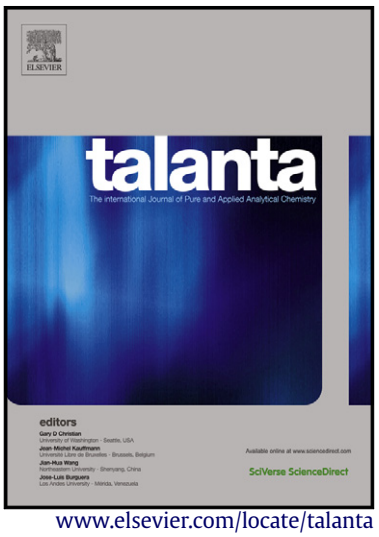

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Validation of a continuous flow method for the determination of soluble iron in atmospheric dust and volcanic ash

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Abstract

Iron is an essential micronutrient for phytoplankton growth and is supplied to the remote areas of the ocean mainly through atmospheric dust/ash. The amount of soluble Fe in dust/ash is a major source of uncertainty in modeling-Fe dissolution and deposition to the surface ocean. Currently in the literature, there exist almost as many different methods to estimate fractional solubility as researchers in the field, making it difficult to compare results between research groups. Also, an important constraint to evaluate Fe solubility in atmospheric dust is the limited mass of sample which is usually only available in micrograms to milligrams amounts. A continuous flow (CF) method that can be run with low mass of sediments (<10 mg) was tested against a standard method which require about 1 g of sediments (BCR of the European Union). For validation of the CF experiment, we run both methods using South American surface sediment and deposited volcanic ash. Both materials tested are easy eroded by wind and are representative of atmospheric dust/ash exported from this region. The uncertainty of the CF method was obtained from seven replicates of one surface sediment sample, and shows very good reproducibility. The replication was conducted on different days in a span of two years and ranged between 8–22% (*i.e.,* the uncertainty for the standard method was 6-19%). Compared to other standardized methods, the CF method allows studies of dissolution kinetic of metals and consumes less reagents and time (<3 hours). The method validated here is suggested to be used as a standardized method for Fe solubility studies on dust/ash.

Keywords: Iron solubility; Continuous flow; Standardization; Dust, Volcanic Ash; Iron Fertilization.

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