Deterioration of air quality in urban agglomerations is a growing problem of global significance. World Health Organization (WHO) reported in 2018 that over 90% of urban population worldwide inhales the air which exceed the WHOs limits set for air pollutants. What's more, indoor and outdoor air pollution is the second leading cause of deaths from so-called non-communicable diseases worldwide. For example, it is responsible for approximately 26% of deaths from ischaemic heart disease.

In 2017 European Environment Agency singled Poland as one of the countries in Europe with most severe air pollution. It is estimated that only in 2012 there was 26 thousand additional deaths in Poland caused by air pollution.

Krakow is among the most polluted urban centres in Poland. High levels of PM (particulate matter) in Krakow's atmosphere are caused by several factors which often act in combination: (i) strong anthropogenic sources of PM within the city limits, (ii) prevalence of surface emission sources (burning of fossil fuels in individual households, rapidly growing car traffic with significant fraction of old car fleet, (iii) specific location of the city in the depression surrounded by hills, which limits its natural ventilation, (iv) possible impact of large urbanized and industrialized region (Upper Silesia) located ca. 100 km west of Krakow (import of polluted air).

Current state of air pollution in the world and in Poland spurs researchers towards better understanding of parameters controlling air quality in urban environment, such as different sources of particulate matter and gaseous contaminants, spatial and temporal variability of their emissions and impact of the dynamics of urban atmosphere on the observed load of atmospheric aerosols.

This project is focused on comprehensive characterization of carbonaceous fraction (CA) in particulate matter present (PM) in the atmosphere of Krakow. The proposed research will comprise chemical (elemental carbon, organic carbon, polycyclic aromatic hydrocarbons, sugars) and isotope ($^{13}C/^{12}C$ and $^{14}C/^{12}C$ ratios) analyses of carbon reservoir in PM. State-of-the-art analytical methods will be used to perform this characterization.

Chemical and isotope characterization of carbonaceous aerosols, supplemented by additional chemical analyses of PM1 and PM10 fraction and dedicated modelling, should result in identification of major sources of CA in Krakow agglomeration and quantification of their seasonal variability.