

Monitoring air pollution and climate change in the Eastern Mediterranean Middle East (EMME) region: Challenges and opportunities

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Abstract

Almost 400 million people live in the Eastern Mediterranean Middle East (EMME); a region where climate change is already evident (the number of extremely hot days has doubled in the region since 1970). In the near future, this region could become so hot that human habitability is compromised. The goal of limiting global warming to less than 2 °C, agreed at the 2015 Conference of Parties (COP21) of the United Nations Framework Convention on Climate Change in Paris will not be sufficient to prevent this scenario. In combination with increasing air pollution and windblown desert dust, the environmental conditions could become intolerable and may force people to migrate. The lack of constraints by accurate in-situ atmospheric data of key climate forcers has been identified as a major limitation for the validation/performance of climate models over the EMME. This may have a strong impact in the design of efficient regional/national Climate Change Mitigation and Adaptation strategies, which are usually fed by high-resolution regional climate projections. In this context, the rapid implementation of a regional atmospheric network with high quality data following international standards appears as a high priority for the entire EMME region. With the support of the ACTRIS pan-European Research Infrastructure, the Cyprus Institute is currently putting unprecedented efforts to establish the first ever long-term observations of climate forcers (greenhouse gases, aerosols, clouds, reactive gases) in the EMME region. This infrastructure gathers a ground-based supersite and a fleet of Unmanned Aerial Vehicles equipped with miniaturized sensors to scrutinize the vertical distribution of air pollutants in the first 5 km of the atmosphere. This infrastructure is seen as the first step towards a regional coordinated atmospheric network that is still missing in the Middle East. Goal: A population of about 400 million is affected by dust storms, dryness, heat extremes and unparalleled air pollution in the "EMME" – Eastern Mediterranean and Middle East region, with severe environmental, health and socio-economic effects. Identified as a global Climate Change "hot spot", EMME is facing adverse impacts ranging from extreme weather events to poor air quality, with increasing intensity in the coming decades. "EMME-CARE" provides scientific,

technological and policy solutions through the establishment of a world-class Research and Innovation Centre of Excellence, focusing on environmental challenges. To address these, the existing Atmosphere and Climate Division of the Cyprus Institute will be upgraded, its partnerships with world-renown institutes will be strengthened, and its status and contribution in regional/global networks of the field will be enhanced. With competitive Horizon 2020 funding, as well as national own resources, EMME-CARE will implement a combination of Research, Education, and Innovation activities, which will involve laboratory studies, instrument development, continuous comprehensive atmospheric observations, field experiments and computer modelling of the regional climate and chemical composition of the atmosphere. The programme focuses on the atmospheric environment (greenhouse gases, the water cycle, extreme weather, atmospheric dust and air pollution) and will address climate change and air pollution impacts. EMME-CARE fully utilizes the strategically enabling geopolitical location of Cyprus to create and foster a gateway between Europe and the Middle East. By building on a critical mass of top scientists and engineers, promoting innovation via regular staff exchanges, networking regionally (Middle East) and globally, transferring knowledge and technology, and by supporting entrepreneurship and spinoffs, EMME-CARE will address challenges by furthering scientific leadership and excellence.

This work is partly presented at 3rd World Congress on Climate Change and Global Warming