A New Top-Down Approach to Quantifying the Spatial, Temporal, and Vertical Distribution of Urban and Biomass Burning Regions using Decadal Measurements from MOPITT

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This work presents an upgraded result of our just introduced new methodology, based on an analysis of CO measurements from the MOPITT satellite over the past 17 years (from 2000-2016). The specifics presented here will cover the entire globe. We analyze the CO total column measurements, as well as the vertical mixing ratio profile (where the degree of freedom is sufficiently high). Since the goal is to characterize and then use this characterization to look into the emissions of CO at high frequency, we focus on those regions which are heavily influenced by large-scale biomass burning, intense urban pollution, or are rapidly urbanizing. The goal is to understand how the vertical, temporal and spatial distribution is changing over time, and the impacts of emissions, in-situ processing, and long-range transport, on the overall atmospheric loading.

Initial results indicate that biomass burning dominates the loadings in Southeast Asia, Africa, and South America, where the loadings are highly variable in time, with part of every year polluted, and another part of every year relatively clean. On the other hand, urban emissions mainly dominate over East Asia, and parts of Europe and North America, where the loadings are almost always polluted. In addition to differences in space and time, there is a significant distributional difference in the vertical between these types of regions.

Given these differences, when we combine our a priori information with information from OMI, MISR, and AERONET, we also are able to differentiate local-sources from long-range transport. The results over Southeast Asia are described in detail with respect to long-range transport, from regions as far west as Bangladesh, and stretching as far east as the Western Pacific Ocean. Additional driving mechanisms are included for long-range transport in other regions of the world.

Key words: biomass burning, MOPITT, OMI