

Examining the Seasonal Variations of Short-lived Climate Pollutants in Hanoi, Vietnam during the period of 2019-2021

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Introduction

In order to limit the global warming rate under 1.5°C, interest in short-lived climate pollutants (SLCPs) has recently been glowing. By applying multi-model approach, Steven J Smith et al (2020) showed a substantial overlap between policies of reducing GHGs and SLCPs. The additional benefit of global temperature from SLCPs' cut along with GHGs' reduction is nearly zero (0.07-0.08°C in 2030/2040), which is much less than expected results from the co-benefits of GHGs-SLCPs reduction in previous studies. Among SLCPs, methane (CH₄) and black carbon (BC) are the two key climate forcers. In Vietnam, CH₄ reduction policies have been clear and feasible enough after officially joined the Climate and Clean Air in 2017 through livestock and paddy rice cultivation. After COP26, this state also committed to net-zero carbon target for tackling climate change issues. However, policies to reduce SLCPs are still unclear due to lack of information and understanding on behaviors of key species of SLCPs such as BC at local scale. Therefore, the objectives of this study are to get better understandings of black carbon behaviors in Vietnam and help policy makers focus on effective targets to reduce local air pollution and region climate impacts.

Methods

BC concentration has been observed with Particle Soot Absorption Photometer (PSAP) at Vietnam-Japan University in Hanoi, Vietnam, since December 2018. This study compared the observed data with model BC data constrained with the remote sensing data from the second Modern-Era Retrospective analysis for Research and Applications (MERRA-2). The collected dataset named Aerosol Diagnostics has spatial resolution of 0.5x0.625 degree and 1-hour frequency. The whole dataset covered the period from 1980-01-01 to 2023-01-01. However, the clip dataset for period of 2019-01-01 to 2021-12-31 was downloaded for smaller file size.

Results and Discussion

In winter, MERRA-2 reproduced well relative variation of both hourly and monthly BC mass concentration at Hanoi, Vietnam, although the absolute values of MERRA-2 BC were systematically higher than the observational BC as shown in the left figure. Agreement between the MERRA-2 and observed values was better in winter. The regional distribution of the MERRA-2 BC concentration, as shown in the right figure, illustrates the transport of BC from more polluted areas. In winter, these distributions in higher BC periods suggested the transport from south China as well as regional emission in of Red River Delta in Northern Vietnam. Further results will be presented in the JpGU meeting.

Keywords: black carbon, climate forcer, vietnam

