Insights into Earth’s volatile origin from krypton and xenon isotopic and elemental analyses of meteorites and mantle-derived samples

Fact Sheet

Project Information

VolatileOrigin
Grant agreement ID: 101022657

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10.3030/101022657

Funded under
EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions

Start date
1 November 2021

End date
1 April 2024

Total cost
€ 203 149,44

EU contribution
€ 203 149,44

Coordinated by
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH

Switzerland

Project description

Earth's volatile origin revealed through krypton and xenon isotope analyses

The composition of the heavy noble gases krypton (Kr) and xenon (Xe) in the Earth's mantle is poorly understood; hence, Earth's volatile history remains largely unknown. The EU-funded VolatileOrigin project will precisely measure the Kr and Xe isotopes in mantle-derived samples, including mid-ocean ridge basalts and diamonds, and in
different types of meteorites. By determining the compositions of mid-ocean ridge and diamond samples, researchers will be able to characterise the extent of mantle Kr and Xe heterogeneities, introduced through progressive atmospheric noble gas recycling via subduction, and thus identify the source(s) of these volatiles in the mantle. Precise bulk meteorite data for the non-radiogenic Kr and Xe isotopes will increase understanding of the measured mantle compositions and fingerprint the volatile sources.

**Objective**

The presence of volatile elements such as carbon, nitrogen, water, noble gases, on terrestrial planets is a requirement for planet habitability, yet their origin is still highly debated. Noble gases are invaluable tracers of volatile sources due to their inertness, in particular their non-radiogenic isotopes have kept remnant signatures of planetary accretion. Krypton and xenon are mighty tools to distinguish between chondritic and solar volatile sources due to the distinct isotopic compositions of these end-members. However, the heavy noble gas (Kr, Xe) compositions of the Earth’s mantle is poorly determined. Hence, the Earth’s mantle volatile history remains largely unknown. The objectives of this project are to precisely measure the non-radiogenic Kr and Xe isotopes in mantle-derived samples, including mid-ocean ridge basalts and diamonds, and in meteorites of different types in order to better understand Earth’s volatile origin. Determining the compositions of mid-ocean ridge and diamond samples will allow to characterize the extent of mantle Kr and Xe heterogeneities, introduced through progressive atmospheric noble gas recycling via subduction, and, hence to identify the source(s) of these volatiles in the mantle. Precise bulk meteorite data for the non-radiogenic Kr and Xe isotopes are incomplete and will be crucial in our understanding of the measured mantle compositions to fingerprint the volatile sources. This project will use a novel protocol for the specific measurements of these isotopes in mantle-derived samples associated with noble gas mass spectrometry. The MSCA fellowship represents a unique opportunity for me to learn new analytical skills in cosmochemistry, to improve my soft skills and to secure my fruitful reintegration in Europe. I will transfer to the host lab my expertise of mantle geochemistry. On the whole, this project will strengthen my scientific independence, taking me closer to achieve an outstanding academic position in Europe.

**Fields of science**

natural sciences › chemical sciences › inorganic chemistry › noble gases  
natural sciences › physical sciences › astronomy › planetary sciences › meteorites  
natural sciences › physical sciences › astronomy › planetary sciences › planets  
natural sciences › earth and related environmental sciences › geochemistry › cosmochemistry  
natural sciences › chemical sciences › analytical chemistry › mass spectrometry
Programme(s)

H2020-EU.1.3. - EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions
H2020-EU.1.3.2. - Nurturing excellence by means of cross-border and cross-sector mobility

Topic(s)

MSCA-IF-2020 - Individual Fellowships

Call for proposal

H2020-MSCA-IF-2020

See other projects for this call

Funding Scheme

MSCA-IF-EF-RI - RI – Reintegration panel

Coordinator

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH

Net EU contribution

€ 203 149,44

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Region

Schweiz/Suisse/Svizzera > Zürich > Zürich

Activity type

Higher or Secondary Education Establishments

Links

Contact the organisation
Website
Participation in EU R&I programmes
HORIZON collaboration network

Other funding

€ 000