SCIENTIFIC TASKS OF THE GAS ANALYTIC PACKAGE FOR THE EUROPA LANDER.

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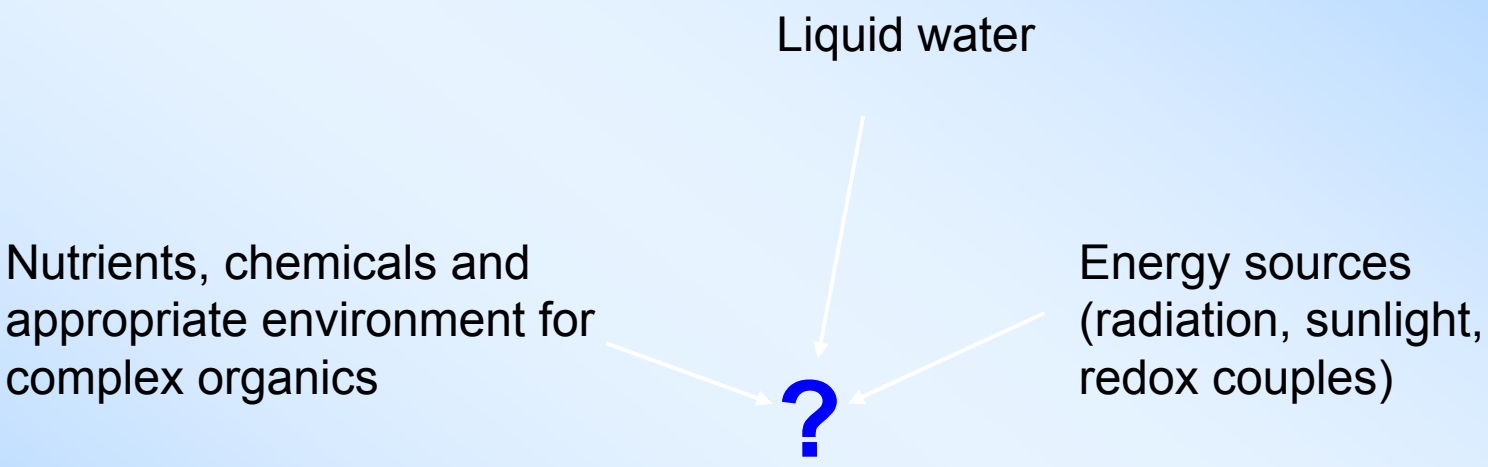
The main scientific question: IS EUROPA HABITABLE?



Other questions:

- Origin of the Jupiter satellites?
- Evolution of an icy planetary body in space and under huge radiation?
- Other

Three main goals of the Lander:

1) Characterization of physical and chemical conditions at surface of Europa;
2) Search for biological activity;
3) Internal structure (thickness of ice, depth of the ocean, silicate core).

Characterization of physical and chemical conditions at surface of Europa

- Chemical composition of ices: Concentration of main and trace components.
- Concentration and composition of organic components.
- Key isotopic ratios: $^{13}C/^{12}C$, D/H, $^{17}O/^{16}O$, $^{18}O/^{16}O$.
- Measure key habitability parameters: T, pH, Eh, electrical conductivity, radiation conditions, redox couples

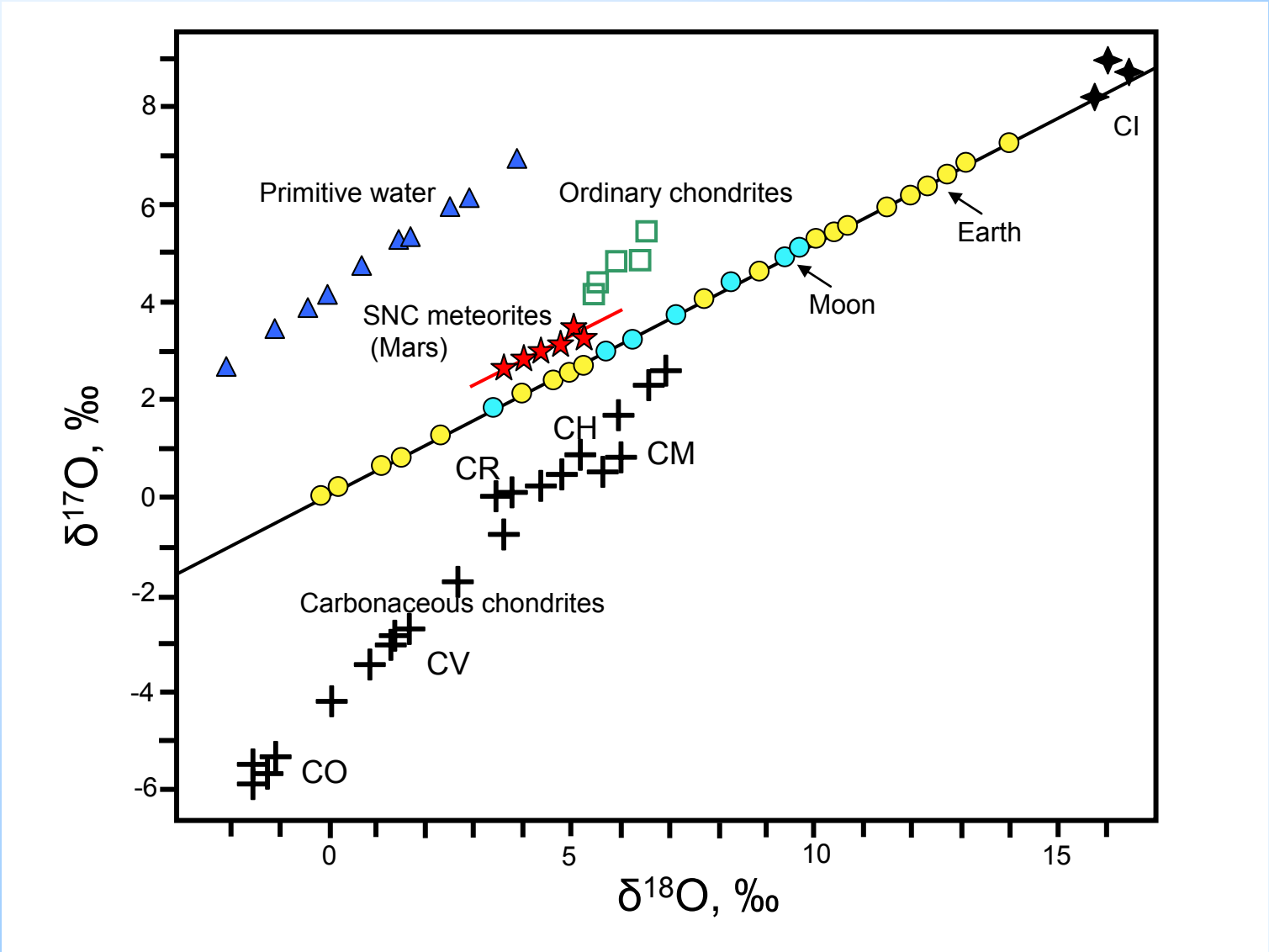
Tasks for search of biological activity

- Characterize potential habitability of Europa
- Search for characteristic organic molecules as indication of extinct/extant life
- Search for environmental modifications induced by metabolic products: homochirality, specific isotopic fractionation
- Search for inorganic signs of life (biogenic gases (CH_4, H_2S, etc.))
- Search for cells and/or cells remnants

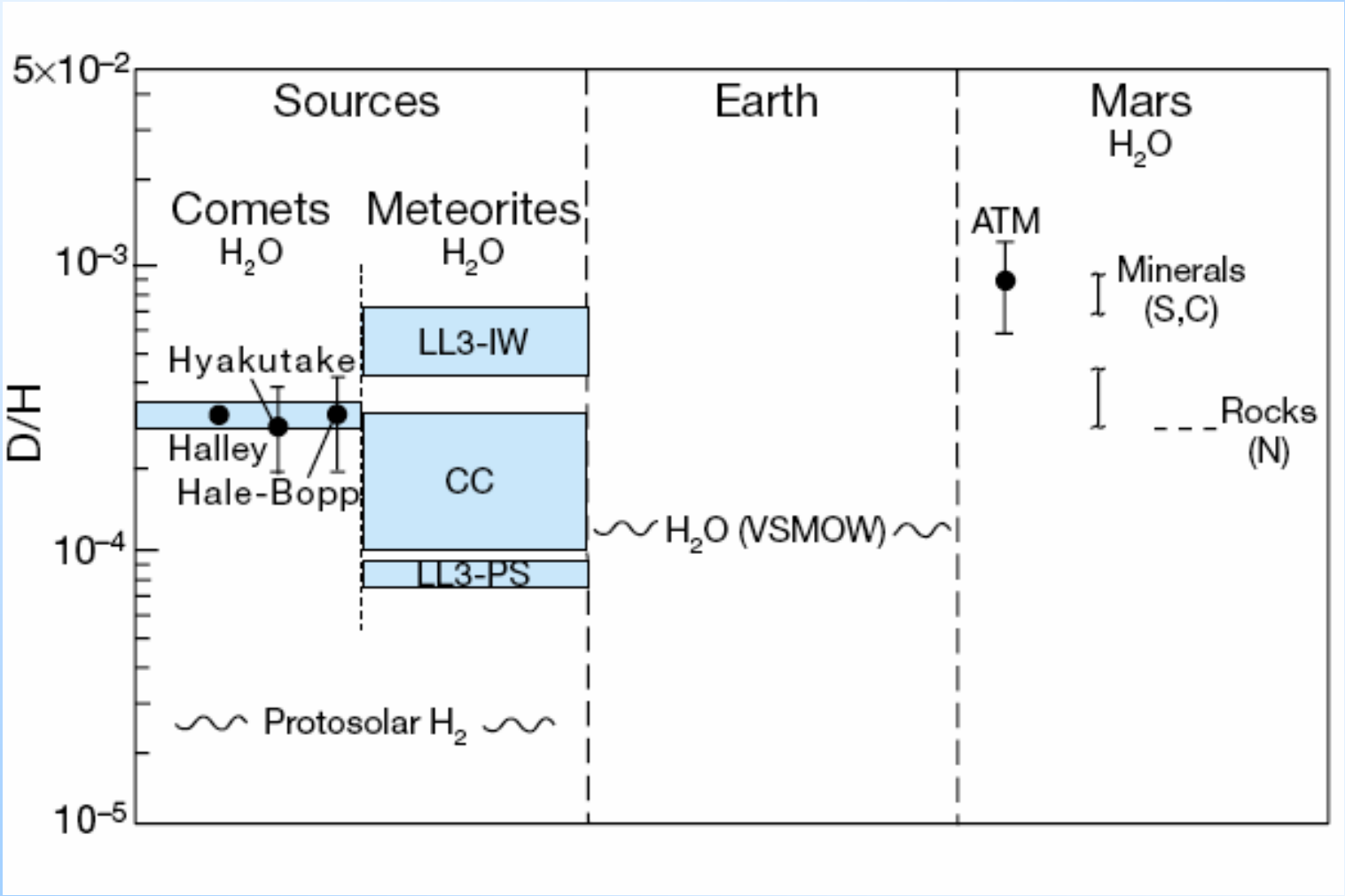
Scientific tasks for the Gas Analytic Package:

- Measurement of chemical composition of volatile components of ices: Concentration of main and trace components.
- Measurement of concentration and composition of organic components.
- Search for biogenic gases (CH_4, H_2S, etc.)
- Measurement of isotopic ratios $^{13}C/^{12}C$, D/H, $^{17}O/^{16}O$, $^{18}O/^{16}O$ in H_2O and CO_2.

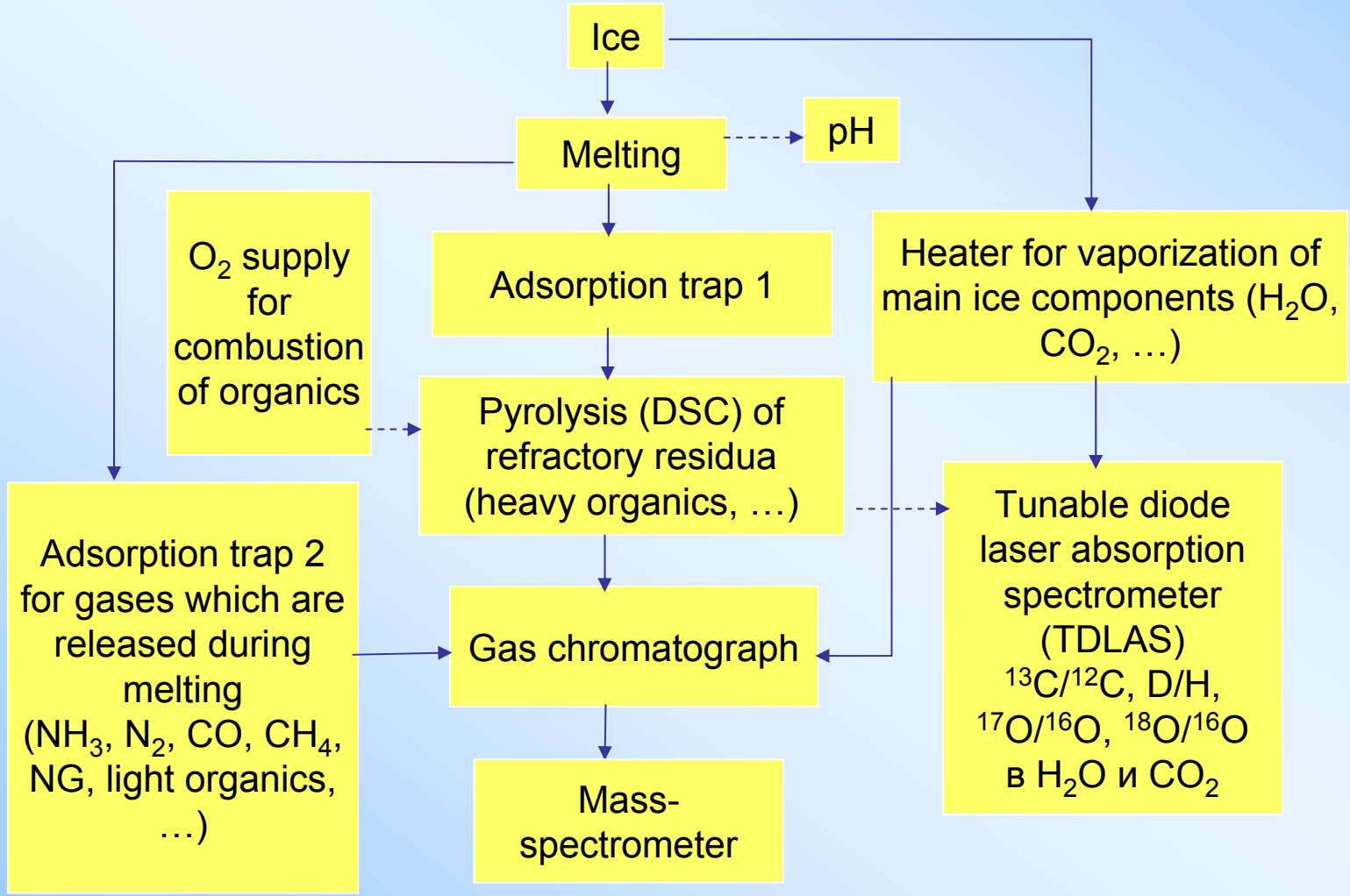
Oxygen isotopes in the Solar System



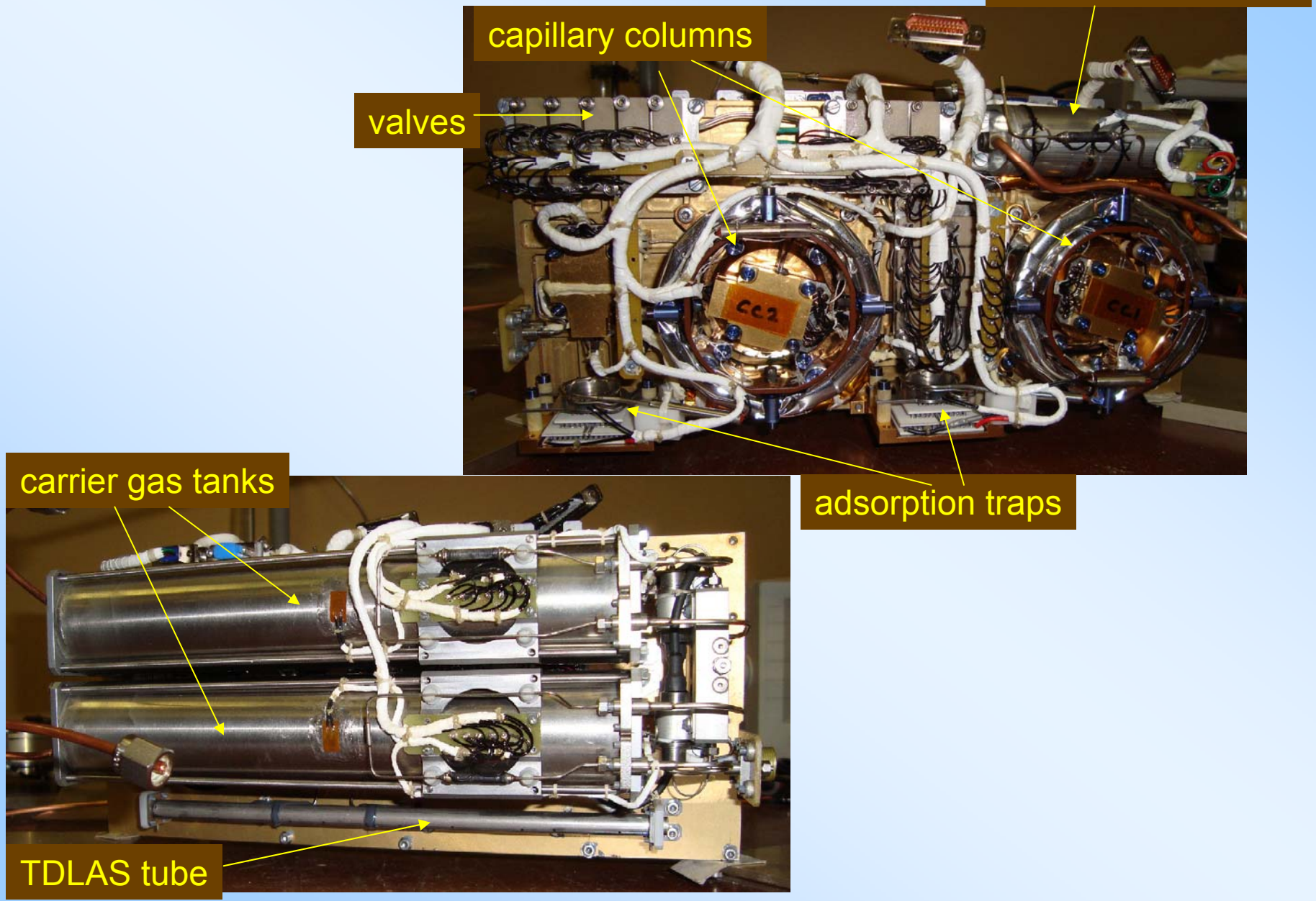
Hydrogen isotopes in the Solar System



Gas analytic package for Europa Lander



GC prototype (Phobos Sample Return project)



TDLAS prototype (Phobos Sample Return project)

Name*	Target molecule	Sigma (cm^{-1})	Lambda (nm)
C_2H_2	C_2H_2	6523.8794 cm-1	1533 nm
CO_2iso	$^{18}OC^{16}O$	4898.7822 cm-1	2041 nm
	$^{18}OC^{16}O$	4899.5653 cm-1	
	$^{13}CO_2$	4899.6133 cm-1	
H_2Oiso	HDO	3788.3366 cm-1	2640 nm
	$H_2\ ^{17}O$	3788.7852 cm-1	
	$H_2\ ^{18}O$	3788.9125 cm-1	
H_2O-CO_2	H_2O	3727.7376 cm-1	2682 nm
	CO_2	3728.4101 cm-1