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Total Particulate Matter Emissions Estimates for Peatland Fires across SE Asia during the El Niño Driven 2015 Fire Season

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Recent work by Mota and Wooster [1] presents a novel 'top down' approach for the generation of biomass burning emissions inventories that directly links measures of fire radiative energy (FRE, in MJ) to total particulate matter estimates (TPM, in g) via biome specific coefficients (C, in g MJ-1) derived from observations of smoke plume optical depth. Developed for Southern Africa using FRE observations from the geostationary SEVIRI imager onboard MSG and 10km AOD retrievals from MODIS-AQUA, a nine-year emissions inventory was produced and compared well to current state-of-the-art products such as the Global Fire Emissions Database (GFED) and the Global Fire Assimilation System (GFAS), whilst also providing a substantial enhancement to spatio-temporal sampling. Here we present work investigating the application of this approach to the challenging conditions of the extreme, El Niño driven, September through October 2015 fire season in SE Asia. Focusing specifically on peatland burning, which produced the vast majority of emissions during the episode, we obtain measures of FRE (at 2km resolution) from time integrated fire radiative power (MW) observations from the recently launched Himawari-8 geostationary imager. Estimates of TPM are derived using peatland specific emission coefficients and optical depth data from the VIIRS polar orbiter (at 750m resolution) produced using a combination of standard and ORAC AOD products. The resulting TPM emission factors are used to generate emissions estimates for the region over the course of the episode and preliminary evaluations are made against the prevailing emissions databases. As this work develops, it is expected that the outcomes could be of considerable assistance. The TPM emissions estimates produced by this approach will not only lead to forecast services being able to be developed and enhanced for operational activities such as near real time smoke dispersion modelling and air quality forecasting, but there will also be a greater evidence base for national governments in prioritising their fire reduction and landscape management policies in this particularly vulnerable region.

[1] Mota, B. and Wooster, M.J., 2018. A new top-down approach for directly estimating biomass burning emissions and fuel consumption rates and totals from geostationary satellite fire radiative power (FRP). Remote Sensing of Environment, 206, pp.45-62.