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European air quality simulations in the context of IMPACT2C, focus on aerosol concentrations

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In the context of the IMPACT2C project, one of the objectives is to estimate the pan-European impacts of a global 2°C increase in temperature on human health, including change in air pollution.
Climate change will affect atmospheric dispersion, biogenic and fire emissions, chemistry , and the frequency of extreme weather situations such as heat waves. These changes will have an impact on air quality with subsequent health consequences that must be evaluated.
In order to evaluate how climate change will potentially affect the efficiency of emission abatement policies and how this will potentially affect health, several simulations have been conducted using different chemistry-transport models (CTMs): CHIMERE (IPSL), EMEP MSC-W (MET.NO), MATCH (SMHI), and MOCAGE (Météo-France). The use of four CTMs provide an estimate of the uncertainty in projections with the spread between models and driving meteorological data.
To compare with future climate, the first step is to perform air quality simulations for the current climate: HINDCAST (CTMs forced by reanalysis boundary forcing ERA-Interim) and HISTORICAL (global climate model boundary forcings). The comparisons between HINDCAST and HISTORICAL simulations allow to evaluate how global climate models modify climate hindcasts by boundary conditions inputs. In this study, we focus on particulate matter (PM10 and PM2.5) and its chemical composition. We first analyze whether the chemical composition of PM is affected by the use of climate models. We then investigate the contributions of the changes in meteorological parameters (frequency of precipitation, 2-m temperature, etc) as well as emissions and depositions processes on surface PM.
These results are the basis for analyzing future 2 degree warming climates. Under the RCP4.5 scenario, simulations have been performed in order to calculate the effect of climate change on emission reduction scenarios, the “climate penalty”, as well as the effect of emission mitigation.