



## **Characterization of air pollution in Kagithane creek valley (Golden Horn) of Istanbul, Turkey: Temporal variations, air quality standard exceedances and dependence on meteorological conditions**

Hafize Melike Celebi (1), Ali Deniz (1), Huseyin Toros (1), Abdullah Kahraman (1), Ismail Sezen (1), Ali Ozturk (2), and Selahattin Incecik (1)

(1) Istanbul Technical University, Faculty of Aeronautics and Astronautics, Department of Meteorology, 34469, Maslak, Istanbul, Turkey (melikecel@gmail.com), (2) Istanbul Technical University, Faculty of Chemical and Metallurgical, Chemical Engineering, 34469, Maslak, Istanbul, Turkey

Traffic related emissions and their dispersion in street canyon environments have been extensively studied with monitoring and modeling tools. However, few studies have systematically investigated the influence of pollution levels at valley areas. In this study, we present an analysis of air pollution in Kagithane valley which is the source part of the Golden Horn and forming the natural harbor that has sheltered (The Golden Horn waterway, named in antiquity because of its shape is an estuary that receives water from Kagithane and Alibeykoy creeks). The Kagithane creek region is one of the most polluted locations in Istanbul due to its topographical form and pollutant sources in the region. In spite of the risks to human health, relatively little is known about the levels of air pollutants in the region. The emission characteristics of airborne PM<sub>10</sub> and traffic based pollutants in the study area are very complicated. It is a creek coastal area surrounded by a dense residential area. The population of the Kagithane region is about 414,000 according to 2009 figures. About 24% of the total residents use coal as domestic heating. Indeed, due to approximately more than 50 small multifarious factories emitting pollutants into the atmosphere in the area. Industrial sources lie along the valley and diesel powered motor vehicles are also major traffic sources in this location.

About 60% of these vehicles are operated by gasoline and 40% by diesel. PM<sub>10</sub> emissions on the Kagithane road traffic are originated from diesel vehicles rather than the gasoline. The most of the heavy vehicles in the region are trucks, construction sector vehicles which use diesel fuel are powered by old technology. These vehicles are higher emitters of particulate matter in this location. Diesel PM emissions have been recognized as one of the potential carcinogens.

The aims of this work are to identify and quantify the air pollution levels in the Kagithane creek valley. For this purpose, an air automatic air quality station has been established in Kagithane of Golden Horn and PM<sub>10</sub>, SO<sub>2</sub>, NO, NO<sub>2</sub>, CO and O<sub>3</sub> have been measured since March 2010. As a result of a unique mix of pollution-emission activities, a comparative study of PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub>, CO, and O<sub>3</sub> in nearby urban areas, combined with meteorology dominated by irregular topographic effects, which may in boundary-layer depth.

For this purpose, assessments of the diurnal variation in addition to day of the week variations of the pollutant concentrations are presented. Exceedances of the air quality limits are examined for each pollutant concentrations. The characteristics of air pollution in the nearby area, Alibeykoy station were compared with the street-canyon air quality station data. PM<sub>10</sub> levels in this area were found extremely higher than the EU-legislated air quality standard for PM<sub>10</sub> throughout the 9 months (15 March – 31 December 2010). PM<sub>10</sub> concentration averages greatly exceeded the EU's daily ambient air quality standard. The PM<sub>10</sub> violations are strongly associated with the local sources of PM<sub>10</sub>. Local sources (traffic, industry, central heating in winter) exhibit a seasonal pattern with maxima during winter months and minima during summer months. Many people who live in the Kagithane region might be exposed to a much higher PM<sub>10</sub> level. The valley topography in the region might be also cause the accumulation of the concentrations. Higher concentrations of PM<sub>10</sub> have also been found on weekdays, specifically on Monday and Friday than at Sunday. Sunday PM<sub>10</sub> values are always lower than average weekday values.

Keywords: PM<sub>10</sub>, emission, traffic, Kagithane, Istanbul.

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