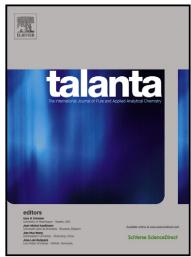
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Validation of a continuous flow method for the determination of soluble iron in atmospheric

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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