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use of earth observation in support of major sport events: case study for the athens, beijing and london olympic games

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The project aims at supporting the needs of major sport events with the use of earth observation. For this to be accomplished focused research is required in a wide number of thematic areas such as land use and cover, urban microclimate, urban green, air quality, forecasting meteorology and oceanography, etc. This project provides suggestions for more effective air particulate pollution control policies by government. Inhalable particulate matter (IPM) samples PM0.3, PM3 and PM5 were taken in heating season from 2007 to 2010 in order to determine temporal and spatial variations of IPM concentration based on the indicator Kriging of Geostatistics. Meanwhile, the correlation between IPM and meteorological factors was discussed; the influences of different factors on pollutant concentration were compared. The results show: Firstly, the concentration of particle in study area has spatial intermediate level variability. The coefficient of variation of PM3 and PM5 were relatively higher, it means they were influenced by some random factors like anthropogenic activity, ground pollution sources and land cover types. Since the classical statistical method could only reflect the whole samples on a certain extent, and it could not reflect local changing characters, so it needs to do spatial variability analysis by Geo-statistic method further. Secondly, based on the prediction result, the spatial distribution of fine particle was different from coarse particle. These are two situations: (1) the pollution area of fine particle (0.3¦Ìm) was mainly located in northwest and southwest in 2007, while it was transferred to southeast in 2010. (2) While the spatial distribution of coarse particle has different polluted area. In detail, PM3 and PM5 have an approximate distribution, with maximum area at the north of fourth and fifth ring road, minimum at southwest region around the fourth and fifth ring road in 2007. The polluted center transferred to southeast region in 2010, while it is weaker in the north and center of Beijing city. Thirdly, the concentration of PM0.3 in study area was found to increase firstly then decline after 2008. However, the concentration of PM3 was increasing during 4 years. The mean coarse particle concentrations were increasing in the last four years, which are assumed to be generated by increasing vehicular emissions. While trending of fine ones was decreasing after 2008 because of the urbanization, greening project and effective air pollute control against dust from construction and smoke from factories during the preparation for Olympic Games in 2008. Fourthly, the correlations between temperature and IPM are negative. In these factors, the negative correlation index between temperature and PM3.0 is highest, which is -0.40, the index indicates that with the temperature increasing, the particle concentration decreased; the positive correlation between humidity and IPM concentration were displayed, among them, the positive correlation between PM1.0 and humidity is 0.67 which is the highest, it is indicated that the humidity has great influence on the IPM; at the same time, the wind speed has a negative correlation to three groups, since the wind speed in the sampling period is less than 3m/s. Generally speaking, in recent four years, the fine inhalable particles pollution in Beijing has dramatically decreased both in pollution level and areas; the main polluted area was centralized at southwest area of the city. Pollution level in suburban areas was worse than in central city. The meteorological factors are crucial elements on influencing the concentration of IPM. Different meteorological factors have different influence on IPM in different years.

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对地观测对大型体育赛事的支持：以雅典、北京和伦敦奥林匹克运动会为例

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城市环境过程与数字模拟国家重点实验室培育基地;
教育部三维信息获取与应用重点实验室；
首都师范大学资源环境与旅游学院

该项目瞄准地球观测技术对大型体育赛事的支持作用。为此需要进行广泛的专题领域研究，如土地利用与覆盖，城市绿化，城市小气候，空气质量，气象预报和海洋学等。该项目为政府提供了更有效的空气微粒污染控制政策建议。从2007年到2010年，收集采暖季节的可吸入颗粒物（IPM）的PM0.3，PM3和PM5样品，利用克里格地统计学方法确定IPM的浓度时空变化。另外，对IPM与气象因素之间的相互关系进行了讨论，对不同因素对污染物浓度的影响进行了比较。结果表明：首先，研究领域中的颗粒物浓度在空间上存在中等水平的变异。PM3的和PM5变异系数相对较高，这意味着他们受一些随机因素的影响，如人为活动，地面污染源和土地覆盖类型。 由于传统的统计方法只能在一定程度上反映了整个样本，它不能反映当地的变化特征，所以还需要进一步做地统计方法的空间变异性分析。其次，在预测结果的基础上，粗颗粒与细颗粒物的空间分布不同。有两种情况：（1）在2007年细颗粒物（0.3微米）的污染面积主要分布在西北和西南，而在2010年转移到东南部。（2）粗颗粒的污染区存在空间分布差异。具体来说，在2007年PM3和PM5的分布区域大致相同，分布面积最大的地区在四环路和五环路北部，最小的区域在西南部的四环路和五环路附近。在2010年，污染的中心转移到东南部，在北京北部和城市中心的分布减少。第三，研究区的PM0.3浓度开始呈现增加的趋势，2008年后开始下降。然而，在4年时间里PM3的浓度持续增加。在过去的四年中，平均粗颗粒浓度增加。可能是车辆废气排放产生的影响。由于城市化，绿化工程和有效的空气污染致力措施，2008年奥运会期间对工厂建设和烟粉尘控制，使得2008年后细颗粒物的浓度出现减小的趋势。第四，温度和IPM之间的相关性为负。在这些因素中，温度和PM3.0之间的负相关指数是最高的，为-0.40，该指数表明，随着温度的升高，颗粒物浓度下降。湿度和IPM浓度之间呈正相关关系，其中，PM1.0和湿度之间的正相关系数最高，为0.67，这表明湿度对IPM的浓度有很大的影响。另外，由于在采样期间的风速小于3米/秒，风速与三组数据存在负相关关系。总的来说，在近四年时间里，细可吸入颗粒物在污染水平和地区上已大幅降低，主要污染区集中在城市的西南部，郊区的污染程度比城市中心弱。气象因素是影响IPM分布的至关重要因素。在不同年份，不同的气象因素会产生不同的IPM空间分布。