

On the impact of COVID-19 lockdown on the atmospheric processes over India: An overview

M. Venkat Ratnam

*National Atmospheric Research Laboratory (NARL), Gadanki, India, e-mail:
vratnam@narl.gov.in*

The lockdown measures that were taken to combat the COVID-19 pandemic minimized anthropogenic activities and created natural laboratory conditions across the globe for investigating several atmospheric processes. More than 200 papers were published across the world but mainly restricted to surface pollution and air quality. Its impact is not only seen on the surface air pollution but extended to dynamic and thermodynamic processes. In order to see effect on these processes, quality observations from the surface, ground-based and space borne remote sensing observations are utilised. Since these observations do not provide all the atmospheric parameters, WRF model simulations are also performed. Before using these simulations, they are validated/compared with ground based and satellite measurements. Both observations and WRF-Chem simulations show a 20–50% reduction (compared to pre-lockdown and same period of previous year) in the concentrations of most aerosols and trace gases over Northwest India, the Indo Gangetic Plain (IGP), and the Northeast Indian regions. It is observed that this was mainly due to a 70–80% increase in the height of the boundary layer besides the low emissions during lockdown. However, a 60–70% increase in the pollutants was observed over Central and South India including Arabian sea and Bay of Bengal during this period, which is attributed to natural processes. Elevated (dust) aerosol layers are transported from the Middle East and Africa via long-range transport, and a decrease in the wind speed (20–40%) causes these aerosols to stagnate, enhancing the aerosol levels over Central and Southern India. A 40–60% increase in relative humidity further amplified aerosol concentrations. Effect of the lockdown is also seen on the convective processes. Our results suggest that besides emissions, natural processes such as background meteorology and dynamics play a crucial role in the pollution concentrations over the Indian sub-continent. COVID-19 provided an opportunity to test this hypothesis by ceasing all major anthropogenic activities, providing the background for a large-scale natural laboratory experiment.