

Anthropogenic emissions and satellite inferred tropospheric formaldehyde trends, seasonality and anomalies over South Asian region

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This study has been conducted to assess the spatiotemporal variability, trends and anomalies of satellite derived tropospheric formaldehyde (HCHO) over South Asia. This study discusses anthropogenic emissions of formaldehyde estimated by MACCity (Monitoring Atmospheric Composition and Climate, MACC and megaCITY – Zoomfor the Environment, CityZEN), and spatiotemporal variability of Ozone Monitoring Instrument (OMI) sensed tropospheric formaldehyde over South Asian region and six study zones. Anthropogenic emissions of formaldehyde have been observed to be averaged at $4.45 \times 10^{-13} \text{ kg m}^{-2} \text{ s}^{-1}$, with a change from $4.24 \times 10^{-13} \text{ kg m}^{-2} \text{ s}^{-1}$ (in 2005) to $4.83 \times 10^{-13} \text{ kg m}^{-2} \text{ s}^{-1}$ (in 2015) with an overall increment of 16.5%. The highest contribution is seen from transport sector at an average of $5.63 \times 10^{-14} \text{ kg m}^{-2} \text{ s}^{-1}$. OMI sensed formaldehyde averaged at $6.16 \pm 0.24 \times 10^{15} \text{ molecules cm}^{-2}$ and increase of 10.9% during 2005-2015 have been observed. Zone-4 consisting of eastern regions of India, Bangladesh and western regions of Myanmar is found to be the highest $10.14 \pm 0.51 \times 10^{15} \text{ molecules cm}^{-2}$ with 10.9% increase during the study period. Also anomalies have been observed with identification of sources. Stepwise linear regression modeling technique has also been adopted to predict formaldehyde columns over South Asia and study zone by using gases and aerosols data such as MODIS-Aqua deep blue Aerosol Optical Depth (AOD), AIRS CO, AIRS O₃, SCIAMACHY CH₄, and OMI NO₂.

Key words: OMI, MACCity, HCHO, Air Quality, South Asia