International Master 2 Atmospheric Sciences: Research Training 2021-2022

Laboratory: CERI EE

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Collaborator:
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CaPPA Work Package: WP2. Aerosol microphysical, chemical and optical properties from fundamental heterogeneous processes to remote sensing

Investigating the emissions and chemical reactivity of asphalt concrete towards key atmospheric species of different chemical families.

Air pollution is one of the major issues that concern our society nowadays. The intensive human activities related to industrial production, fossil fuel burning for transportation, and heating produce a variety of primary and secondary pollutants that degraded the air quality. Air quality degradation is getting more and more important in large cities (i.e. urban environments) where pollutant concentrations often exceed the limits settled by environmental protection agencies.

The objective of this master is to identify and quantify the emissions of asphalt concretes used for the construction of roads in urban sites, under simulated atmospheric conditions. The speciated emissions from asphalt concrete surfaces will be estimated in micro and macro scale, employing temperature-regulated atmospheric simulation chambers that can mimic the real conditions existing in the atmosphere (i.e. temperature, humidity, sunlight). In addition, the impact of atmospheric oxidants (i.e. O_3, NOx, etc.) on asphalt concrete emissions, as well as the possible formation of SOA, will be investigated. State of the art instrumentation (GC-FID/MS, PTR-MS, SIFT-MS, HPLC, NOx, and ozone analyzers) will be used to characterize the volatile and semi-volatile organic fractions of asphalt concrete emissions. The anticipated sound results will be provided to collaborators and be implemented in chemical transport models aiming to evaluate whether asphalt concrete can be an important source of organic compounds in the atmosphere and what could be the consecutive impacts on air quality of urban cities in the context of climate change.

The successful candidate should have a strong background in heterogeneous phenomena (physisorption/chemisorption) as well as in infrared spectroscopy and mass spectrometry. Good computer skills and knowledge of data treatment software (Excel, Origin Pro) will be required.

Key words: heterogeneous reactivity, asphalt concrete, pollutants fate, NOx, O3, VOCs;