Satellite-based monitoring of extreme biomass burning across Southeast Asia in 2015 El Nino year.

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In 2015, an intense El Nino occurred and resulted in an extremely low rainfall in Indonesia and other countries in Southeast Asia during the dry season (e.g. Aug-Oct in Southern Borneo). In the same year, record breaking forest fires occurred in this region since the 2000, especially in southern Borneo and western Sumatera islands. The fire affected agribusiness, such as palm oil production and timber, and human health, such as respiratory tract infections. It also affected environmental conditions over greater region, by releasing large amount of CO2 and aerosol into the atmosphere. We analyzed multiple satellite-based datasets, e.g., OMI aerosol optical index, MODIS land surface temperature, active fire counts, and vegetation index, TRMM rainfall, and GFED (Global Fire Emissions Database) CO2 emission in order to quantify severity of biomass burning in 2015, relative to the period of 2005-2015. We identify major drivers of anomalous biomass burning in 2015 especially in the southern Borneo and western Sumatra islands. We found that anomalous weather (e.g. temperature and precipitation) developed since July led to fire occurrence in Southeast Asia during August to October as detected from MODIS active fire counts, aerosol optical index, and the amount of CO2 emission in the south of Borneo and Sumatra islands in 2015. Among climate variables, we detected a persistent low precipitation period before and during dry season in 2015 from SPI (Standardized Precipitation Index) data. The persistence of low precipitation period before and during dry season showed correlation with severity of biomass burning. Therefore, monitoring of persistence in anomaly of precipitation is one of the keys to predict the severity of biomass burning in Southeast Asia. Further analysis can be performed for CO2 emissions using near-realtime data from the GOSAT and OCO-2 satellites.

