

Europlanet TA Report

Please see Annex 1 below

Infrastructure short name	Installation ID	Installation short name
Distributed Planetary Simulation Facility (DPSF)	TA2-4	CSS

PROJECT LEADER – APPLICANT 1

Project number: 16-EPN2-028		
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Legal Status*: RES		
*UNI (University and other higher education organisations) RES (Public research organisation (including international research organisation as well as private research organisation controlled by a public authority) SME , PRV (Other Industrial and/or profit Private organisation) or OTH		
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Gender: M	Year of birth: 1974	Group Leader: Y
New user: Y	Number of visits: 1	Nationality: Italian
Affiliation: INAF-IAPS	Researcher Status: EXP	Activity Domain*: Physics

CO - APPLICANT

Name: Simone De Angelis		
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Gender: M	Year of birth: 1982	Group Leader: N
New user: Y	Number of visits: 1	Nationality: Italian
Affiliation: INAF-IAPS	Researcher Status: PDOC	Scientific background*: Physics

**Please select the most appropriate description from the list below:*

Physics	Chemistry	Life Sciences & Biotech	Earth Sciences & Environment
Mathematics	Energy	Material Sciences	Engineering & Technology
Social Sciences	Humanities	Information & Communication Technology	

How did you hear about us?

Website	Advertising email	Colleague	Colleague
Other:-			

COLLABORATORS

Name:	Affiliation:
Cristian Carli	INAF-IAPS, Rome, Italy
Date of TA visit:	14-18 November 2016
No. of days:	5
Host laboratory:	Institut de Planétologie et Astrophysique de Grenoble (IPAG), France
Reimbursed	No

Project Title – ***Characterization of Hydrated Na-Carbonates at Cold Planetary Conditions***

Scientific Report Summary.

(plain text, no figures, maximum 250 words, to be included in database and published)

Our proposal is focused on a series of laboratory measurements aimed to acquire VIS-NIR spectra of sodium carbonates with different levels of hydration, in three different grain sizes and in a wide range of temperatures, representative of real planetary surfaces.

To achieve this goal, we used the setup of Cold Surfaces spectroscopy at the *Institut de Planétologie et Astrophysique de Grenoble* (IPAG), to measure sodium carbonate monohydrate and sodium carbonate decahydrate in three different grain sizes: 20-50 μm , 75-100 μm , and 125-150 μm and in the overall temperature range 93-279 K, in 11 steps.

These measurements are key to correctly interpret data acquired by spectrometers carried onboard ongoing and future interplanetary space missions at various planetary bodies, particularly focused on the Jovian icy satellites (*JUICE, Europa Multiple-Flyby Mission*).

Full Scientific Report on the outcome of your TNA visit

Approx. 1 page

In the first week (14-18 November 2016), the visitors were Federico Tosi (project leader) and Cristian Carli (collaborator). Upon our arrival, we met with Pierre Beck (researcher, and manager of the CSS facility) and Olivier Brissaud (technician), who immediately put us at ease, showing the guest room at IPAG and the locations that were reserved for us. Then we had a pleasant visit of the institute and its facilities.

The first day was entirely spent to fine-tune the setup, and to solve some technical issues. The measurements therefore started in fact from the second day (Tuesday, November 15th). A clear advantage was having prepared the samples in advance, sending them to the host laboratory already sieved for the different grain sizes, i.e. ready to be measured. Within an overall duration of 10 working days assigned to this TA visit, substantial waiting times were provided by the cryostat in reaching a given desired temperature, and by the acquisition of

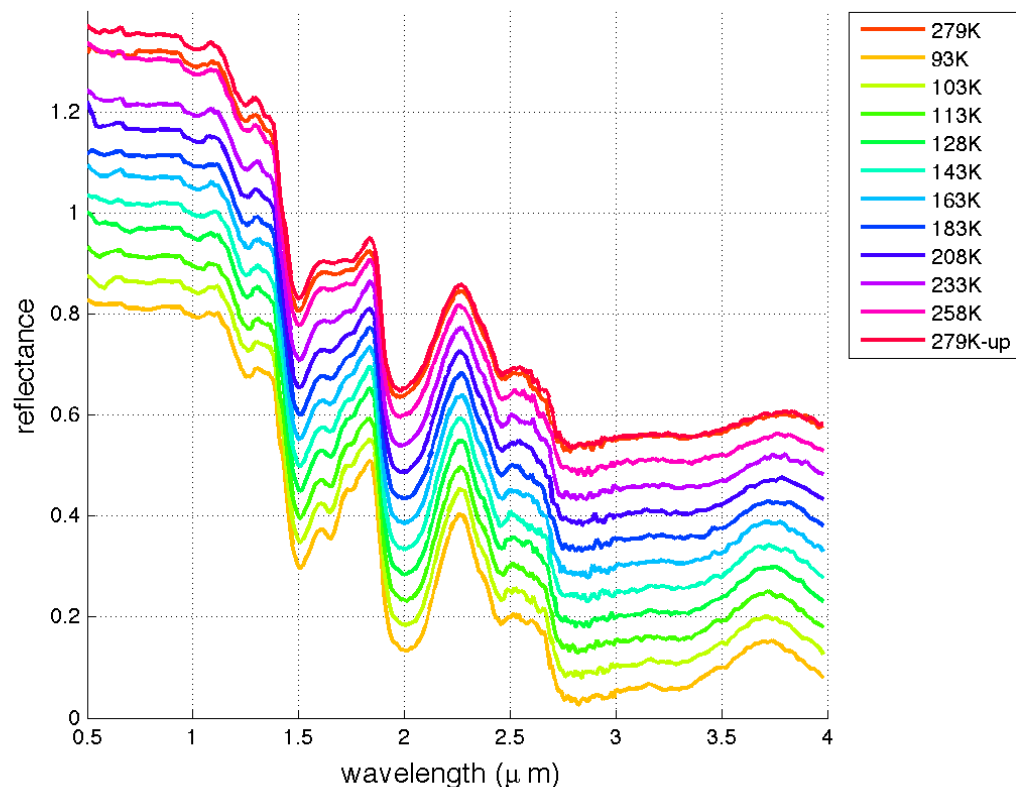
the spectrometer. Therefore, a critical decision was to establish the number of sampling steps in the temperature ramp and their separation. We finally chose to have a total of 11 steps between 93 K and 279 K, at intervals varying between 10 K (towards the lower temperatures) and 25 K (towards the higher temperatures), to better discriminate the fine structure of the absorption bands of hydrates that emerges particularly at low temperatures.

From here on, the measurements continued without major issues, taking about 1.5 days to measure each sample (particle size). Over the weekend, there was the transition between the first two participants and Simone De Angelis (co-applicant), who followed the measurements in the second week (21-25 November 2016). No substantial issues were experienced in this period. The contribution of two people from the host laboratory was secured essentially throughout the entire allotted time.

At the end of the two working weeks, we were able to acquire the full set of spectra related to five of the six samples planned (three grain sizes for sodium carbonate monohydrate and two grain sizes for sodium carbonate decahydrate). The last sample/grain size was measured in a following week by the CSS facility people to compensate the technical problems encountered and solved in the first day. Finally we got all samples fully measured, as expected from our initial proposal.

In the plot below, we show an example of spectral profiles measured for one grain size of sodium carbonate decahydrate, which demonstrates the capability of the CSS facility in acquiring reflectance spectra of samples in a sufficiently broad spectral range and in different conditions of temperature, indicative of real planetary surfaces.

Carbonato di Sodio - Deca-idrato ($\text{Na}_2\text{CO}_3 \times 10\text{H}_2\text{O}$)
Sample: $\text{Na}_2\text{CO}_3\text{-}10\text{H}_2\text{O}$ -deca-75-100um (powder)



- Publications arising/planned (include conference abstracts etc): 1 conference abstract (European Geosciences Union 2017), 1 peer-reviewed scientific paper planned within 2017.

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

The two managers of the facility, Bernard Schmitt (CNRS/IPAG, Grenoble), and Pierre Beck (UJF/IPAG, Grenoble), approve the report and agree that it is an accurate account of the research performed during the visit of the Cold Surface Spectroscopy facility (DPSF/CSS/TA2-4).

Annex 1

<i>Access provider short name</i>	<i>Short name of infrastructure</i>	<i>Installation</i>		<i>Installation Country code</i>
		<i>ID</i>	<i>Short name</i>	
INTA	PFA	TA1-1	Rio Tinto	ES
IRSPS	PFA	TA1-2	Ibn Battuta	IT
Matis	PFA	TA1-3	Iceland	IS
INTA	PFA	TA1-4	Tirez Lake	ES
IRSPS	PFA	TA1-5	Danakil	IT
DLR	DPSF	TA2-1	PEL	DE
MUG	DPSF	TA2-2	IMRF	AT
AU	DPSF	TA2-3	PEF	DK
CNRS	DPSF	TA2-4	CSS	FR
UJF	DPSF	TA2-4(8)	CSS – 3 rd party	FR
VUA	DPSF	TA2-5	HPHT	NL
OU	DPSF	TA2-6	LMC	GB
NHM	DPSF	TA2-7	PMCF	GB
VUA	DAFS	TA3-1	GGIF	NL
CNRS	DAFS	TA3-2	HNIF	FR
CNRS	DAFS	TA3-3	SRIF	FR
OU	DAFS	TA3-4	HS50L	GB
OU	DAFS	TA3-5	LFS	GB
OU	DAFS	TA3-6	CSSIA	GB
WWM	DAFS	TA3-7	RNTSI	DE
CNRS	DAFS	TA3-8	IPF	FR