

1.026 Modeling of the anthropogenic heat flux and its effect on air quality over the Yangtze River Delta region, China.

Presenting Author:

Min Xie, Nanjing University, minxie@nju.edu.cn

Co-Authors:

Tijian Wang, Nanjing University

Lei Shu, Nanjing University

Abstract:

Anthropogenic heat (AH) can affect the city environment. The spatial distribution of AH fluxes in the Yangtze River Delta (YRD) region is estimated, and is also incorporated into the modified WRF/Chem with the seasonal and the diurnal variation. The impacts of accounting for AH fluxes on the meteorology and air quality over the YRD region are studied. The results show that AH fluxes over YRD has been growing from 1990 to 2010. In 2010, the high values of AH over the urban areas of Shanghai can reach 113.5 W/m^2 . Including AH can significantly change the urban heat island and urban-breeze circulations in the cities of the YRD region. In Shanghai, 2-m air temperature increases by $1.6 \text{ }^\circ\text{C}$ in January and $1.4 \text{ }^\circ\text{C}$ in July, the planetary boundary layer height rises up by 140m in January and 160m in July, and 10-m wind speed is enhanced by 0.7 m/s in January and 0.5 m/s in July. And the enhanced vertical movement can transport more moisture to higher levels, which causes the decrease of water vapor at the ground level and the increase in the upper PBL, and thereby induces the accumulative precipitation to increase by 15-30% over the megacities in July. The adding AH can impact the simulated pollutants as well. The concentrations of primary air pollutants decrease near surface and increase at the upper levels, due mainly to the increases of PBLH, surface wind speed and upward air vertical movement. But surface O_3 concentrations increase in the urban areas, with maximum changes of 2.5ppb in January and 4 ppb in July. Chemical direct and indirect effects can play a significant role in O_3 changes. AH should be considered in any climate and air quality assessment.