Europlanet TNA Report

PROJECT LEADER

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COLLABORATORS

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Date of TNA visit:	May 17-21 2010
Host laboratory:	Centre de Recherches Pétrographiques et Géochimiques, Nancy, France

Project Title – Oxygen isotopes in the non-magmatic IIE iron meteorite Mont Dieu

- Report on the outcomes of the TNA visit (approx 1 page)

The goal of this study was to measure the oxygen isotopes in the silicate inclusions of the Mont Dieu meteorite. This meteorite has been classified as an IIE non-magmatic iron meteorite. Silicate inclusion major element contents have been shown having affinities with enstatite (E) chondrite, while traditionally, IIE non-magmatic iron meteorites are related to ordinary (H) chondrites. This is because E chondrites plot on the terrestrial fractionation line while H chondrites plot on a distinct higher fractionation line. The ion probe IMS1270 located at the CRPG-Nancy, is especially dedicated to in-situ analyses of light mass isotopes, such as oxygen. Despite the silicate inclusions are typically from mm- to cm-scale in Mont Dieu, the small beam size of 30 µm is particularly useful in our case, in order to detect and analyze the smallest silicate fragments trapped in the metallic matrix of the meteorite, possibly to recover isotope signature from both the initial asteroids and its impactor.

In order to achieve these measurements, 4 full days have been planned at the CRPG-Nancy, from 17 to 21 May 2010. Two others samples have been selected beside Mont Dieu, one IIE and one IIICD iron meteorites, in order to control the results and validate the reproducibility of our measurements. Two small (cm-size) metallic pieces of Mont Dieu have been selected for the small globules they presented and that were believed to be silicate parts.
The two first days have been dedicated to the preparation of samples: sawing small parts and mounting the fragments in a warm epoxy-resin. The next day, when the epoxy resin has

cooled and hardened, the samples have been polished in a number of stages using diamond-impregnated fluids and a rotating lap fitted to a polishing machine, until the required flatness was achieved.
The two next days were supposed to be dedicated to measuring the samples on the ion probe IMS1270, but unfortunately, technical problems arose and we only measured standards without being able to measure the samples. At that point, I had to come back in Belgium with no measurements, while someone at the CRPG would take care of my samples later.
After my visit, the ion probe manager decided to pass my samples on an electron microscope in order to identify the different mineralogy of the silicate inclusions in the 4 samples. There, she realized that the small globules in the pieces of Mont Dieu were not silicate but iron sulphur, hence impossible to measure for oxygen isotopes. The technician was then able to measure the two others meteorites, but not Mont Dieu. In addition, due to the presence of many different minerals (for which the standards are not developed), the $\delta^{18}O$ and $\delta^{17}O$ could not be corrected and only the $\Delta^{17}O$ was obtained. Considering the very busy schedule of the ion probe, it now seems difficult to envisage finally measuring Mont Dieu using this instrument. The large amount of material available for this meteorite has allowed us to use another more precise technique.
The results obtained on the two other samples are difficult to interpret, because of the large variation of $\Delta^{17}O$ between each mineral, but are currently discussed.

Please include:

- Publications arising/planned (include conference abstracts etc)

No publication is envisaged at that point, despite we are still willing to publish the data as soon as it will be possible.

- Host approval The host is required to approve the report agreeing it is an accurate account of the research performed.

This report has been read and approved by Christophe Cloquet, from the CRPG.