

CRPG facilities available through Europlanet 2020 RI

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Abstract

Europlanet H2020 program include Transnational Access (TA) supporting travel and local accommodation costs of European researchers to conduct their own research. At CRPG, TA3-Distributed Sample Analysis Facility is available, giving access to the state of the art of 4 analytical facilities.

1. EuroPlanet

Europlanet 2020 RI is a Research Infrastructure that is addressing key scientific and technological challenges facing modern planetary science by providing open access to state-of-the-art research data, models and facilities across the European Research Area. It is a 9.95 million euros project to integrate and support planetary science activities across Europe. The project is funded under the European Commission's Horizon 2020 programme; it was launched on 1st September 2015 and will run until 31 August 2019.

A series of networking and outreach initiatives will be complimented by joint research activities and the formation of three Trans National Access distributed service laboratories (TA's) to provide a unique and comprehensive set of analogue field sites, laboratory simulation facilities, and extraterrestrial sample analysis tools.

A central part of the Europlanet 2020 RI programme is to allow any European researcher interested in pursuing planetary science research access to a comprehensive set of laboratory facilities and field sites tailored to the needs of planetary research.

Access is provided by a **Transnational Access (TA)** programme that supports travel and local accommodation costs of European researchers (and of researchers from Third Countries under certain conditions) at the facility for an approved period of time to conduct their own research programme. Applications are made in response to annual calls and

are subject to peer review. It should be noted that applicants must apply to use facilities outside the country in which they are employed (i.e. it is a transnational access). **Applications can be made for analytical time or access to planetary analogue sites ranging from single days up to several weeks and up to two researchers can be fully financed in each research visit**

Europlanet 2020 RI is designed to support planetary science but applications in other research disciplines are also considered based on innovation and potential scientific and technological impact to the planetary sciences field.

Here we report on the infrastructure that comprises the facilities offered at CRPG under TA3: Distributed Sample Analysis Facility (DSAF). The modular infrastructure represents a major commitment of analytical instrumentation and forms a state-of-the-art analytical facility. The centre perform research in the fields of geochemistry and cosmochemistry, studying fluids and rocks in order to better understand the keys of the universe..

2. Ion Probe facilities

This facility comprises a CAMECA IMS 1280 HR2 and a CAMECA IMS 1270 Ion microprobe, upgraded in 2014 to match the capabilities of the recently installed IMS 1280. Ion microprobe is a CNRS-INSU national facility. About a third of the useful analytical time of the ion probe (about 3 months each year) is allocated to the national community. French scientists have to submit their projects to a national committee for selection. The selected projects are allocated time in the following 6 months twice a year. About 15 to 20 projects are run each year. There are only few such instruments in Europe, with cosmochemistry only performed at CRPG. Different analyses can be performed on a routine basis; which include U-Pb dating on zircon, monazite or pitchblende, C, O, Si isotope ratios and light and trace elements contents of different matrixes. A notable speciality is the measurement, at

high precision, of the isotopic ratios of light elements (H, Li, N, Mg, S) including mass independent fractionation of sulfur isotopes.

3. Helium and Nitrogen Facility

Helium isotope measurements can be performed to determine the origin of gases and to date surface exposure with cosmogenic ^3He using the latest He isotope mass spectrometer, the GV Helix SFT, the first instrument of its kind installed in Europe. Analysis of nitrogen at the nanomole level in rocks can also be done on static gas-source mass-spectrometer VG5400.

4. Stable Isotope Facility

ThermoFinnigan Neptune Plus MC-ICPMS, MAT253, Picarro L2140i and GV Isoprime provide the capability for C, O, S, H isotope analyses of rocks, minerals, organic matter and fluids (water, natural gases) by continuous flow mass spectrometry coupled with elemental analyser or off line extraction and "novel" stable isotopes (e.g. Mg, Fe, Zn, Ge,) by sector field ICP-MS (Neptune+). This includes O isotopes on silicates by fluorination and H, C & O on fluids from single inclusions. The determination of high precision Mg, Ca, Fe and Ge isotopes is offered.

5. Radiogenic Isotope Facility

Analysis by TIMS (Finnigan Mat 262 and Thermo Finnigan Triton). This includes the Re-Os isotopic system and the extinct system ^{146}Sm - ^{142}Nd as well as the Sr Nd and Pb isotopic systems that are the "traditional" isotopic systems in meteorite, lunar and terrestrial rock studies.

6. Example of Application

A recent study on the habitability of desertic areas, such as the hyperarid Atacama desert used the Stable isotope facility to demonstrate that the δD values for the waters in the hydrous sulfate minerals suggest that small amounts of water accessible to microorganisms might be available even in these hyperarid soils e.g., in the form of thin H_2O films at

mineral surfaces or as a product of mineral–water exchange reactions. These results have implications for the prospect of life on other planets such as Mars, which has transitioned from an earlier wetter environment to today's extreme hyperaridity (Schulze-Makuch et al. 2018; www.pnas.org/cgi/doi/10.1073/pnas.1714341115).

7. Summary and Conclusions

Currently planetary research is limited to meteorites and lunar samples but future return missions will provide enough material from comets and asteroids. A major focus of research in the next 5-10 years will be comparative planetology to understand the types of geochemical processes that can be expected on the (former) water rich regions of Mars to be sure that the detection of past life is unambiguous. The aim of this infrastructure is to provide a structured access to state of the art analytical facilities for European users.

<http://www.europlanet-2020-ri.eu/research-infrastructure/field-lab-visits>

