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Editorial: Advances in metals and trace elements isotopes measurements, experiments and application in environmental sciences

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Editorial on the Research Topic
Advances in metals and trace elements isotopes measurements, experiments and application in environmental sciences

The isotopic composition of trace metals and elements can be used to characterize their sources of emission and to trace the physicochemical or biological processes that these elements undergo. Precise measurements of trace metals and their isotopic compositions are pre-required for such research issues. Regarding the processes leading to fractionation between isotopes and thereby to a modification of the isotopic composition, the main mechanisms of isotopic fractionations result from physicochemical reactions such as redox transformations, the dissolution or precipitation of minerals and/or neoformed phases (eg. oxy-hydroxides). Added to this are the effects associated with living organisms that, for their development, can integrate metals into their metabolism and be also the cause of strong isotopic fractionations. The development of multi-collector inductively coupled plasma instruments (MC-ICP-MS) has made it possible to accurately and repeatably measure the isotopic composition of trace metals and elements whose (small) variations in isotopic abundance obey the laws of mass dependent fractionation. In addition, few non-traditional elements, such as Hg, have been identified to exhibit specific isotopic fractionation that do not follow such basic rules (i.e. mass independent isotopic fractionation).

This Research Topic aimed to promote specific studies on stable and meta-stable isotopes of metals and trace elements that have been recently developed and integrated into environmental sciences and pollution research. Isotopic composition of trace metals

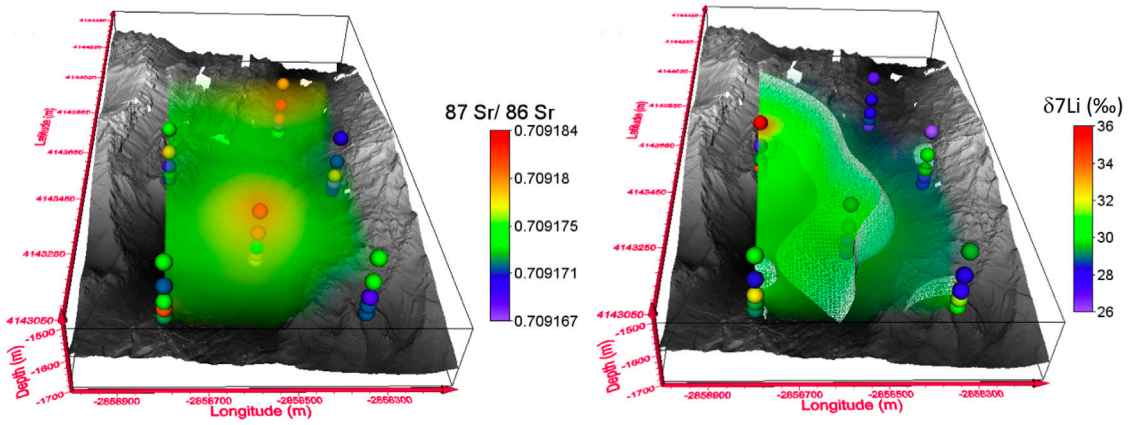


FIGURE 1
Simultaneous investigation of Sr radiogenic isotopic ratios and Li stable isotopic composition in deep-sea layers affected by hydrothermal inputs (adapted from (Artigue et al.)).

and elements requires methodological development in order to be applicable to various environments from pristine to more polluted areas. In addition, the isotopic information should provide unique insight into both their environmental sources and their physico-chemical or biological pathways. Altogether, isotopic composition combined with speciation of trace elements and metals are important information that could be used to investigate their pathways and impact.

The scope of this Research Topic, was thus to address specific investigations related, to both trace elements and metals method developments and to the study of their potential applications in environmental and pollution sciences. This special issue covered a wide range of isotope systems, from non-traditional stable isotopes (Lacan et al.; Artigue et al.; Pinzone et al.) to radiogenic systems (Yamakawa et al.; Artigue et al.; Pham et al.). It includes papers showing fine analytical developments for isotopic measurements and for validation with reference materials (Lacan et al.; Yamakawa et al.). One study unravels the trophic transfer and impact of metabolic processes on Hg isotopes (Pinzone et al.). Another study demonstrates the possibility to use Li and Sr isotopes (Figure 1) to monitor in barely documented extreme environments the extent of deep hydrothermal plumes (Artigue et al.). Finally the coupling of Nd isotopes with hydrological tracers in Equatorial Pacific allows to highlight land-ocean interactions affecting specific water layers (Pham et al.). These original investigations open new avenues of research in environmental sciences combining stable and radiogenic isotopes of trace metals and elements.

Author contributions

DA and NV wrote the editorial text and select the figure.

Conflict of interest

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