



EURO-CARES
A PLAN FOR EUROPEAN CURATION OF RETURNED
EXTRATERRESTRIAL MATERIALS



WORK PACKAGE 5
INTERIM REPORT ON ANALOGUE CHARACTERISTICS
NECESSARY FOR THE CURATORIAL FACILITY
(DELIVERABLE D5.1)

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D 5.1 Interim Report on analogue characteristics necessary for the curatorial facility

Motivation

The aim of the EURO-CARES project is to create a curation and analytical facility dedicated to extra-terrestrial samples brought to Earth from different bodies in the Solar System (Mars, planetary satellites, asteroids, the Moon), either by unmanned and/or by manned missions. These samples will require specific storage conditions and handling procedures. For practical reasons and sterility concerns it might be necessary for the curation and analytical facility to have its own collection of analogue samples.

Objectives

- to evaluate specific storage conditions and handling procedures during curation and analysis of extraterrestrial materials
- to identify analogue samples crucial for evaluating and defining the protocols necessary to accomplish safe and sustainable handling of extra-terrestrial materials.
- to create a list of different types of samples that would be required for a sample curation facility (analogues and standards)
- to create a preliminary list of analogue materials already available
- to complete these lists over the course of this project in response to the requirements established by the other work packages
- to include recommendations for the fabrication of new artificial analogues

WP5 Team Members:

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External Members: Katherine Joy, Martin Lee, Jesus Martinez Frias, Joe Michalski, Penny Wozniakiewicz

Scientific Activity

Our main activity during the first period of the project was a survey of the existing literature and the creation of a preliminary list based on input from the WP5 team members, of the kinds of samples necessary for a curation facility including geological samples (rocks and minerals), chemical sample (ices and organics), and technical samples as well as of the analogues characteristics necessary. This list was submitted as delivery D1.5. We presented results of our literature reviews and an updated list of "Analogues in a European Sample Curation Facility" at the EURO- CARES International Conference and Invited Workshop in August 2015. Lively exchange of ideas and input from other

working groups and external participants at that meeting enriched our existing list of preliminary requirements. In delivery D1.5 we had already covered aspects of the analogue characteristics necessary for the curatorial facility. For this reason as well as for logical reasons we moved delivery D5.1 to month 15 in order to incorporate results from the first workshop to be held in month 14 on the exact same topic.

Results of the workshop held in Orléans February 4-5, 2016

The participants of the WP5 workshop came to the conclusion that a selection of 8 rocks and 15 minerals would be sufficient for the purposes of the Curation Facility. These rocks and minerals were chosen because of their pertinence for:

- Composition/textural similarities with planetary materials;
- Relevance for sample handling, processing, training
- Contaminants

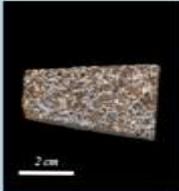
The selected rocks include: primitive basalt, OIB (Oceanic Island Basalt), anorthosite, dolerite, tuff, suevite (impact breccias), mudstone, sandstone.

The selected minerals include: jarosite, goethite, hematite, Ca-carbonate, Fe-carbonate, Mg-carbonate, gypsum, anhydrite, perchlorates, sulphides, Mg-smectites, illite, chlorite, silica (opal, quartz and tridymite), ices.

N.B. Generic dust/regolith to be made up of mixtures of powdered basalt and minerals as needed (with addition of H₂O ice for SPA Basin on the Moon).

Powdered (not only powdered, maybe also some with chondrules that will pop out and roll around) meteorite should also be considered to represent asteroidal material (N.B. rare therefore to be used only in specific cases).

For each rock and mineral listed above, a data sheet listing the characteristics is being drawn up, following the example shown in below. This work is ongoing and should be completed by the end of April.

 Basalt from Iceland		Reference: EuroCares-B1
Target Bodies: <input checked="" type="checkbox"/> Mars <input type="checkbox"/> Moon <input type="checkbox"/> Asteroids <input type="checkbox"/> Other()		Credits photo: ISAR (www.isar.cesr-cesr.ca.fr)
Context: <input type="checkbox"/> Igneous rocks <input type="checkbox"/> Volcanic rocks <input type="checkbox"/> Altered rocks		
Curation Facility Usage	<input type="checkbox"/> Testing/verifying curation equipment <input checked="" type="checkbox"/> Testing/verifying protocols <input checked="" type="checkbox"/> Testing/verifying processes <input checked="" type="checkbox"/> Witness samples <input type="checkbox"/> Standards for instrument(s) <input type="checkbox"/> Component of artificial analogue recipe	
Type of Analogue	<input checked="" type="checkbox"/> Rock <input type="checkbox"/> Mineral <input type="checkbox"/> Synthetic <input type="checkbox"/> Amorphous material	
General geological Description	Petrography: Altered silicified basalt Mineralogy (for rock sample): olivine Mineral type (for mineral sample): N.A. Chemistry: ICP-MS-AES data available.	
Physical Properties	Density: TBD Hardness/Compressive strength: TBD Porosity measurement: TBD Quantity: 12 g but easy to obtain Any other relevant physical properties data:	
Location	Europe/Iceland/Elborgir/Lambahraun GPS: 64.416667, -20.491667	
Links to other WPs		
Further comments, information	ISAR sample 05IS01, Age: 4000±250 yr BP, Collected by Nicolas Mangold, September 6th 2005.	
Associated data	EuroCares-B1-ICP: elementary composition obtained by ICP-MS-AES EuroCares-B1-ref1: N. Mangold et al. (2011), Planet. Sci. Lett. 310, 233-243.	

In the coming months, the following tasks need to be addressed:

- Complete list (also with biological and chemical samples)
- Choose best analogues of each category/type of rock at next meeting (1-2 June, Frankfurt am Main)
- Involve outside specialists.
- Iterate list with WP 4, and 2
- Write the final report

Internal Communication

We have had regular communication through phone calls and email exchanges that helped us to developed strategies for effectively using the expertise of WP5 group.

Participation to Conferences

Jutta Zipfel participated at the EURO- CARES Meeting and Invited Workshop in Greenwich, UK, Monday 24th and Tuesday 27 the August 2015 and presented a talk about "Analogues in a European Sample Curation Facility" by Westall, F., Zipfel J., and F. Foucher.

Planning of Meetings

We are hosting a second expert workshop in Frankfurt am Main 1-2 June to which external experts will also be invited to choose the best analogues of each category/type of rock.