MACSECH project

Megacity Aerosol Composition by Satellite: A tool to study anthropogenic Emissions, Climate change and human Health

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Anthropogenic aerosol emissions from growing urban agglomerations contribute to air pollution with impacts on climate change and on human health. The composition of aerosols over megacities is partly unknown, although important to accurately understand and prevent these impacts.

Satellite-based remote sensing provides a unique opportunity to spatially monitor the atmospheric composition in the lowermost troposphere. We propose to analyze complementary information on gases and aerosols in order to provide estimates of aerosol concentration at the surface with their composition, specifically over megacity regions. Current aerosol concentration and chemical composition will be assessed by combining:

1) Local snapshots of aerosol concentration and composition at high spatio-temporal resolution from aircraft campaigns,

2) Global retrievals of aerosol optical properties from satellite measurements, and

3) Numerical atmospheric simulations.

This project focuses on three regions (with different emission regulations) where scientific aircraft campaigns (EMeRGe and DACCIWA) have been carried out, namely Europe (strict regulation), East Asia (regulation implementation in progress) and West Africa (no regulation). Based on modelling sensitivity studies, we will evaluate the benefits of emission reduction strategies on human health and anthropogenic climate change.

Applied to future regulations, our methodology will provide a comprehensive analysis to advise policymakers on sustainable choices.