Development of Daily Biomass Burning Emission Inventory for Peninsular Malaysia in year 2015

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Abstract

Biomass burning emission (BBE) is a recurring air pollution problem in Malaysia. Abundance of harmful pollutants emitted during the burning including course particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and carbon dioxide (CO_2). Various global BBE inventories were derived from top-down satellite data with limitation on resolution, cloud cover and lack of localized landuse and fire activity information. This study develops a high-resolution (1 km×1 km) BBE inventory for Peninsular Malaysia in the extreme El-Niño year (2015). This study integrates local vegetation burning data from the Fire and Rescue Department of Malaysia (BOMBA) and landuse information from Department of Town and Country Planning Malaysia (PLANMalaysia) with MODIS hotspots (MCD14ML) from the Fire Information for Resource Management System (FIRMS) , above-ground biomass (AGB) by European Space Agencies (ESA), and Fraction of Vegetation Cover by Copernicus Global Land Service. The studies discovered a total 817 kha vegetation cover lost in Peninsular Malaysia with July (47.9 kha) recording the highest lost, while the land use type burnt is predominantly agriculture land (276 kha). Emission estimates showed CO_2 at 8936×10^7 g/km^2 as the highest pollutants emitted followed by CO at 533.5×10^7 g/km^2, PM_{10} at 49.60×10^7 g/km^2, $PM_{2.5}$ at 46.17×10^7 g/km^2 and CH_4 at 27.50×10^7 g/km^2. The dataset recorded the highest correlation with Fire Inventory from NCAR (FINN) by National Centre for Atmospheric Research (R = 0.80) and with better ability to capture the temporal peaks. This research finding could improve the BBE representation for air quality modelling and supports data-driven policy guidance.

Keywords: Vegetation fire, Emission Inventory, Smoke, Southeast Asia