1.093 Decadal changes of ozone-NOx-VOC sensitivity over Japan estimated using satellite data and their impact on the effectiveness of surface ozone mitigation policies inferred from air quality simulations..

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Abstract:

It is crucial how surface ozone respond to emission reduction of its two main precursors, NOx and VOC, for policymakers pursuing the effective ozone mitigation strategy.
In the present study, I estimated decadal change of ozone-NOx-VOC sensitivity over Japan utilizing HCHO/NO_2 column density ratio measured with Ozone Monitoring Instrument (OMI). Also, using the air quality model, ADMER-PRO, we estimated the effect on surface ozone concentration of some emission reduction scenarios, such as the NOx reduction from diesel truck cars and the VOC reduction from evaporative point sources, which are considered as choices of the air pollution mitigation policies. The effect on surface ozone concentration of each emission reduction scenario was estimated using two kinds of emission inventory as the input to the base case simulation, one prepared for a decade ago situation (year of 2005) and the other simply adjusted for the current situation.
The results from satellite data showed that surface ozone sensitivity has become more NOx-sensitive over Japan during the last decade. Accordingly, the simulation results showed the scenarios with NOx reduction are more effective for mitigating surface ozone when using the emission inventory adjusted for the current situation than using that for a decade ago situation.
The above results suggest that the appropriate surface ozone mitigation policies should be selected on the basis of the current situation of ozone-NOx-VOC sensitivity but not a decade ago situation, and also suggest that the emission data input to the base case simulation should be updated for the current situation in order to estimate correctly the effect of each emission reduction scenario. So, for the next challenge, we should develop the method of updating emission inventory for the current situation not just simply but also correctly, though preparing emission inventory is in general very time-consuming and with large uncertainty.