

Monitoring of Formaldehyde over Punjab Pakistan Using Car Max-Doas and Satellite Observation

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Abstract : Air pollution is one of the main perpetrators of climate change. GHGs cause melting of glaciers and cause change in temperature and heavy rain fall many gasses like Formaldehyde is not direct precursor that damage ozone like CO₂ or Methane but Formaldehyde (HCHO) form glyoxal (CHOCHO) that has effect on ozone. Countries around the globe have unique air quality monitoring protocols to describe local air pollution. Formaldehyde is a colorless, flammable, strong-smelling chemical that is used in building materials and to produce many household products and medical preservatives. Formaldehyde also occurs naturally in the environment. It is produced in small amounts by most living organisms as part of normal metabolic processes. Pakistan lacks the monitoring facilities on larger scale to measure the atmospheric gasses on regular bases. Formaldehyde is formed from Glyoxal and effect mountain biodiversity and livelihood. So its monitoring is necessary in order to maintain and preserve biodiversity. Objective: Present study is aimed to measure atmospheric HCHO vertical column densities (VCDs) obtained from ground-base and compute HCHO data in Punjab and elevated areas (Rawalpindi & Islamabad) by satellite observation during the time period of 2014-2015. Methodology: In order to explore the spatial distributing of H₂CO, various fields campaigns including international scientist by using car Max-Doas. Major focus was on the cities along national highways and industrial region of Punjab Pakistan. Level 2 data product of satellite instruments OMI retrieved by differential optical absorption spectroscopy (DOAS) technique are used. Spatio-temporal distribution of HCHO column densities over main cities and region of Pakistan has been discussed. Results: Results show the High HCHO column densities exceeding permissible limit over the main cities of Pakistan particularly the areas with rapid urbanization and enhanced economic growth. The VCDs value over elevated areas of Pakistan like Islamabad, Rawalpindi is around 1.0×10^{16} to 34.01×10^{16} Molecules/cm². While Punjab has values revolving around the figure 34.01×10^{16} . Similarly areas with major industrial activity showed high amount of HCHO concentrations. Tropospheric glyoxal VCDs were found to be 4.75×10^{15} molecules/cm². Conclusion: Results shows that monitoring site surrounded by Margalla hills (Islamabad) have higher concentrations of Formaldehyde. Wind data shows that industrial areas and areas having high economic growth have high values as they provide pathways for transmission of HCHO. Results obtained from this study would help EPA, WHO and air protection departments in order to monitor air quality and further preservation and restoration of mountain biodiversity.

Keywords : air quality, formaldehyde, Max-Doas, vertical column densities (VCDs), satellite instrument, climate change

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