

Preliminary environmental magnetic results of roadside pollution derived by passing vehicles at the Royal Botanical Garden of Madrid, Spain

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Biomagnetic monitoring methods have been shown to be useful for investigating roadside pollution. Previous studies have reported a positive correlation between: a) the amount of magnetic minerals and heavy metal concentration; and, b) the distance from a road and amount of magnetic minerals. However, most magnetic investigations on such spatial distributions of roadside pollution have focused on relatively close to the roadside (<10-20 m) or comparison between urban or industrial area and its surrounding area. The effective distance of biomagnetic method is not clear. Here environmental magnetic studies are reported for the Royal Botanical Garden of Madrid, Spain that is located in the city centre with heavy traffic. *Viburnum tinus* is planted as perpendicular to the main road and made a straight pass in the garden as it is used as plant fences. The materials deposited on the top of the *Viburnum tinus* are wiped off and analyzed their rock magnetic properties between 38 m and 162 m from the roadside. Room temperature magnetic measurements and low temperature experiments indicate that the main magnetic mineral is pseudosingle-domain maghemite. Since the magnetic mineralogy on leaves' surface is likely consistent throughout the survey line, the saturation IRM (SIRM) intensity can be used as a proxy of the relative amounts of magnetic minerals. The observed SIRM intensities gradually decrease between 38 m and 86 m from the roadside, suggesting that the environmental magnetic applications to the materials deposited on tree leaves could be effective to study the spatial distribution of roadside air pollution up to ~85 m from the roadside.

Keywords: Environmental magnetism, *Viburnum tinus*, Urban roadside pollution, Spain