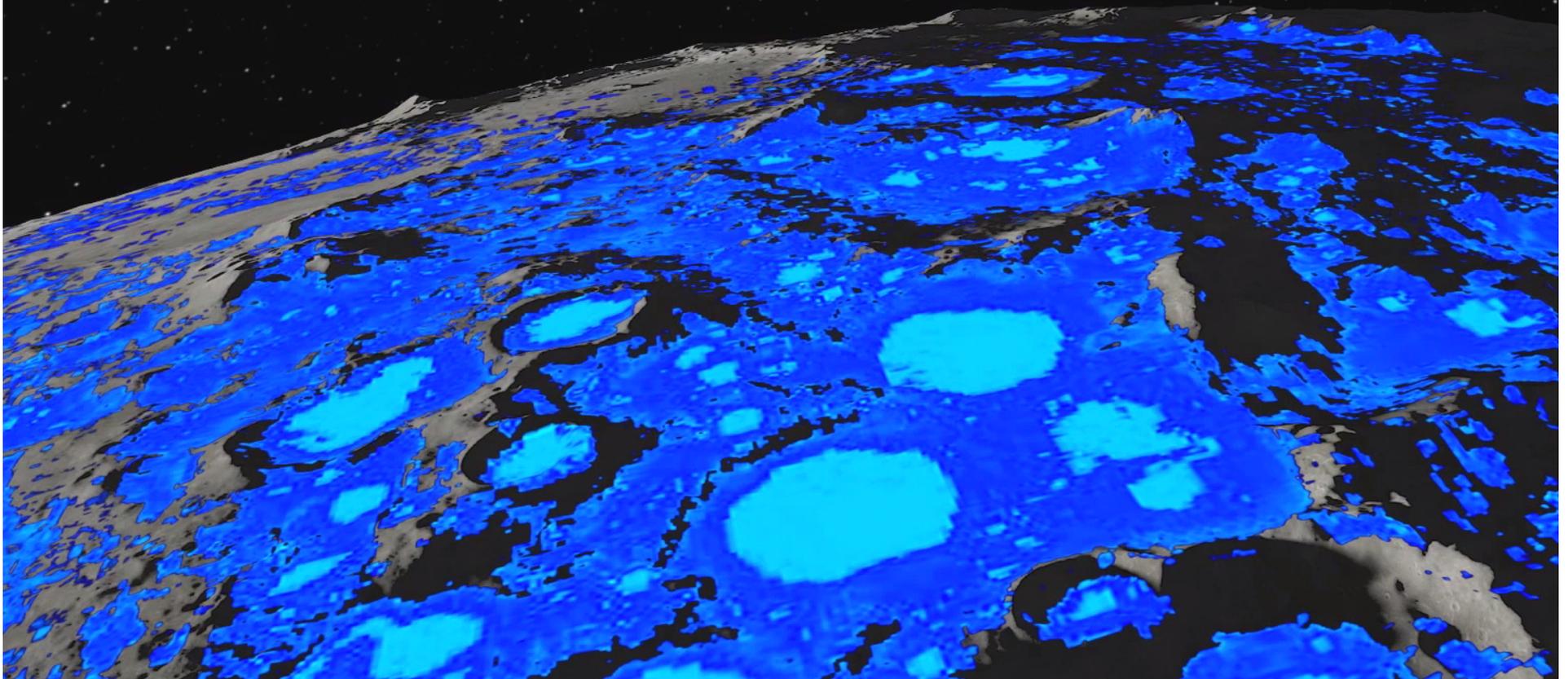




PROSPECTing the Moon

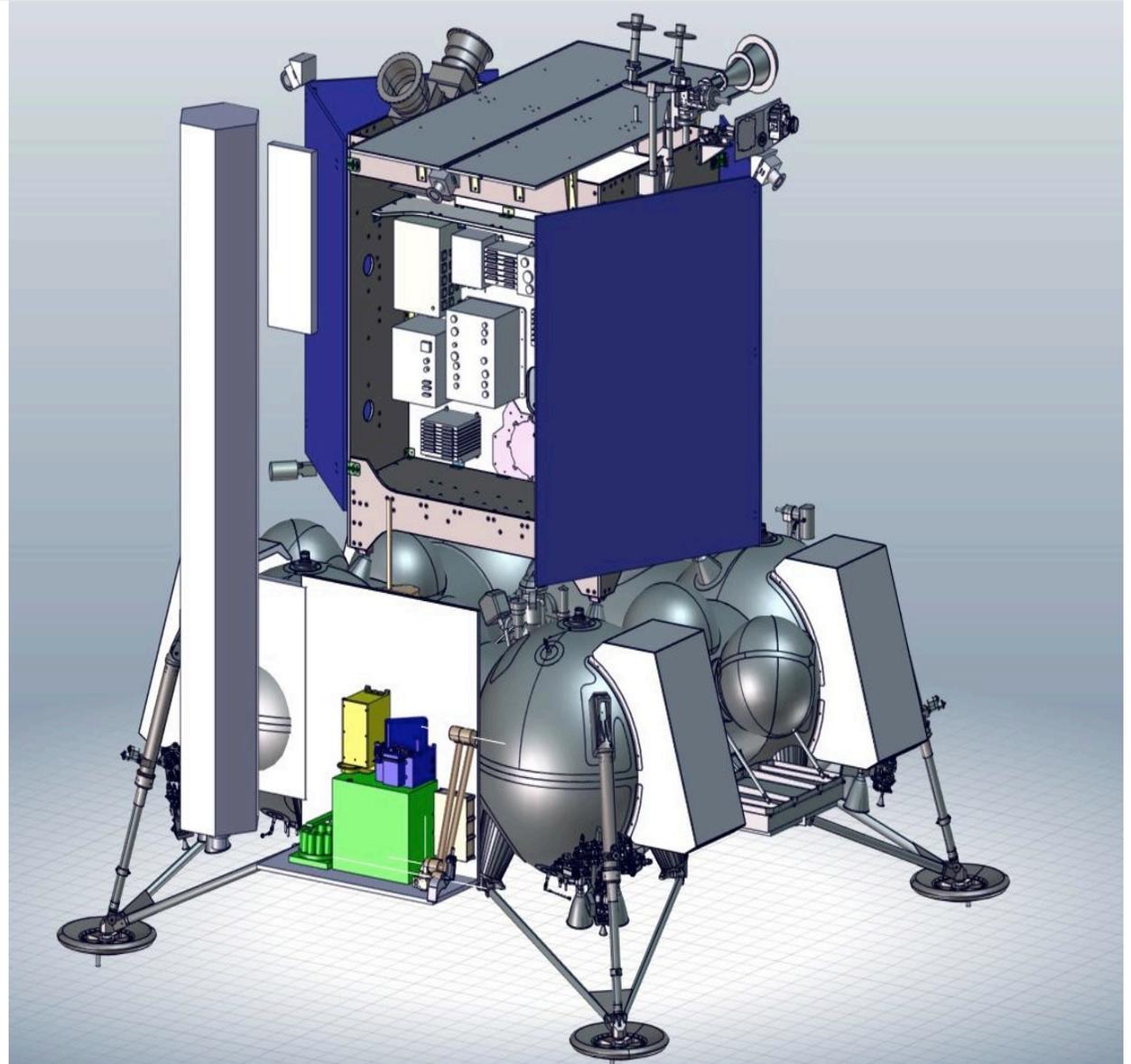
James Carpenter for the ESA Lunar Exploration Team



PROSPECT on Luna-27 (Luna-Resurs)



1. ProSEED drill
2. ProSPA laboratory

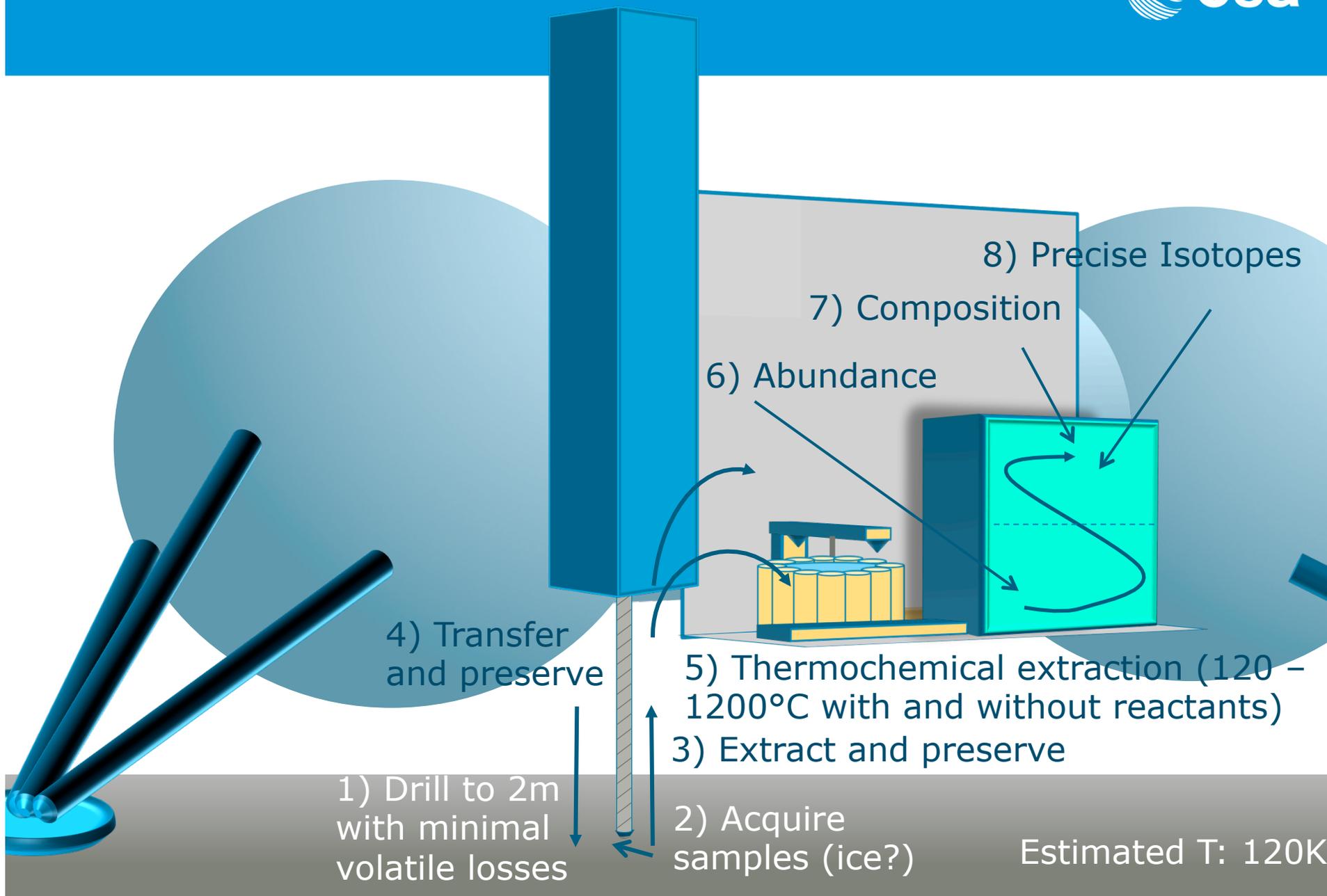


General ProsPA Questions

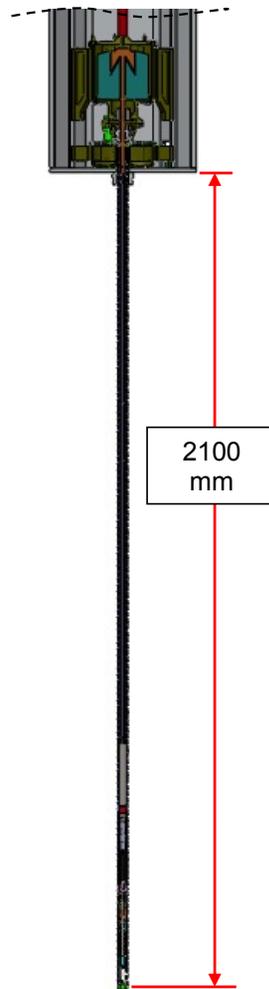
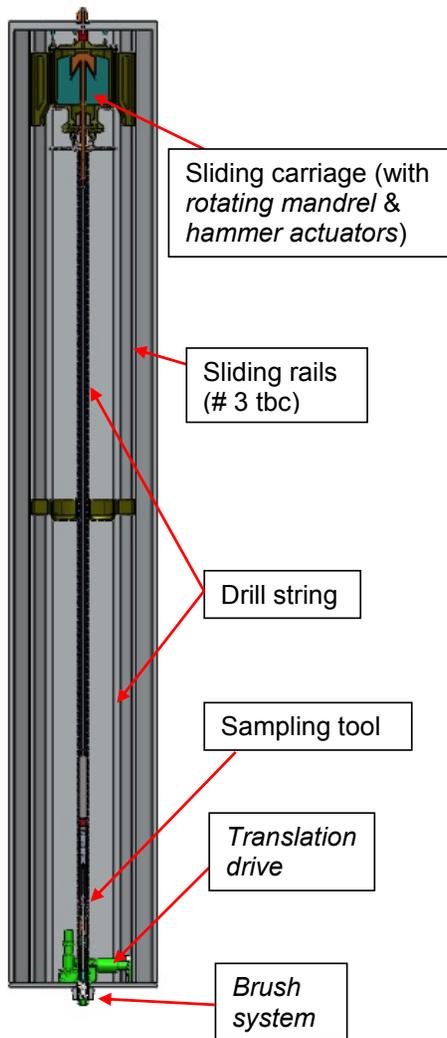


- 1. Are Lunar volatiles and regolith a potential resource for future exploration?**
- 2. what can resource orientated measurements tell us that's of fundamental scientific value?**
 - a. What is there?
 - b. How much is there?
 - c. What does it take to release the resource relevant species?
 - d. What are the sources of volatiles?
 - e. What were the processes that put them there?
 - f. How can we use this knowledge to understand the wider distribution?

PROSPECT Functions and Performance



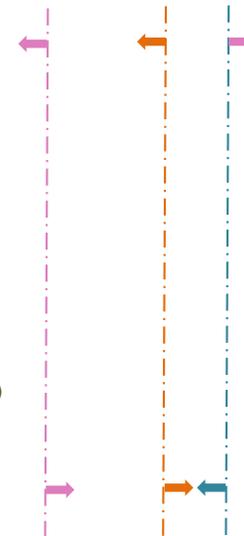
ProSEED drill concept by Selex ES



① Drilling

② Coring (reference position)

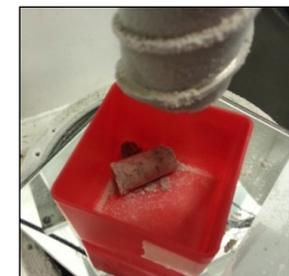
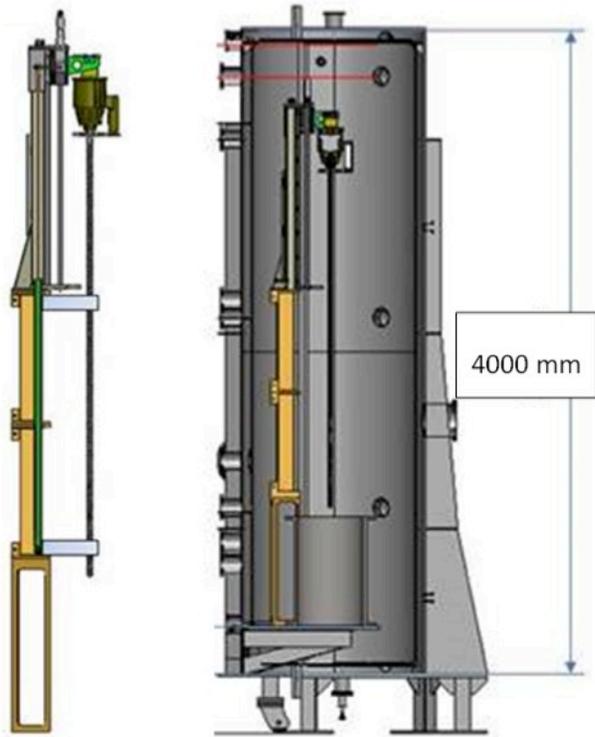
③ Pinching (spikes 'indenting' the sample)



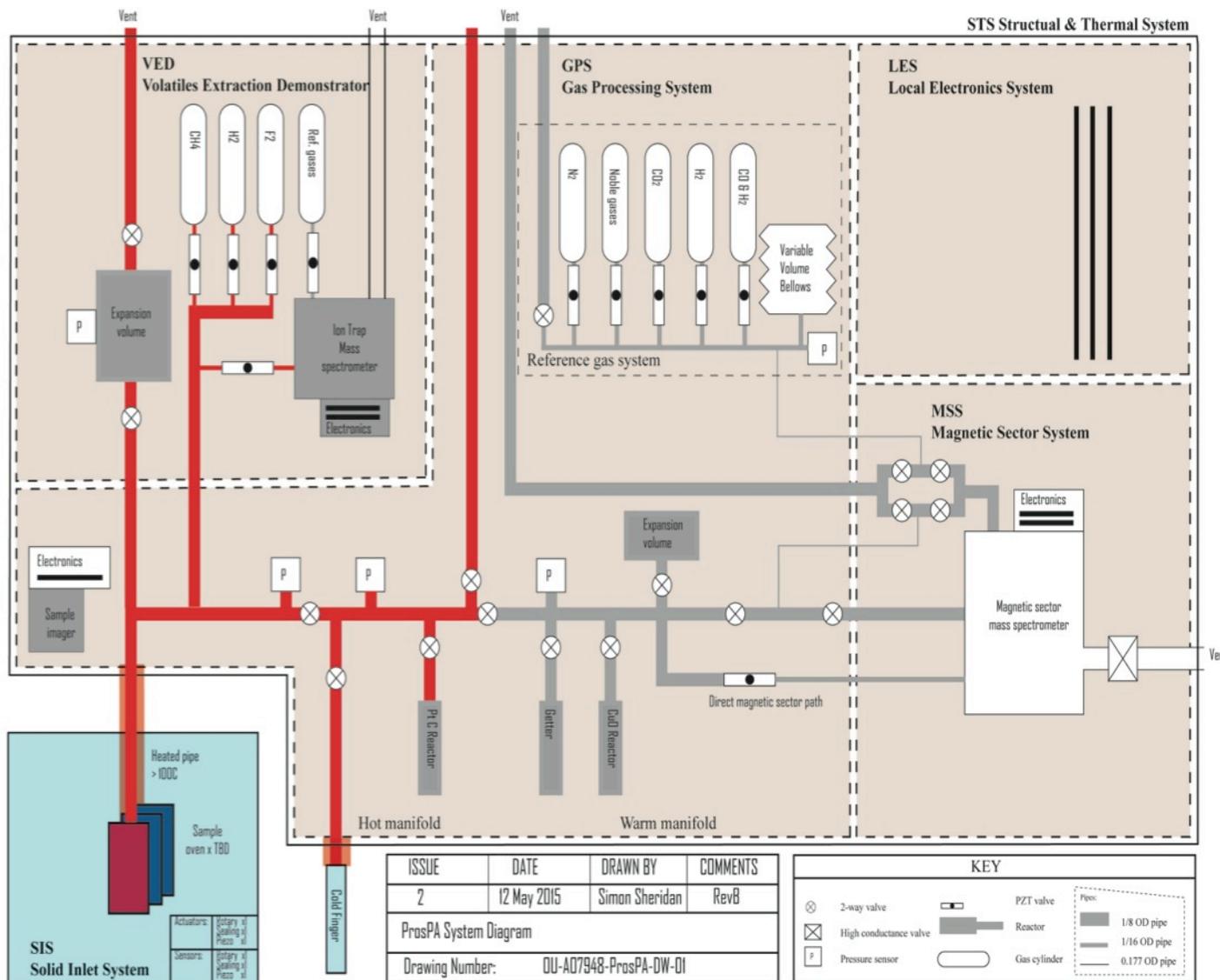
Includes temperature measurements

Investigating NIR and electrical permittivity

Drill testing and breadboarding (Selex ES)



ProSPA laboratory Concept

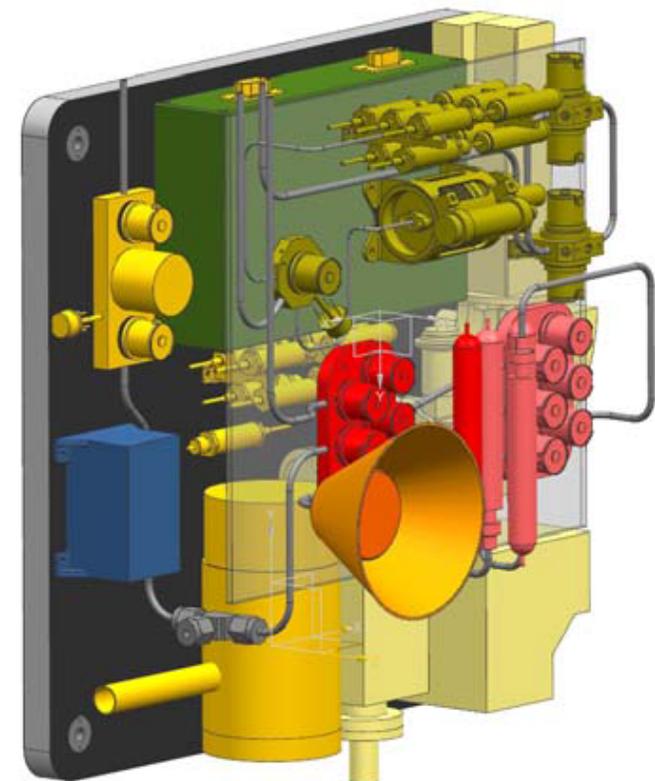
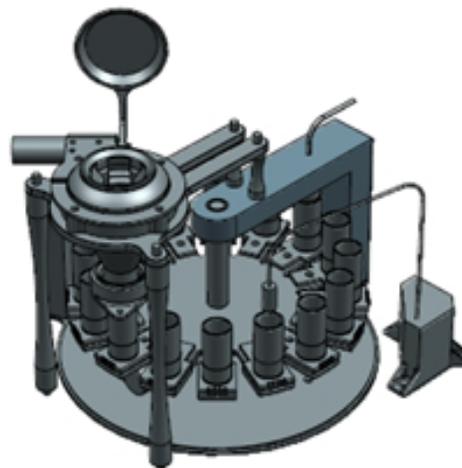


ProSPA Preliminary Design and Expected Performance

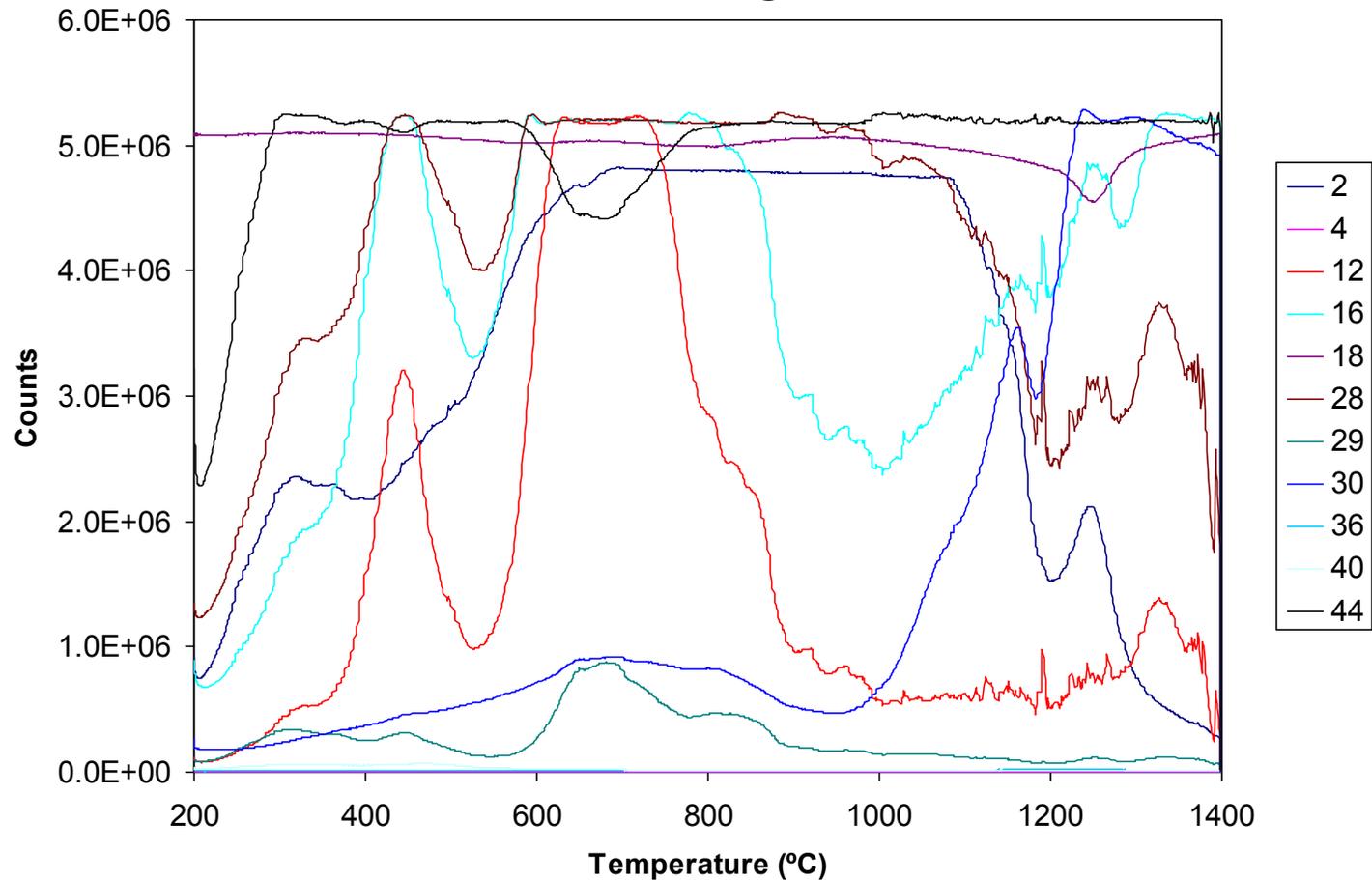


- m/z range
 - 10-300 (VED)
 - 2-150 (MSS)
- Water detection at ppm levels in regolith

Isotope	Species	Precision (‰)
δD	H_2	10
$\delta^{13}\text{C}$	CO_2	0.1
		1
$\delta^{15}\text{N}$	N_2	0.1
		1
$\delta^{18}\text{O}$	CO_2	0.1
$\delta^{17}\text{O}$	CO_2	2.2

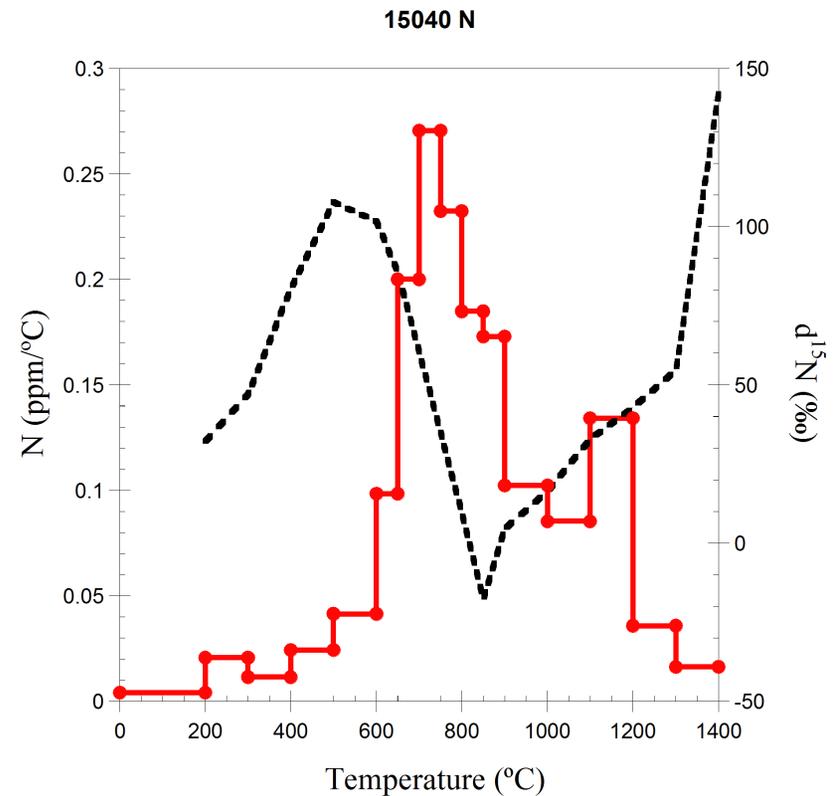
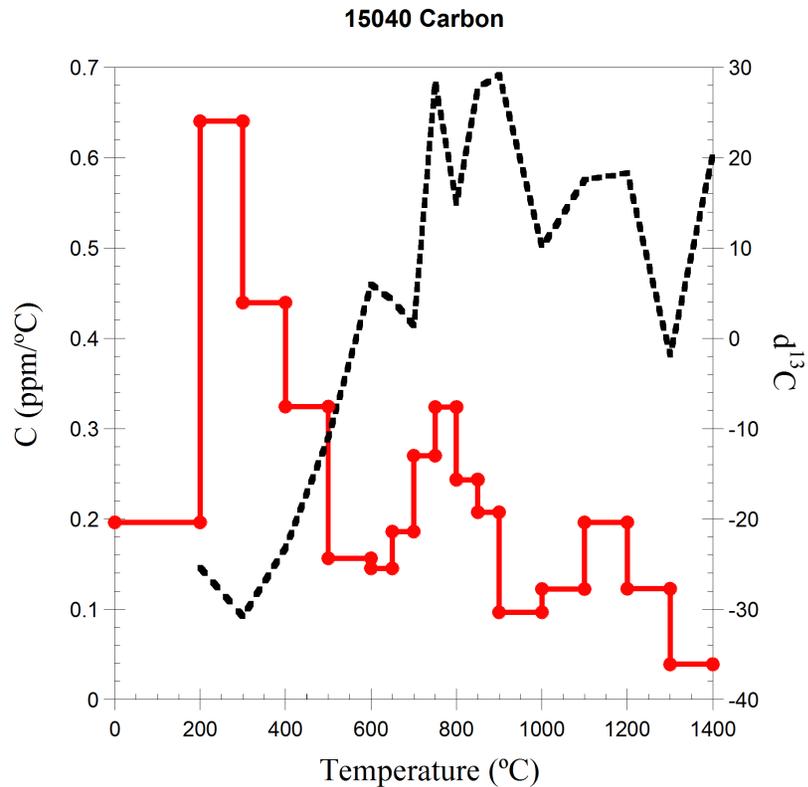


Linear Heating



- Direct measurement from the furnace through a quadrupole mass spectrometer
- Up to 11 masses analysed simultaneously
- Analysis time is ~ 1 hour
- Furnace range up to 1400 °C

Data provided by Dr Alexander Verchovsky (OU) using FINESSE



- Operation in stepped combustion mode
- Histogram shows the abundance profile
- Individual release components can be resolved using abundance peaks
- Black line shows the isotopic composition of each step
- Instrument blank level is ~ 10 ng of carbon and ~ 0.2 ng of nitrogen
- Step lengths customisable

Graphs provided by James Mortimer. Show data from lunar soil 15040 (OU) using FINESSE

1. Phase A activities on-going
 - a. ProSEED drill – Led by Selex ES
 - b. ProSPA laboratory – Led by Open University
2. Phase B activities in preparation – Kick off expected before end 2015
 - a. System design and development
 - b. Development models and test campaigns
 - c. User Group activities begin
3. Confirmation of Phase C & D expected by end 2016
4. Luna-27 flight 2020