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## Classification and transformation of aerosols over selected Indian cities during reduced emissions under COVID-19 lockdown

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An improved air quality around the globe and over India has been witnessed during the Covid-19 pandemic lockdown. Using surface observations of particulate matter and chemical species data and products from the MERRA-2 reanalysis Ångström exponent ( $\alpha$ ) and aerosol optical depth (AOD), this study documents the changes in atmospheric chemistry over the Indian subcontinent as a result of nationwide lockdown. Two major cities are selected in five Indian regions to cover a large spatial domain. A general shift from fine to coarse particle size, predominantly of dust type, in all regions is observed, which implies a lowered residence time of aerosol in the atmosphere during decreased anthropogenic emissions. For the studied period, Thiruvananthapuram is the cleanest city with marine origin aerosols and an average  $PM_{2.5}$  concentration of  $7.69 \pm 2.40 \mu\text{g}/\text{m}^3$  in the last phase of nationwide lockdown. Over Delhi and Ahmedabad, industrial and vehicular emission play important role in influencing the air quality. The diurnal variation of  $O_3$  and  $NO_2$  and their interdependency on each other vary over space and time, with the sharp nighttime  $O_3$  peak observed in the southern region for each lockdown phase. Biomass burning type aerosols decrease over the eastern region. In lockdown,  $NO_2$  also shows a significant correlation with population density ( $R^2 = 0.75$ ;  $p < 0.05$ ), suggesting human mobility (and accordingly vehicular emissions) as the major contributor to  $NO_2$  concentration in the atmosphere. The results of present study did not find any relationship between the ambient concentrations of pollutants to the cumulative increase in COVID-19 cases. However, there is a significant relationship with  $O_3$  concentrations, and in turn with  $NO_2$ , which can be associated with respiratory ailments.