FOREWORD

Real-time analysis of data reported by environmental monitoring networks poses a number of interesting challenges, one of which is the handling of point measurements of phenomena that display some spatial continuity. This is the case for many variables, such as atmospheric and aquatic pollutant levels, background radiation levels, rainfall fields, temperature and seismic activity, to name but a few.

What these variables have in common is that the observations are usually interpolated, a step necessary to obtain maps that show information continuous in space. These maps can then be used for modelling or decision making. Ideally, in order to allow real-time assessments and minimize human intervention in case of hazards and emergencies (e.g. extreme pollution levels, earthquakes, floods or nuclear accidents), these maps should be established automatically and quickly.

To explore these issues in the field of environmental radioactivity, the Radioactivity Environmental Monitoring (REM) Group of the Institute for Environment and Sustainability at the Joint Research Centre (JRC) of the European Commission has organised Spatial Interpolation Exercises (SICs). They form part of the JRC's institutional support to Commission Services, DG TREN in Luxembourg. In these exercises, participants are invited to estimate values of a variable observed at N locations with the help of a subset of n observed measurements. Once the participants have made their estimates, REM discloses the true values observed at the N-n locations, so that the participants may assess the accuracy of their approach.

The SIC 1997 exercise (GIDA 1998, EUR 2003) mainly addressed the state of art of spatial interpolation at the time to highlight developments in spatial statistics as well as the large impact of human factors on the results obtained. On the other hand, the SIC 2004 exercise, whose results are published in this issue of Applied GIS, was more ambitious in its objectives. This time, participants were invited to fully automate their interpolation algorithms on the basis of some training data sets made available in advance. Moreover, the methods proposed had to describe how to calculate estimates and their associated uncertainties in the shortest period of time and, to address the behaviour of these mapping algorithms in emergency situations, be able to respond to situations in which extreme values are encountered.

As with the SIC 1997 exercise, readers will not find a unique "best" method recommended herein, since no generalisation can be made from a single case study applied to a specific problem. They will nevertheless find that results presented in the twelve papers tend to be relatively similar for routine situations, independent of the choice of algorithm. On the other hand, many obstacles clearly remain before one can rely on fully automatic mapping systems in emergency situations, especially during early and critical stages of an accident when measurements are usually sparse and statistical methods unable to cope with the lack of information.

Additional contributions from invited authors will appear in a separate publication, an EUR report of the European Commission (EUR 2005). These papers will deal with specific problems in spatial statistics and cover other aspects of monitoring networks and their associated decision support systems.

More information on these Spatial Interpolation Comparison exercises and how to access the data used may be found at www.ai-geostats.org under the "Events" topic.

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