

Doctoral project: Age of the Moon and chronology of its differentiation

The giant impact that formed the Moon corresponds to the last major stage of terrestrial accretion. Although the model for the crystallization of the lunar magma ocean is relatively well constrained, the age of the Moon's formation is still widely debated, given the results obtained by various chronometers. We propose to reconstruct the chronology of differentiation and constrain the age of impact by associating measurements of several radiochronometers on lunar samples of varying origin and composition. The aim of this project is to 1) gain precision on the chronology of lunar differentiation; 2) provide a robust age for the Moon's formation; and 3) refine the giant impact model.

In this project, measurements on bulk rock samples and mineral separates to obtain internal isochronas as well as in-situ measurements, using different short- and long-lived radioactive isotope systems (Rb-Sr, La-Ce, Sm-Nd, Lu-Hf and U-Th-Pb) will be carried out by multi-collection thermal ionization (TIMS) and plasma source mass spectrometry (MC-ICPMS/MS). Samples from identified silicate reservoirs will be analyzed: anorthosites, Mg-suite samples, mare basalts, and KREEP basalts (enriched in K, rare earth elements and P). Samples returned from the Moon by the Apollo missions are already available. This study will be completed by the analysis of selected lunar meteorites.

This thesis has received 3 years of funding from the Graduate Track for Volcano in the Earth system research (InVolc) of Université Clermont Auvergne (UCA), which covers the salary and part of the running costs. This thesis will be conducted under the supervision of Dr. Maud Boyet and Dr. Marion Garçon at UCA (Laboratoire Magmas et Volcans, Clermont-Ferrand, France), and in collaboration with Dr. Audrey Bouvier at Universität Bayreuth (Bayerisches Geoinstitut, Bayreuth, Germany).

We seek a highly-motivated student who enjoys planetary science topics and can tackle challenging laboratory work, with a Masters degree in a subject related to the PhD project. Research experience in analytical geo- or cosmochemistry is advantageous.

For further information and questions, please contact Dr. Maud Boyet (maud.boyet@uca.fr)

Applications will be submitted online: <https://adum.fr/as/ed/proposition.pl?site=casf>

Applications include 1) a curriculum vitae, 2) a cover letter (2 pages maximum) describing your qualifications, experience and motivation for the project, 3) degree certificates and course grade transcripts. Please provide in your cover letter the names and contact of two referees.

The deadline for application is May 5th, 2024.

The starting date is October 1st, 2024.