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What drives observed space-borne variations of formaldehyde columns over the Indian subcontinent?

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Oxidation of volatile organic compounds (VOCs) leads to the formation of secondary air pollutants (e.g. formaldehyde, HCHO) and secondary organic aerosol linked with deleterious impacts on human health. Our focus in this study is the Indian subcontinent where there is a range of chemical environments that span forest ecosystems (dominated by biogenic VOCs) to megacities that are sometimes influenced by upwind sources (e.g. agricultural burning), both with and without some marine influence. To understand this range of environments we use space-borne column observations of HCHO from the Ozone Monitoring Instrument (OMI), in coordination with the GEOS-Chem atmospheric chemistry transport model, to provide insight into the emissions and photochemical processes in the atmosphere. As part of this work we have developed a HCHO vertical column product using slant column retrievals from the NASA OMHCHO v003 product combined with air-mass factors determined by a high-resolution (c25 km), nested run of the GEOS-Chem model. We report our analysis for a calendar year, studying in particular seasonal cycles associated with biogenic emissions, agricultural burning, and meteorology (most notably monsoon dynamics). We also consider the extent to which these satellite data can provide information on city-sized spatial scales, and investigate such an approach for some of India's megacities.