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Abstract title: Assessing aviation pollutant emissions under future high-temperature extreme events at the airport scale

Abstract text (max 300 words):

Aviation emissions have an impact on the climate system, with a net warming effect, and contribute to climate change. The main goal of this study is to evaluate, in turn, the potential impact of climate change on aviation emissions. In particular, the amount of Nitrogen Oxides (NO_x) emitted per kg of fuel burnt by the aircraft engine is expected to increase under warmer ambient temperatures.

In this study, the effect on NO_x emissions of the evolution of the magnitude of high-temperature extremes (*TX*) is assessed for a list of major airports selected in the Euro-Mediterranean *hot-spot* region. Observations and future climate projections performed with both Regional and Global Climate Models (RCMs and GCMs) are used to estimate the changes in the magnitude of *TX* events through the periods 1961-1990, 1991-2020, 2021-2050 and 2041-2070 under the most severe climate change scenario RCP8.5, from the previous CMIP Phase 5. Climate data are used as input ambient conditions to the Gasturb software for engine performances computation. Gasturb allows the estimation of NO_x emission intensity during *TX* events.

Results show an increase in the levels of NO_x emissions of between +0.5% and +2.7% by 1991-2020, relative to the reference period 1961-1990. By 2021-2050, a relative increase of between +2.2% and +3.9% is found at the airports, across the RCM and GCM Multi-Model Ensemble means, and of between +3.3% and +5.9% by 2041-2070.

Absolute NO_x emissions from aviation could be substantially magnified during *TX* events in the future due to the higher emission intensity found here, considered along with the increased fuel consumption resulting from reduced aircraft and engine performances under warmer conditions, plus the expected growth in air traffic. This would lead to further warming of the climate system and a worsening of air quality at the airports and their surroundings, threatening human health.