

Impact of Weather Patterns and Meteorological Factors on PM_{2.5} and O₃ Responses to the Covid-19 Lockdown in China

Fuzhen Shen

Forschungszentrum Jülich, Germany

Author list (excluding presenting author)

Michaela I. Hegglin

Abstract

The haze event in North China Plain (NCP) and decline in ozone levels in Southern Coast China (SC) from 21st January to 9th February 2020 during the COVID-19 lockdown have attracted public curiosity and scholarly attention. Most previous studies focused on the impact of atmospheric chemistry processes associated with anomalous weather elements in these cases, but fewer studies quantified the impact of various weather elements within the context of a specific weather pattern. To identify the weather patterns responsible for inducing this unexpected situation and to further quantify the importance of different meteorological factors during the haze event, two scenarios are employed. These scenarios implemented the comparisons of observation in 2020 with climatology averaged over the years 2015-2019 by a novel structural SOM (Self-Organising Map) model and with the prediction for 'Business As Usual' (hereafter referred to as BAU) emission strength by GBM (Gradient Boosting Machine) model, respectively. The results reveal that the unexpected PM_{2.5} pollution and O₃ decline from the climatology in NCP and SC could be effectively explained by the presence of a double-centre high-pressure system across China. Moreover, the GBM results provided a quantitative assessment of the importance of each meteorological factor in driving the predictions of PM_{2.5} and O₃ under the specific weather system. These results indicate that temperature played the most crucial role in the haze event in NCP, as well as in the O₃ change in SC. This valuable information will ultimately contribute to our ability to predict air pollution under future emission scenarios and changing weather patterns that may be influenced by climate change.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

TOAR: Tropospheric Ozone Assessment Report

IGAC Regional Working Groups

China Working Group