EPSC Abstracts
Vol. 5, EPSC2010-528, 2010
European Planetary Science Congress 2010

Europlanet Research Infrastructure: Planetary Sample Analysis Facilities progress

C. Cloquet

CRPG-CNRS, INPL- Nancy Université, Vandoeuvre les Nancy, France, cloquet@crpg.cnrs-nancy.fr / Fax: +33 383511798

Please make sure that your pdf conversion results in a document with a page size of 237 x 180 mm!

EuroPlanet
The Europlanet Research Infrastructure consortium funded under FP7 aims to provide the EU Planetary Science community greater access for to research infrastructure. 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 (TNA's) to provide a unique and comprehensive set of analogue field sites, laboratory simulation facilities, and extraterrestrial sample analysis tools. Here we report on the infrastructure that comprises the third TNA: Planetary Sample Analysis Facilities. The modular infrastructure represents a major commitment of analytical instrumentation by three institutes and together forms a state-of-the-art analytical facility of unprecedented breadth. These centres perform research in the fields of geochemistry and cosmochemistry, studying fluids and rocks in order to better understand the keys cof the universe.
After a presentation of the facilities offered through the network, I will present how to ask time in the different facilities and other practical information about what the FP7 project will cover...I will also give a sum up of the activity so far through the network.

Europlanet Research Infrastructure Facilities:
Ion Probe facilities at CRPG and OU
The Cameca 1270 Ion microprobe is a CNRS-INSU national facility. The selected projects are allocated time in the following 6 months twice a year for french scientists. About 15 to 20 projects are run each year. There are only two such instruments in Europe, with cosmochemistry only performed at CRPG. Different analyses can be performed on a routine basis, such as U-Pb dating on Zircon, Monazite or Pechblende, Li, B, C, O, Si isotopic ratios determination on different matrix, 26Al, 60Fe extinct radioactivity ages, light and trace elements contents .

The NanoSIMS 50L – producing element or isotope maps with a spatial resolution down to ≈50nm. This is one of the cornerstone facilities of UKCAN, with 75% of available instrument time funded and committed to UK cosmochemical activity – but the remainder is free for other applications and users. Management of the remaining 25% of other activity will be organised through the local working group. This is the newest, and most advanced of three instruments of this type in Europe which routinely address cosmochemical analyses.
The instrument is capable of providing high spatial resolution (down to 50nm) elemental and isotope distribution maps for a wide range of elements from across the periodic table. It is also capable of high precision (per mil) isotopic spot measurements with a spatial resolution of a few microns for a range of elements including C, N, O, S, Si, Mg, etc.

Noble Gases facilities at CRPG and OU
Ar/Ar Nu Instruments Noblesse is coupled with an ultra-low volume extraction line and with a choice of 213 nm UV laser or 1090 nm IR lasers, providing a wide range of analytical capability in Ar/Ar dating of lunar and meteorite samples. This instrument is unique with a mass resolution of 3000, and with the UV laser it has the capability to measure Ar isotope variation on a ca. 30 –micron resolution enabling detailed mapping of age and apparent age variation within minerals. The 1090 nm laser provides the capability to step-heat small samples. The laboratory is fully supported by sample preparation facilities and technical expertise in lunar and meteorite Ar/Ar analysis.
Helium isotope facility. Analysis of the isotopes of helium in rocks and minerals. Determining the origin of gases in meteorites and ET return samples, dating surface exposure with cosmogenic 3He using the latest He isotope mass spectrometer, the GV Helix SFT, the first instrument installed in Europe. CRPG is an European leader in this domain.

Non-Traditional stable Isotopes and radiogenic isotopes at VUA and CRPG

The specific facility proposed for the TNA is the geochemistry labs used for the study of long (e.g. Rb-Sr, Sm-Nd…) and short-lived radioisotope (e.g. Mg-Al, Hf-W..), including also Os isotopes, stable and non traditional stable isotope facilities (e.g. Fe, Pb, Zn…). The facility comprises three multicollector Thermal ionization mass spectrometers (TIMS) and two multi-collector ICP-MS one of which is fitted with 193 nm laser for in situ work. In addition these instruments are fully supported by sample preparation labs (crushing, mineral separation/picking), a clean lab and geochemical support (XRF; ICP; ICP-MS etc). Data that can be obtained on samples containing sub nano gram to nanogram amounts.

Organic matter analysis at OU

Leco Pegasus IV GCxGC-TOFMS - mass spectrometric complete characterisation of very complex mixtures of organic materials. The Pegasus4D GCxGC–TOFMS system, from Leco, provides the analyst with four dimensions of analytical resolution for significantly more complete sample analysis compared to conventional GC-Mass Spectrometry. The main advantages include: 1) The significantly increased sensitivity over the whole mass range (5-1000 amu); 2)The separation of compounds that co-elute on standard gas chromatograph systems; 3) Separation of analytes by volatility and polarity enables traditionally unresolved mixtures to be examined in detail, and vastly increases the number of compounds identified; 4) Greatly increased signal to noise ratio, due to compounds being separated from the column bleed of the first column on the second GC column and an enormous increase in the Spectral Generation Rate. A number of different pyrolysis and injection sample introduction facilities are available and access to off-line data processing and reference libraries. This is the only instrument of this type in a European laboratory with a significant focus on extra-terrestrial materials.

Thermo MAT 253 GC-IRMS –isotopic measurements of H, C or N on individual organic compounds in complex mixtures. One of only a few instruments of this type worldwide primarily dedicated to the analysis of extra-terrestrial materials. Supported by fully equipped sample preparation laboratories and GC-Mass Spectrometers required to develop the exact methodology necessary for optimal analysis of each sample. A number of different sample introduction injection and pyrolysis systems are available. Open University is one of the leading laboratories in the world for compound specific isotopic measurements of extra-terrestrial organics and this is one of a very few instruments of this type in the world largely dedicated to extra-terrestrial materials.

Conclusion

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.