term data of vegetation rates variance was estimated that helps to reveal areas with anomalous growth rate. Such estimation shows sensitivity degree of different areas to climatic changes. It was shown that vegetation rate anomaly depends not only on species structure but also on growth conditions. Woods of heights depend on climatic variability unlike woods of lowlands. Principal components analysis shows vegetation with different rate conditions. Also it reveals vegetation of same type in areas with different conditions. It was demonstrated that using of remote sensing is able to monitor vegetation phenology with good success.

vegetation phenology, electromagnetic methods, boreal forests

Irina Pasko, Institute of Biophysics, Siberian Branch of Russian Academy of Sciences, 660036 Russia, Krasnoyarsk, Akademgorodok, 50/50, tel.: +7 (391) 249 44 55, fax: +7 (391) 243 34 00, e-mail: mycat@mail.ru