BRAIN-be
Belgian Research Action through Interdisciplinary Networks

BAMM!

Belgian Antarctic Meteorites and Micrometeorites to document solar system

DURATION
15/01/2017 - 15/04/2021

BUDGET
389.815 €

PROJECT DESCRIPTION

Since 2009, joint Belgian-Japanese missions in Antarctica have recovered more than 1200 highly pristine meteorites and 2500 micrometeorites from the blue ice fields surrounding the Sør Rondane Mountains. This new Antarctic project aims to significantly extend the Belgian meteorite patrimony and stimulates meteorite curation and research at federal institutes and universities in Belgium, supported by the BELAM (2012-2016) and ADMUNDSEN (2016-2017) BELSPO projects. It builds on and expands the assembled expertise, and centers on a number of highly promising, but previously unexplored research opportunities provided by this valuable set of newly recovered extraterrestrial samples.

Meteorites constitute the most primitive objects in the solar system and represent the building blocks of the terrestrial planets. Their petrographic, chemical and isotopic study sheds light on the evolution of planetary materials in the early solar system and documents planetary differentiation processes. However, as (micro)meteorites represent highly fragile material, optimal preservation conditions are needed to provide a reliable understanding of their formational history. Antarctic (micro)meteorites constitute an enormous volume of extraterrestrial material that was preserved under excellent conditions thanks to a dry and cold climate. Using the meteorites and micrometeorites recently collected in the Sør Rondane Mountains of Antarctica, the following two complementary approaches further constrain our understanding of the formation and evolution of solar system materials:

(1) A detailed study of micrometeorites and their igneous textures to better document their parent body precursors (possibly not sampled by larger meteorites), quantify the continuum between unmelted and fully molten objects, and further constrain the effects of rapid melting, melt extraction and silicate-metal segregation on the petrological, chemical and isotopic characteristics of the precursor materials. One of the main focuses of this project is to fully characterize a peculiar group of micrometeorites that based on oxygen isotopes does not appear to be represented among macroscopic meteorites. In combination with more general characterization methods, in situ isotope analysis by LA-MC-ICP-MS (e.g., ε^{50}Ti) will identify and characterize this potentially new group of solar system parent bodies.

(2) A precise characterization of the isotope anomalies existing in bulk meteorite samples, and their counterparts in the constituent mineralogical phases measured by in situ mass spectrometry to better understand the presence and destruction of nucleosynthetic anomaly carrier phases during nebular and planetary processes.

Despite working on samples from different size fractions and aiming for essentially different goals, the two work packages converge by implementing state-of-the-art in situ isotopic analysis. The different partners will contribute their individual specialties, discuss and interpret the results together, and combine them into an integrated model. As coordinator, the Royal Belgian Institute of Natural sciences (RBINS) provides mineralogical expertise, while the partners from the ULB and the VUB contribute their expertise in isotope geochemistry. Efforts will also be made to disseminate the scientific results through conference presentations and international peer-reviewed journals. Considering the broad interest for extraterrestrial samples, our results will also be distributed to the general public and centers of education, using the broad outreach channels of the RBINS in particular.

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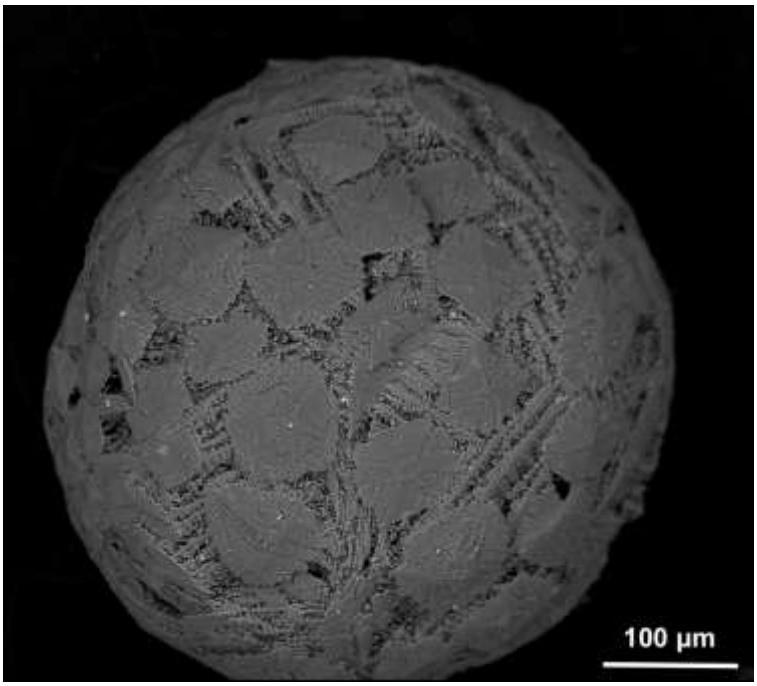
In addition, the BAMM! project further expands the Belgian Antarctic meteorite collection and encourages a reliable, long-term protective curation program of Antarctic meteorites at the RBINS, boosting at the same its position as a key Antarctic (micro)meteorite curation center in Europe.



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