TITLE OF THESIS : ***« Characterization of aerosols and their sources in East Mediterranean sites under industrial influence.»***

ABSTRACT :

The main objectives of this work were to study the chemical composition and the temporal variability in the urban atmosphere of two East Mediterranean sites under industrial influence. This study was focused on the chemical characterization of $PM_{2.5}$ and volatile organic compounds (VOCs), the identification of $PM_{2.5}$ sources and the evaluation of the health risk associated with the exposure to these pollutants. Fine particulate matter and VOCs were collected between December 2018 and October 2019 in two sites in Lebanon. The Zouk Mikael site encompasses the biggest power plant in the region which runs on heavy fuel oil and the Fiaa site, in Chekka region, is under the influence of the cement plants and their corresponding quarries. The chemical composition of the collected $PM_{2.5}$ was determined through the quantification of the carbonaceous and organic fractions, water-soluble ions, and major and trace elements. The organic characterization included primary (alkanes, polycyclic aromatic hydrocarbons, phthalates, hopanes, and fatty acids) and secondary organic aerosols (oxidation products of α-pinene, isoprene, and β-caryophyllene and dicarboxylic acids). Additionally, different tools were employed in order to have a preliminary idea of the most relevant sources. In order to identify the $PM_{2.5}$ sources and quantify their contributions to $PM_{2.5}$ concentrations, the source-receptor model Positive Matrix Factorization (PMF) was used. The identification of the sources was based on the available chemical profiles in the literature but also from the chemical characterization of $PM_{2.5}$ samples collected at near field for local sources with physico-chemical characteristics specific to the Eastern Mediterranean Basin. Finally, the health risk evaluation due to the exposure to $PM_{2.5}$ was presented by two different approaches: the evaluation of the health risk for different classes of compounds of $PM_{2.5}$ and VOCs and the measure of the oxidative potential using two acellular assays (ascorbic acid and dithiothreitol assays). Finally, the attribution of intrinsic oxidative potential values for the sources was evaluated by multiple linear regression in order to link the contribution of the sources to the observed values of the oxidative potential.