Geophysical Research Abstracts
Vol. 21, EGU2019-15665-1, 2019
EGU General Assembly 2019

Benefits of current and future policies on emission reduction and air quality improvement indicated by continuous emission monitoring on coal-fired power sector in China

Yu Zhao and Yan Zhang
Nanjing University, School of the Environment, Nanjing, China (yuzhao@nju.edu.cn)

Emission inventory is essential to understand the sources of air pollutants through chemistry transport modeling. Uncertainties existed in emission estimations due to lack of on-site measurements and slow updates of emission factors for developing countries including China. In this study, online measurement data of continuous emission monitoring systems (CEMS) were collected and analyzed to rebuild the “bottom-up” emission inventory of China’s coal-fired power sector in 2015. We then applied the Weather Research and Forecasting and Community Multi-scale Air Quality model (WRF-CMAQ) to explore the improvement of incorporating CEMS data on air quality modeling and to evaluate the benefits of the "ultra-low emission" policy on air quality over the Yangtze River Delta (YRD) in 2015. The emissions of SO_2, NO_x and TSP from coal-fired power plants in China were recalculated at 1324.2, 1453.0 and 343.5 Gg respectively, 74.6%, 61.9% and 75.0% smaller than our estimates with the traditional “bottom-up” approach without CEMS data. The results implied that online monitoring data might be able to better capture the effects of recent strict controls on emissions from power sector, and that the removal efficiencies of air pollutant control devices might be underestimated with the “bottom-up” approach. The normalizes mean errors (NME) between simulated and observed concentrations with the updated emission inventory were 33.6, 62.0, 31.9, and 23.3%,for SO_2, NO_x, O_3 and PM2.5 respectively over YRD, all of which were smaller than those with the traditional approach. The comparison indicated the improvement of the emission inventory of power sector based on online monitoring data. We further set two simulation cases in which the emissions from power sector (Case 1) and those from power and industry sector (Case 2) fully meet the ultra-low emission standard. Compared to the base case, SO_2, NO_x and PM2.5 concentrations were simulated to decrease by 2.8%, 1.3% and 0.2% respectively, and O_3 increase by 2.7% in January in Case 1. The pollutant concentrations changed more significantly in Case 2. Similar changes were predicted in April, July and October, in accordance with the fact that emissions from industrial sector in YRD were much larger than those from power sector. The result indicated that the potential of emission abatement and air quality improvement through the ultra-low emission policy on power sector was limited, and more stringent measures were thus suggested for other sectors like industry and household in the future.