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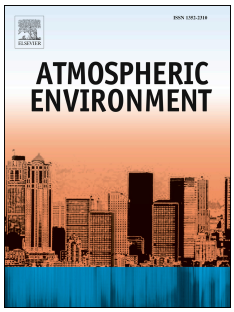


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# Investigating impact of emission inventories on $PM_{2.5}$ simulations over North China Plain by WRF-Chem

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**Abstract:**

Anthropogenic air pollutant emissions have been increasing rapidly in China, leading to severe heavy haze events. In order to predict $PM_{2.5}$ concentrations accurately, the emissions of precursor gases and primary particles are quite critical but remains large uncertainty. In this study we firstly compared the emissions of precursor gases and primary particles such as sulfur dioxide ($SO_2$), nitrogen oxides ($NO_x$), ammonia ($NH_3$), carbon monoxide (CO), black carbon (BC), organic compounds (OC), non-methane volatile organic compounds (NMVOCs), $PM_{2.5}$ and $PM_{10}$, in three emission inventories (EIs) including INTEX-B (representing the year 2006), MEIC10 and MEIC12 (representing the year 2010 and 2012) over North China Plain (NCP), one of the most polluted regions in China. It is found that annual total emissions of $SO_2$ decreased 34% (26%) from INTEX-B to MEIC10 (MEIC12), possibly due to effective control and improvement of fuel combustion efficiency conducted in recent years. The $NO_x$ emissions increased 53% (58%) from INTEX-B to MEIC10 (MEIC12), and the major contributor to $NO_x$ was replaced from power in INTEX-B by industry in MEIC10/12. The VOCs emissions in MEIC10/12 are 21.1% lower than in INTEX-B possibly due to tightened emission standards and operating conditions. The simulations with three EIs, based on WRF-Chem, generally reproduced the observed seasonal variation of $PM_{2.5}$ concentrations, i.e. high in winter and autumn but low in spring and summer. The spatial distribution from the simulations are overall in good agreement with each other, and the differences less than 20μg $m^{-3}$ in most regions. The maximums by the simulations with three EIs occur in autumn due to very low wind speed despite the highest emissions in winter.