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研究报告

多元观测资料融合应用的灰霾天气关键成因研究

The key factor research of haze with the combined application of the multi element data

关键词：<u>多元观测资料</u>　<u>灰霾天气</u>　<u>关键成因</u>

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摘要：利用临安作为区域大气本底站的优势和杭州大气复合污染综合观测设施,再融合DMSP/OLS夜间灯光数据及气象观测数据,从不同层面研究了灰霾天气形成的主导因素·通过浙江省灰霾日数空间分布与同时期Defense Meteorological Satellite System (DMSP)/Operational Linescan System (OLS)卫星遥感得到的夜间灯光分布对比以及1960—2009年间杭州和浙江省年平均灰霾日数演变过程,从空间和年代际变化两个角度论证了当前不科学的社会发展是造成灰霾天气日益严重的根本原因·通过杭州和临安本底站实际观测对比发现,对灰霾天气形成起主要作用的是细粒子,关键排放因子不是尘粒等气溶胶,而是黑碳、NO_2、SO_2等.脱硫减排可以使霾污染有所减缓,但由汽车尾气等排放的含氮前体物对霾污染的贡献却越显突出·气象条件是灰霾天气形成的外部控制因素·在各种天气形势中,由于高压控制下下沉气流明显、大气相对稳定,出现灰霾天气的概率最高,达64.5%.除天气形势、大气稳定度外,风速、气温、湿度、气压、降水、变温等地面气象因子及前1日PM_{10}浓度对污染物浓度皆有一定影响,其中降水、湿度、风速与污染物浓度之间的相关性最显著,是灰霾天气形成的关键气象因子·

Abstract：Based on the comprehensive observations of the complex atmospheric pollutions in Hangzhou, and the observations at the Linan regional background station, together with the DMSP/OLS data and the routine meteorological data, the leading factors of the haze were investigated from different perspectives. Through the comparisons between the haze day distribution and the contemporary night light intensity distribution from DMSP/OLS, as well as the temporal evolution of average annul haze day in Zhejiang province, it was demonstrated that the unscientific social activities were the most predominant reasons of the more and more serious haze pollution from the aspects of spatial distribution and the interdecadal change. By the comparison analysis of the observational data in Hangzhou and Linan, it was confirmed that the key impacting factors of the haze formation are carbon black, NO_2, SO_2, which can increase fine particle density, but not dust particles or other disposable aerosols. The desulfurization is an effective method to reduce SO_2 emission, but it further highlights the role of the nitrogen precursor in atmosphere pollution. Meteorological conditions are the external trigger causes of the haze formation. Because of the subsidence flow and stable atmosphere, the haze occurrence probability under subtropical high reached 64.5%, higher than those in other synoptic situations. In addition, the surface meteorological elements, such as wind speed, temperature, relative humidity, air pressure, precipitation, temperature difference and the pre-day PM_{10} concentration, all present certain degree influence on the intraday pollutant concentration, but the correlations between precipitation, relative humidity, wind speed and the PM_{10} are more outstanding, which means that these three elements are the key meteorological factors of the haze formation.

Key words：<u>multi element data</u>　<u>haze</u>　<u>key factor</u>

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