Geophysical Research Abstracts
Vol. 18, EGU2016-8859-1, 2016
EGU General Assembly 2016

Relationship between meteorological phenomena and air pollution in an urbanized and industrialized coastal area in northern France

Cyril Gengembre (1), Shouwen Zhang (2), Elsa Dieudonné (1), Anton Sokolov (1), Patrick Augustin (1), Véronique Riffault (2), Sébastien Dusanter (2), Marc Fourmentin (1), and Hervé Delbarre (1)

(1) Laboratoire de Physico-Chimie de l'Atmosphère (LPCA), Université du Littoral Côte d'Opale (ULCO), Dunkirk, France, (2) Sciences de l'Atmosphère et Génie de l'Environnement (SAGE), Mines Douai, Douai, France

Impacts of global climate evolution are quite uncertain at regional and local scales, especially on air pollution. Air quality is associated with local atmospheric dynamics at a time scale shorter than a few weeks, while the climate change time scale is on the order of fifty years. To infer consequences of climate evolution on air pollution, it is necessary to fill the gap between these different scales. Another challenge is to understand the effect of global warming on the frequency of meteorological phenomena that influence air pollution. In this work, we classified meteorological events related to air pollution during a one-year long field campaign in Dunkirk (northern France).

Owing to its coastal location under urban and industrial exposures, the Dunkirk agglomeration is an interesting area for studying gaseous and aerosols pollutants and their relationship with weather events such as sea breezes, fogs, storms and fronts. The air quality in the northern region of France is also greatly influenced by highly populated and industrialized cities along the coast of the North Sea, and by London and Paris agglomerations. During a field campaign, we used simultaneously a three-dimensional sonic anemometer and a weather station network, along with a scanning Doppler Lidar system to analyse the vertical structure of the atmosphere. An Aerosol Chemical Speciation Monitor enabled investigating the PM1 behaviour during the studied events. Air contaminants such as NO_x (NO and NO_2) were also measured by the regional pollution monitoring network ATMO Nord Pas-de-Calais.

The events were identified by finding specific criteria from meteorological and turbulent parameters. Over a hundred cases of sea breezes, fog periods, stormy days and atmospheric front passages were investigated. Variations of turbulent parameters (vertical sensible heat flux and momentum flux) give estimations on the transport and the dispersal of pollutants. As the fluxes are weak during fogs, an increase of PM1 concentrations was observed, which causes a deposition of the particles. Due to turbulence and horizontal dilution, PM1 concentrations were weak during storms.