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Daily Fire Occurrence in Northern Eurasia from 2002 to 2009

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Northern Eurasia, covering 20% of the global land mass and containing 70% of boreal forest, is extremely sensitive to climate changes. Warmer temperatures in this region have led to less snowfall, earlier spring, longer growing season, and reduced moisture for soil and vegetation in summer. Recently, severe drought and record high temperatures caused catastrophic fires in Russia during the summer of 2010. Future climate projections suggest significant changes in fire regimes which may increase fire frequency, burned area, fire severity, and fire emissions in northern high latitude ecosystems. We examined the daily fire occurrence in different land cover categories at a 1 km x 1 km resolution from 2002 to 2009 over a region from 10°W to 180°E and from 38°N to the Arctic. This research is critical in understanding the impact of climate change on the fire dynamics and emissions in Northern Eurasia. The results are also important in assessing the contribution of fire emissions in this region to the black carbon deposition on Arctic ice. We divide this wide region into seven geographic areas: Russia, Europe (Eastern, Western, Northern and Southern), Eastern Asia, and Central and Western Asia. The fire locations were based on the MODIS active fire products and MODIS MOD12Q1 product was used for the classification of land cover types. Agricultural fires dominated biomass burning in Northern Eurasia during the eight-year period, accounting for about 62% of the MODIS fire detections, followed by grassland and shrubland fires (25%) and forest fires (13%). Approximately half of the active fire detections in Northern Eurasia occurred in Russia. The remainder of fire activity largely occurred in Central and Western Asia (27%) and in Eastern Europe (11%). In Russia, more than two-thirds of the fire detections were agricultural fires, about 18% were forest fires, and 13% were grassland and shrubland fires. The finding is not surprising, because Russia is the fourth largest wheat producing country in the world. Agricultural residues are often burned after harvest in the autumn or before plowing in the spring. In Central and Western Asia, about 63% of the fire detections were grassland and shrubland fires, and 37% were agricultural fires. The years 2003 and 2008 had 43% and 47%, respectively, more fire detections than the annual mean (280,000) from 2002 to 2009. The unusually high fire activity in 2003 and 2008 was a result of extensive burning on cropland in Russia and Central and Western Russia, and over forest and grassland and shrubland in Russia. There is no apparent trend of fire occurrence in the entire Northern Eurasia, within each geographic area, or within each of the land cover types between 2002 and 2009. We will present the results of the study and discuss its significance on the spatial and temporal extent of emissions of atmospheric trace gases and aerosols from forest, agricultural, and grassland and shrubland fires in Northern Eurasia.

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