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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of urban land expansion on the regional meteorology and air quality of Eastern China" *by* W. Tao et al.

Anonymous Referee #3

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Using WRF-CHEM model, authors of this manuscript assessed quantitatively the effects of urbanization to urban air quality with focus on eastern China where rapid expansion of urban area has been taking place over last several decades. Urbanization can increase anthropogenic emissions of criteria air pollutants and alter dynamics and thermodynamics of air parcels and atmospheric contaminants in the atmosphere. This paper dealt with the response of urban air pollutants to changes in atmospheric turbulence and advection induced by changes in underlying urban surfaces. Results reported in this study fill knowledge gaps in understanding redistribution of air pollutants forced by urbanization from a dynamic perspective. I recommended publication in ACP after following comments are addressed.

As the authors mentioned, anthropogenic emission were obtained from the Multi-

resolution inventory for China. Given that this model simulation used fixed surface emissions, it is not clear if emissions in 2010 from the MEIC were the fixed emissions used in authors' modeling exercises of 2008 through 2012. In Model evaluation section (3) modeled atmospheric level of O3, CO, and PM2.5 were verified against monitored data in 2008, 2009, and 2012, respectively. Were these modeled concentrations all derived from fixed emissions in 2010 as well?

Surface wind field perturbations due to urban expansion shown in Fig. 9 seem to suggest that the effect of urbanization on wind field in eastern China is quite significant. From my view, perturbed southeasterly winds extending from East China Sea to the east seaboard of China are in the regime of east Asian summer monsoon. The top panel of Fig. 9 shows that GT0 scenario yielded strongest perturbation as compared with other two scenarios. Does this suggest that the urban expansion in east China could increase the strength of wind field under the monsoon regime? As authors mentioned (pg 4, line 5-8), both large-scale weather patterns and land surface conditions govern the dispersal, transformation, and eventual removal of airborne pollutants. Does Fig. 9 imply a feedback of change in land use types to large-scale weather pattern?

Perhaps I missed the discussions on interactions between targeted species at LOCAL and ADJACENT cells. If urban expansion reduced atmospheric level of these species at LOCAL cells, partly due to urbanization-induced outward horizontal advection, featured by lower concentrations over LOCAL cells than those over the ADJACENT regions (pg 13, line 10-11), concentrations over the ADJACENT cells might also flow towards LOCAL cells to compensate the lost mass of species at LOCAL cells unless an equilibrium of the species between LOCAL and ADJACENT cells is reached.

Other comments"

Pg 5, line 14, Jing-Jin-Ji, you mean Beijing-Tianjin-Hebei? Pg 10, line 28-29, terrestrial O3 level (∼24-32 ppb) is almost identical to its level (∼24-30 ppb) at 800 hPa. You mean 800 hPa over an urban site? Pg 17, line 3-12, how about humidity influence on

PM2.5? If urban expansion decreases relative humidity, this decline may affect PM2.5 formation.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 10299, 2015.