Summary of the AC-VC Topical Seminar #1

The AC-VC Topical Seminar #1 on the topic “Covid-19 impact: what can be learnt from satellite observations and the emission changes?” was held as a virtual meeting on July 13, 2021, 13:00-15:30 UTC. As many as 58 participants from space agencies and research institutes from around the globe attended the meeting.

After an invited talk reviewing publications on the impact on urban air quality, a series of short presentations were given covering key constituents such as NO_2, $PM_{2.5}$, ozone, and CO_2.

It was highlighted that disentangling Covid-related changes from other variations, e.g. due to weather, seasonal effects, or transport, is challenging and, at the same time, a critical step in the interpretation of time series of observed abundances. Various methodologies were discussed, ranging from evaluating differences of differences to creating a reference scenario using machine learning techniques.

In many published analyses, changes in observations of short lived trace gases such as NO_2 and CO are attributed to Covid-related emission changes and restrictions. Significant correlations are reported with an index capturing the severity of lock-down measures. The value of analyses per emission sector was stressed.

It was reported that reductions in NO_x emissions tend to lead to less titration and hence increased ozone concentrations near the surface, for most urban areas. In the NO_x-limited free troposphere, less NO_x leads to less ozone. The variability on high altitudes densities is dominated by other factors. More analyses are needed covering also ozone precursors, in particular non-methane volatile organic compounds, which are not readily observed by satellite instruments.

Linking changes in observed $PM_{2.5}$ abundances with Covid-related effects is not straightforward. E.g. it is challenging to disentangle the latter from variations due to transport of biomass burning aerosol and mineral dust, which can drive the changes. More analyses are needed accounting for these contributions and also accounting for PM precursors, in particular ammonia and sulphur dioxide.

Changes in CH_4 abundances are consistent with a change in the oxidizing capacity of the atmosphere associated with Covid-related emission changes. It was speculated that the overall radiative impact of the various changes in the constituents driving the radiation balance might be cancelling out, which has not yet been verified by observations.

The need for quick answers to questions of public interest related to the Covid-19 pandemic was discussed. The proper analysis and interpretation of observed changes by the science community always takes more time than the media and public expect. Efforts to make observational data and scientific results accessible faster and more widely should to be accompanied with efforts to promote best practices for a proper use of the data.