Mapping Air Pollution Using Magnetometery on Tree Leaves in Tehran Metropolitan, Iran

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Extended Abstract

Introduction

Air pollution is one of the major anthropogenic related productions which has had direct or indirect impact on environment during past recent century. Tehran metropolitan is one of the polluted cities in the world, in such way that in 2010, 120 days out of 365 days, were much polluted with one or several polluted elements. The major aim of this work is to map air pollution of Tehran metropolitan using new technique and method of magnetometry of tree leaves. Application of magnetic measurement is known as a new advanced method in investigation of the magnetic mineral emitted in to the air in industrial area.In recent years magnetic measurements have been increasingly used as a proxy for the heavy metal content in soils and sediments influenced by industrial emissions. Also, Magnetic particles are found almost invariably amongst atmospheric particulate pollutants. But sometimes it is difficult to

judge if the measured distribution really reflects the present situation or if it is a product of past industrial activities. Therefore, we tested,to what extent, magnetic measurements of tree leaf samples can give information on the current spread of magnetic dusts. In fact, this project examines the capability of Tehran air pollution to produce some pollutant elements applying magnetic parameters leaves in urban green space. These elements deposited by vehicles and plants. Tree leaves with large surface areas can accumulate efficiently urban dust on their surfaces. This dust is partially washed out during rain precipitation, and therefore, monitoring pollution through the magnetic properties of tree leaves provides time-averaged results, which are more useful when studying regular patterns of urban pollution, than the direct measurement of air pollutants in a short period. Due to their widespread distribution, tree leaves allow for the construction of sampling grids of different scales (e.g., from streets to entire urban areas), with a high density of sampling points and with a spatial resolution which is hard to achieve with monitoring stations.

Methodology

Sampling was carried out during a fifteen-day period in September. As far as possible the sampling points were evenly distributed over the area in and around of the Tehran city.Sampling points were chosen with the help of the urban administration of Tehran city. We collected more than 1000 leave samples from 3 species namely Morusalba, Fraxinus excelsior and Pinuseldarica from 22 sectors at Tehran metropolitan.Whenever possible, sampling was confined to branches, facing road, at a height of 1-1.5 m above ground. Samples were put in pocket-sized sealable plastic bags, and then were refrigerated at 5°C before being returned to the, environmental and paleomagnetic laboratory, based at Geological Survey of Iran for magnetic analysis. Specimen preparation includes drying at open air, powdering before measuring them in the laboratory. Then the samples were place in 6 cm^3 plastic boxes, specifically designed for sampling of paleomagnetic specimens.Each sample was weighted before the measurements in order to normalize the magnetic susceptibility values relative to the leaf mass (χ, m^3 Kg^{-1}). Magnetic susceptibility was measured using an AGICO Kappabridge MFK-1 instrument. Then susceptibility data used to map air pollution with the help of GIS software. The one way ANVOA was performance for the variability of magnetic susceptibility in three different species at 22 sectors of Tehran city.

Results and Discussion

The Magnetometery measurement results of the polluted air showed that sectors 9, 11, 12, 14 and15 in Tehran city have highest pollution. Then these results compared with the result of Co content and major wind direction of Tehran metropolitan. All of these researches had same results and confirmed that sectors located in south and south-west of Tehran city have the highest pollution. These sectors have higher population per area so there is high traffic of vehicles in these regions. The magnetometry results show the maximum absorption of pollution by Morusalba.

Conclusion

The results indicate that a magnetic survey of tree leaves, which is relatively rapid and inexpensive, may be used in addition to the classical air quality monitoring systems to identify and delineate high-polluted areas in urban environments. Compared with other analytical methods, magnetic minerals provide a compositional tool, which is reliable, rapid, non-destructive, inexpensive and sensitive to low detection levels.

Keywords: Susceptibility, Tree Leaves, Air Pollution, Tehran.