



Impact of growing urbanization on air quality and climate in the East Mediterranean - An overview of the first results from the CITYZEN project

Maria Kanakidou (1) and the CITYZEN East Mediterranean Team

(1) Maria Kanakidou, Nikos Mihalopoulos, Nikos Daskalakis, Ulas Im, Mustafa Kocak, University of Crete, Environmental Chemical Processes Laboratory, Department of Chemistry, Heraklion, Greece (mariak@chemistry.uoc.gr, +30-2810545001), (2) Evangelos Gerasopoulos, Institute of Environmental Research and Sustainable Development, National Observatory of Athens, Athens, Greece, (3) Nikos Hatzianastassiou, Physics Department, Ioannina University, Ioannina, Greece, (4) Mihalis Vrekoussis, Institute for Environmental Physics, Bremen University, Bremen, Germany; now at the Center of Climatology and Atmospheric Physics, Academy of Athens, Athens, Greece, (5) Alper Unal, Tayfun Kindap, Istanbul Technical University, Eurasia Institute of Earth Sciences, Istanbul, Turkey, (6) Mustafa Kocak, Nilgun Kubilay, Middle East Technical University, Institute of Marine Sciences, Erdemli-Mersin, Turkey, (7) Kostas Markakis, Anastasia Poupkou, Laboratory of Atmospheric Physics, Physics Department, Aristotle University of Thessaloniki, Thessaloniki, Greece, (8) Ahmed Fahmy Youssef, Hani Moubasher, Center for Environmental Hazard Mitigation, Cairo University, Cairo, Egypt

The Mediterranean, and particularly its east basin, is a crossroad of air masses coming from Europe, Asia and Africa. Over this area, anthropogenic emissions, mainly from Europe, Balkans and the Black Sea, meet with natural emissions from Saharan dust, vegetation and the sea, as well as from biomass burning, in overall presenting a strong seasonal pattern. As a consequence of its unique location and emissions, the Mediterranean region is climatically very sensitive and often exposed to multiple stresses, such as a simultaneous water shortage and elevated air pollution exposure.

The east basin of the Mediterranean and the surrounding regions, include significant megacities such as Istanbul and Cairo, but also several large urban centers like to its north part Athens and Thessaloniki; to the east Izmir and Adana, Amman, Beirut, Damascus and to the south Alexandria. The region covers from rural to maritime and desert conditions.

During the last decades, the East Mediterranean, following the general trend, has experienced a rapid growth in urbanization, including enhanced vehicle circulation, and in industrialization, all impacting pollutant emissions in the atmosphere. Air pollution is one of the challenging environmental problems in Istanbul and Cairo megacities but also for the whole East Mediterranean region. Ozone and aerosol air quality limits are often exceeded over the entire Mediterranean, in particular during summer. High ozone and aerosol concentrations are harmful for human health and ecosystems, and they can also be responsible for agricultural crop loss and climate change. The contribution of various sources to these exceedances remains to be determined. In addition the importance of interactions between natural and anthropogenic emissions in the area has to be evaluated.

For this purpose, in the frame of the CityZEN EU funded project, available records of air pollution levels over the past decades have been compiled and analysed for Istanbul and Cairo megacities and Athens highly populated extended area as emitter regions and for the Finokalia remote location on the island of Crete as a receptor site in the East Mediterranean. These data have been complemented by satellite observations of trace gases and aerosol optical depths over the region and by chemistry-transport model results. The interannual and seasonal variability of the air pollutants are analysed in conjunction with emissions and meteorology changes. The first analysis of these results is presented and their environmental significance is discussed.