Geophysical Research Abstracts
Vol. 14, EGU2012-6685, 2012
EGU General Assembly 2012

Greenhouse gases emissions due to biomass burning and deforestation in Acre State- Brazilian Amazonia

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During the 20th century, deforestation and biomass burning have produced substantial emissions of trace gases and particles into the atmosphere. Biomass burning and deforestation, especially but not exclusively in the tropics, is supposed to be the second major source of carbon injections into the atmosphere by the emission of gases such ozone and carbon monoxide, which consistently show large increase during the dry season in the tropics.These emissions have resulted in significant perturbations in radiative balance of the atmosphere and in air quality at regional and global scales. Trace gases and aerosol emissions from biomass burning have a large oscillation associated with the initial combustion activity. Different from urban-industrial emissions, which are predominantly injected into atmospheric planetary boundary layer (PBL), biomass burning emissions are strongly accelerated in the vertical direction and transported directly to free troposphere. In this research, we focused on Acre State, in the Brazilian Amazon. We combined a biomass map for the year 2007, the Brazilian official deforestation data (PRODES) to the year 2011 and the areas which were burned in the same year originated from Moderate Resolution Imaging Spectroradiometer (MODIS) fire products and burned areas. For validating the MODIS fire area product, we also assessed burns cars derived from Thematic Mapper (TM) sensor aboard of Landsat 5 satellite and fieldwork. Our preliminary results indicate that estimated burned area in Acre was 3,108 km2, while MCD45A1 product estimated the burned area in 411 km2. Comparing the reference image with the burned area product (MCD45A1), they agree in 7.27% of total map area. However, errors of commission represented 44.76% of the total area estimated by MDC45A1, or 185 km2. Moreover, the MCD45A1 missed 2,882 km2 of burned areas, equivalent to 92.72% of omission. The correspondence between MCD45A1 and radiance emitted by fires indicates that the intensity of the fire does not affect the detection of burned areas in MCD45A1 algorithm. Next steps will be the the evaluation between traditional emission method, that use the amount of above-ground biomass available for burning, the combustion factor, the burned area and the emission factor for a certain species, and the method that apply [U+FB01]re radiative power (FRP) products extracted from MODIS and from the Geostationary Operational Environmental Satellites (GOES) [U+FB01]re products and FRP-based smoke aerosol emission coef[U+FB01]cients. In this research, the images were geometrically corrected using manually selected control points to fit and apply a first order polynomial and a nearest neighbor resampling. The resulting root mean square error was less than 0.5 pixels. Moreover, to map the burned area to 2011 we applied a segmentation algorithm with a similarity of 8 and a minimal area of 12 pixels. As a result, the burned area was manually mapped through image segmentation and subsequent manual edition of polygons. Initial results indicates that estimated burned area in Acre was 3,108 km2, while MCD45A1 product estimated the burned area in 411 km2. Comparing the reference image with the burned area product (MCD45A1), they agree in 7.27% of total map area. However, errors of commission represented 44.76% of the total area estimated by MDC45A1, or 185 km2. Moreover, the MCD45A1 missed 2,882 km2 of burned areas, equivalent to 92.72% of omission. The correspondence between MCD45A1 and radiance emitted by fires indicates that the intensity of the fire does not affect the detection of burned areas in MCD45A1 algorithm. The comparison of emissions methods is in progress.