

## Ozone steady-state at the semi-urban region, Shadnagar, in Southern India

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The photo steady-state (PSS,  $\phi=1$ ) of ozone ( $O_3$ ) is considered when the production of  $O_3$  ( $P_{O_3}$ ) and sink of  $O_3$  ( $S_{O_3}$ ) are in equilibrium. In the PSS,  $O_3$  forms when  $NO_2$  is destroyed and reform fast after reaction with  $O_3$  in the sunlight. A hypothetical photo-stationary state (HPPS) can be assumed when the rate change of ozone balances with its net production ( $P_{netO_3}$ ) and net transport ( $T_{netO_3}$ ) in and out of small volume around the monitoring. The transport process is difficult to address without the set of spatial concentrations measurement, emissions inventories, and meteorological data for chemistry-transport modeling. Therefore the HPPS can be considered. However, detailed chemical observation and chemical transport models are used to study ozone production and its transport. In the real atmosphere,  $\phi < 1$  represents the involvement of transport and  $\phi > 1$  represents the involvement of peroxy radicals which converts  $NO$  to  $NO_2$ .

The Ozone concentration in PSS and HPPS framework were studied. The continuous observation of  $NO$ ,  $NO_2$ ,  $O_3$  concentrations with a temporal resolution of 1 minute was hourly averaged during the August 2014 to April 2017 period. The hourly values of  $J_{NO_2}$  were calculated using the radiative transfer model Tropospheric Ultraviolet and Visible (TUV) model. The average difference between the  $O_3$  and  $O_{3HPPS}$  was observed 4.08 ppb while the difference between  $O_3$  and  $O_{3pss}$  was observed -0.16 ppb in the daytime between 06:00 to 18:00 hours local through the study period. The net local transport was found at 52.78 ppb/h at the same time. The ozone that was transported was supported due to its long lifetime at the site. The study suggests that the site was ozone sink prominent and the ozone was transported at the site to balance the observed ozone throughout the study period.