应用气象学报 Journal of Applied Meteorological Science

基于观测的污染气体区域排放特征

Regional Emissions of Gaseous Pollutants Based on Observations

基金项目：资助项目：国家自然科学基金项目(40775074)，公益性行业(气象)科研专项(GYHY200706005),中国气象科学研究院基本科研业务费

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摘要：

利用2006年9月—2007年8月河北省固城生态与农业气象试验基地（固城站）反应性气体观测数据获得了CO与NO x， CO与SO 2， SO 2与NO x体积分数比的变化特征，并将观测得到的体积分数比与从INTEX B等排放源资料得到的排放比进行比较研究。当风向来自北方向(北京)时，固城站的CO和NO x体积分数显著高于其他方向，而来自南方向(保定、石家庄)时，SO 2体积分数显著高于其他方向。固城站观测到的CO与SO 2， CO与NO x体积分数比分别为43.7和31.6，较排放比高出2~12倍。分析表明：排放源清单对CO排放低估了大约2倍以上，生物质燃料燃烧，尤其是收获季节大规模秸秆燃烧排放可能是重要的且被低估了的源。从观测数据估计得到秸秆燃烧期比平时CO大约多排放了90%±30%，忽略秸秆燃烧期额外排放对CO排放强度估计有重要影响。未来排放源清单编制和使用需要更加关注我国农业区秸秆燃烧排放对排放强度的影响。

关键词： SO 2 NO x CO 排放比 固城站

Abstract:

Measurements of ambient CO, NO x and SO 2 made at Gucheng Station, Hebei Province, China from September 2006 to August 2007 are analyzed and applied to the validation of emission inventory data. It shows that the concentrations of these gases are significantly correlated among each other, suggesting that the gases have common sources. The concentration ratios of CO to NO x, CO to SO 2 and SO 2 to NO x for the entire day, daytime and nighttime in different seasons are obtained based on the slopes of the respective correlation lines. The results show that the seasonal variations of the ratios are not very high and the correlations of CO and NO x, CO and SO 2, SO 2 and NO x in winter are more significant than those in other seasons. There is large difference between the daytime and nighttime in the ratio of CO to NO x, particularly in the warmer seasons, indicating strong photochemical impact on the ratio of CO to NO x. There are certain dependences of the gas concentrations and the concentration ratios on wind directions, reflecting the different impacts of sources from different wind sectors. The prevailing surface wind directions at the Gucheng Station are northeast and southwest, facilitating the transport of plumes from Beijing and Baoding, respectively. When winds come from the north sector (Beijing), surface concentrations of CO and NO x are significantly higher than those from other directions, and when the winds come from south sector (Baoding, Shijiazhuang), surface concentration of SO 2 is significantly higher than that from other directions. The characteristics of pollutants in different wind directions may reflect the characteristics of pollution sources in different directions. The concentration ratios from the observations are compared with emission ratios derived from the emission inventories (INTEX B, TRACE P, REAS, HB). To avoid the influences from inadequate vertical mixing and strong photochemistry, only afternoon data in seasons other than summer are considered. Under this condition, the observed concentration ratios are 43.7 and 31.6 for CO to SO 2 and for CO to NO x, respectively, which are 2—12 times higher than the respective emission ratios derived from the emission inventories. This result suggests that CO emission may be underestimated by more than two times in the emission inventories. Further studies show that CO emission from biomass combustion, especially the large scale straw combustion in harvest seasons would be the important but greatly underestimated source. The analysis of the observation data indicates that the average CO level in open straw burning periods is (90%±30%) higher than that in the other periods under similar meteorological conditions. So far, biofuels are still used for cooking and heating by rural families in many Chinese regions and open burning of agricultural residues is often not effectively controlled. In the future, the impacts of emissions from agricultural straw burning on the emission strengths should be given more attention in the process of making and using the emission inventories.

Keywords:SO 2 NO x CO emission ratio Gucheng Station

李 阳,徐晓斌,林伟立,赵花荣.基于观测的污染气体区域排放特征[J].应用气象学报,2012,23(1):10~19.Li Yang,Xu Xiaobi,Lin Wei Li and Zhao Hua Rong.Regional Emissions of Gaseous Pollutants Based on Observations[J].Journal of Applied Meterological Science,2012,23(1):10~19

主办单位：中国气象科学研究院，国家气象中心，国家卫星气象中心，国家气候中心，国家气象信息中心，中国气象局气象探测中心　　单位地址：北京市海淀区中关村南大街46号 中国气象科学研究院《应用气象学报》编辑部

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