The Gutenberg–Richter Law for Earthquakes in Air Pollution Episodes: A Case Study for Athens, Greece

SHORT COMMUNICATION

Maria EFSTATHIOU, Chris TZANIS, Costas VAROTSOS, and Despina DELIGIORGI

Climate Research Group, Division of Environmental Physics and Meteorology, Faculty of Physics, University of Athens, Athens, Greece
e-mails: efstathiou@avgouleaschool.gr, chtzanis@phys.uoa.gr (corresponding author), covar@phys.uoa.gr, despo@phys.uoa.gr

A b s t r a c t

The main aim of this study is to investigate whether the main components of the photochemical smog episodes over megacities obey the Gaussian distribution or do they follow the distribution of the Gutenberg–Richter law. To this end, a case study has been implemented for Athens, Greece, which is among the most densely populated capitals in the middle latitudes of the Northern Hemisphere. The data employed are hourly mean values of surface ozone and nitrogen dioxide concentrations collected by the National Air Pollution Monitoring Network during the period 1988-2008. The results obtained show that the surface ozone and nitrogen dioxide concentrations obey the Gutenberg–Richter law, while their extreme values follow the Generalized Pareto distribution. This finding is important for current efforts to reliably forecast the air pollutants concentrations and to quantify their contribution to climate change. Finally, the plausible mechanisms involved in air pollution dynamics leading to the above-mentioned behaviour are also discussed, assuming the air pollution system governed by non-linear processes.

Key words: air pollution, Gutenberg–Richter law, Generalized Pareto distribution.