

Environmental magnetic studies of roadside pollution: Identification of spatial distributions of vehicle-derived material at Mt. Hakusan, Japan.

\*Kazuo Kawasaki<sup>1</sup>, Yoshitake Furuya<sup>2</sup>, Keisuke Fukushi<sup>3</sup>, Hideo Sakai<sup>1</sup>

1. Graduate School of Science and Engineering for Research, University of Toyama, 2. Department of Earth Sciences, Faculty of Science, University of Toyama, 3. Institute of Nature and Environmental Technology, Kanazawa University

Environmental magnetic techniques have been shown to be useful for investigating roadside pollution. Previous studies have reported a positive correlation between: a) magnetic susceptibility and heavy metal concentration; and, b) the distance from a road and magnetic susceptibility. However, few systematic magnetic investigations on the spatial distributions of such roadside pollution have been reported in Japan. This deficiency is due to: a) lots of volcanos that supply great amount of magnetically-enhanced fly ashes; and, b) the dense population that cause huge amounts of magnetic noise. The environmental magnetic studies are reported for the Mt. Hakusan National Park in Ishikawa and Gifu prefectures. The Mt. Hakusan is an active volcano and its most recent eruption occurred in 1659. In-field as well as in-laboratory magnetic susceptibility of top soils along the Hakusan Shirakawa-go White Road show that the higher magnetic susceptibility is observed on soils collected near the road. In addition, there is a positive correlation between mass susceptibility and heavy metal contents. Based on rock magnetic measurements, the major magnetic mineral in top soils is pseudosingle- to multi-domain magnetite. The Day plot and crossover plot analyses indicate additional inputs of multi-domain magnetite to the top soils near the roadside. Furthermore, the rock magnetic and geochemical analyses of Japanese cedar tree barks show a positive correlation between saturation isothermal remanent magnetization intensity and Zn concentration and estimate the spatial distribution of single-domain magnetite derived from passing vehicles. The results show that detailed environmental magnetic analyses of top soils and tree barks are effective methods to monitor spatial distribution of pollution associated with vehicle traffic even in an active volcanic region.

Keywords: Environmental magnetism, Roadside soil and tree bark contamination, Active volcano, Japan