Geophysical Research Abstracts
Vol. 13, EGU2011-3459, 2011
EGU General Assembly 2011
© Author(s) 2011

Network design for ozone monitoring

Lin Wu (1,2) and Marc Bocquet (1,2)

(1) Université Paris-Est, CEREA, joint laboratory Ecole des Ponts ParisTech - EDF R & D, France ({Lin.Wu, Marc.Bocquet}@cerea.enpc.fr), (2) INRIA, Paris-Rocquencourt research center, France

Ozone is a harmful air pollutant at ground level, and its concentrations are measured with routine monitoring networks. In this study, network design based on the ozone monitoring network over France (BDQA) is conducted by either removing the redundant stations or by displacing the background stations (e.g. the rural and some suburb stations). The design methodology is composed of three parts: a geostatistical ozone estimator, a design criterion and an optimal selection procedure based on simulated annealing. Several spatial interpolation (kriging) methods have been tested. It is found that statistical information about the means of ozone concentrations improves significantly the kriging results, and that it is necessary to consider the correlation model to be hourly-varying and daily stationary.

In the network reduction problem, we examine how well a subset of the BDQA network can represent the full network. By this way, the efficiency of the complete BDQA network is evaluated. Significant improvements can be obtained through optimal reduction. For instance, removing optimally half the stations leads to an estimation error of the order of the standard observational error (5 ppb). In the network displacement problem, chemistry-transport model (CTM) simulations are used to estimate ozone concentration where no observations are available. Three types of redistribution criteria are assessed: the geometrical, geostatistical, and physical ones. The geometrical criteria are of space-filling type. The geostatistical criteria minimize the kriging error (according to A, D or E-optimality conditions). The physical criteria aim at best reconstructions of ozone fields (generated by simulations of a CTM or by data assimilation experiments). By displacing background stations to regular grid points over France, significant improvements against the original background BDQA network have been found under all the proposed criteria. The impact of the different criteria on displacement is also discussed. The physical criteria are more appropriate for complex design taking into account the heterogeneity of ozone field. More background stations are displaced to the coast, frontiers, and large urban agglomerations, e.g. Paris and Marseilles.