Functional kriging prediction of pollution series. The geostatistical alternative when data are anchored in space

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Abstract: *Air quality is a core topic, because air pollution is one of the most important pollution problems in the world. This is why the authorities of the large cities have established air pollution monitoring networks that register the level of the most dangerous pollutants in a number of locations of the city on an hourly basis. Thus, the dataset including such measurements can be considered as a panel dataset where data are anchored in space. The way geostatistics deals with such panel or longitudinal data differs largely from the way econometrics do: geostatistics takes advantage of the spatio-temporal dependencies to make kriging or cokriging predictions at non-observed sites. But spatio-temporal kriging implies a prohibitive computational burden and, as a consequence, functional kriging has emerged as an interesting strategy to deal with this type of data since it deals with single entities (functional data or curves) representing the observations recorded at each location observed, so that spatial kriging based on such functional observations allow predicting the corresponding curves at the non-observed locations of interest. It could be said that functional kriging reproduces the history of the phenomenon under study at such non-observed sites. This novel approach has been applied in the city of Madrid (Spain) to particulate matter (PM10) registers, the reason being that PM10 is the most important pollutant in terms of adverse effects on human health. As ecologists claim that the monitoring stations operating in the city of Madrid are not located in the most polluted sites of the city, functional data are predicted at some of these most polluted sites to check whether the level of PM10 at such locations exceeds that of registered at the sites where the monitoring stations are placed.*

Key words: *Panel data, functional data, functional kriging, spatio-temporal dependencies, air pollution, PM10.*

JEL classification: C21, C23, C55, O13, Q53