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CONTROL ID: 1465415

TITLE: Reconstructing a 40-year record of forest disturbance in Russia from contemporary satellite data

ABSTRACT BODY: Russian boreal forests contain vast pools of carbon and thus play an important role in the global carbon cycle. These forests also figure prominently in the global radiative budget due to their direct impact on surface albedo over large portions of Northern Eurasia within areas of seasonal snow and ice cover in high northern latitudes. As such, Russian boreal forests have a strong influence on the direction and amplitude of regional and global climate change. However, despite the importance of these forests in ecological and climatological contexts, large uncertainties in estimates of carbon storage and dynamics of Russian forests remain. These uncertainties are linked to the limited information about forest age, structure, and dynamics available across the full extent of Russia's forested zone. Although satellite imagery has been collected globally since the early 1970s, satellite data record over Russia from coarse and moderate resolution satellites was spotty until mid-1990s. Great improvements in land surface observations in Northern Eurasia came with the launch of the Moderate Resolution Imaging Spectroradiometer (MODIS) in late 1999. However, the MODIS-based wall-to-wall multi-temporal observations of forest composition and disturbances are available only for the last decade. Here we present an analysis of disturbances over the past 40 years based on a combination of the on-going mapping of burned area in Russia from the MODIS sensor from 2001 to present and a method based on merging the long-term opportunistic observations of forest cover from Landsat imagery with the spatially contiguous but relatively short-term record from MODIS to reconstruct a nearly 30-year history of disturbances across the full extent of the Russian boreal forests. Our reconstruction approach stems from the slow regrowth rate of boreal forests, making it possible to observe past disturbances and infer the approximate time of disturbance from the present day distribution of forest types. The reconstruction method limits the disturbance mapping to the latest disturbance time thus making it impossible to develop estimates of the extent of repeated disturbances outside of the data available since 2001. The analysis of the regional MODIS burned area product shows that between 2001 and 2011 over 31 million ha of Russian forests burned. More than 7% of those experienced repeated burning once, and almost 1% burned 3 times or more. Although the majority (over 61%) of burned forest is found within deciduous needleleaf forest, deciduous broadleaf forests are more prone to repeated burning, with nearly 22% of burns in these forests mapped 2 or more times since 2001. The combination of extended record for forests disturbance and the detailed analysis of disturbance within the recent decade represents an improved view of stand age distribution and forest type in support of carbon and climate modeling activities.

CURRENT SECTION/FOCUS GROUP: Global Environmental Change

CURRENT SESSION: GC019. Environmental, Socio-economic and Climatic Change in Northern Eurasia and Their Feedbacks to the Global Earth System

INDEX TERMS: [1632] GLOBAL CHANGE / Land cover change, [1640] GLOBAL CHANGE / Remote sensing, [1615] GLOBAL CHANGE / Biogeochemical cycles, processes, and modeling.

AUTHORS/INSTITUTIONS: T.V. Loboda, D. Chen, C. Hight-Harf, Geographical Sciences, University of Maryland, College Park, MD;

SPONSOR NAME: Tatiana Loboda

CONTACT (E-MAIL ONLY): loboda@umd.edu

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Product version number 4.0.0 (Build 56)
Build date Aug 07, 2012 12:22:26. Server tss1be0014