

SPACE EXPLORATION SYMPOSIUM (A3)
Space Exploration Overview (1)

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FRENCH INSTRUMENTS FOR IN-SITU MISSIONS: PAST PRESENT AND FUTURE

Abstract

Two in-situ missions are to be launched at the end of the year, soon after this conference, one to Mars and the other to one of its moons, Phobos. The first - Mars Science Laboratory - has been developed by NASA and will take the largest ever rover, Curiosity, to the surface of Mars. The second mission, Phobos-Grunt under the responsibility of RosCosmos, will carry out orbital and in-situ experiments before sending Phobos samples to Earth.

CNES is privileged, together with French scientific laboratories from CNRS, to contribute to both missions. More specifically, we participate to two MSL instruments:

- The mast part of CHEMCAM (CHEMistry CAMera) which will analyse by spectrometry a plasma light emitted after a laser shot by Martian rocks. CHEMCAM - Mast Unit encompasses a laser, a telescope, a camera and the associated electronics.

- The Gas Chromatograph (SAM-GC), one of the three SAM instruments. SAM detect a wide range of organic components from the atmosphere and the ground. It will also search for carbon isotopes, as well as noble gas isotopes.

French contributions to Phobos Grunt involve:

- The Gas-Chromatograph (GC) and the Tunable Diode LAsEr Spectrometer (TDLAS) of the Gas Analytic Package (GAP) which will characterise the molecular soil composition.

- The supply of two panoramic cameras (PANCAM), of a pair of stereoscopic cameras (STEREO PAIR), and of a visible microscope (MICROMEGA VIS).

- The IR spectral microscope (MicrOmega IR), a new instrument that will perform the first in-situ characterisation by microscopic spectral imaging of the mineralogical and molecular composition of a probably non differentiated body. This characterisation will be decisive in determining the origin of Phobos, and as a reference for the sample analyses.

Before describing extensively these contributions and their objectives, the paper will put them into perspective by presenting previous French involvement in surface missions, in particular on Cassini – Huygens, and on Rosetta – Philae. We will then elaborate on future missions, by presenting our participation in the in-situ segments of the ESA – NASA ExoMars mission, in the DLR – CNES Mascot asteroid lander carried by JAXA's Hayabusa 2, and other candidate missions such as Sage (Venus lander in the final

list of NASA's New Frontier programme), Marco Polo (asteroid sample return competing for ESA's 3rd medium size Cosmic Vision mission), and Selene 2. We will conclude by highlighting the synergy between these missions for the various instrument families.