GC31B-1173: Uncertainty analysis of moderate- versus coarse-scale satellite fire products for quantifying agricultural burning: Implications for Air Quality in European Russia, Belarus, and Lithuania

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Cropland and pasture burning are common agricultural management practices that negatively impact air quality at a local and regional scale, including contributing to short-lived climate pollutants (SLCPs). This research focuses on both cropland and pasture burning in European Russia, Lithuania, and Belarus. Burned area and fire detections were derived from 500 m and 1 km Moderate Resolution Imaging Spectroradiometer (MODIS), 30 m Landsat 7 Enhanced Thematic Mapper Plus (ETM+), and Landsat 8 Operational Land Imager (OLI) data. Carbon, particulate matter, volatile organic carbon (VOCs), and harmful air pollutants (HAPs) emissions were then calculated using MODIS and Landsat-based estimates of fire and land-cover and land-use. Agricultural burning in Belarus, Lithuania, and European Russia showed a strong and consistent seasonal geographic pattern from 2002 to 2012, with the majority of fire detections occurring in March – June and smaller peak in July and August. Over this 11-year period, there was a decrease in both cropland and pasture burning throughout this region. For Smolensk Oblast, a Russian administrative region with comparable agro-environmental conditions to Belarus and Lithuania, a detailed analysis of Landsat-based burned area estimations for croplands and pastures and field data collected in summer 2014 showed that the agricultural burning area can be up to 10 times higher than the 1 km MODIS active fire estimates. In general, European Russia is the main source of agricultural burning emissions compared to Lithuania and Belarus. On average, all cropland burning in European Russia as detected by the MCD45A1 MODIS Burned Area Product emitted 17.66 Gg of PM_{10} while annual burning of pasture in Smolensk Oblast, Russia as detected by Landsat burn scars emitted 494.85 Gg of PM_{10}, a 96% difference. This highlights that quantifying the contribution of pasture burning and burned area versus cropland burning in agricultural regions is important for accurately calculating carbonaceous emissions and emissions that negatively impact air quality.