Geophysical Research Abstracts,
Vol. 11, EGU2009-13122, 2009
EGU General Assembly 2009

ExoGeoLab Test Bench for Landers, Rovers and Instruments

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In the frame of ESTEC technology and research pilot project, we have started a small pilot facility with a ExoGeoLab and a mini-Habitat, supported by two design and control offices in the European Space Incubator (ESI), as well as infrastructure support and manpower. We have in addition to contribution on external instruments and manpower from partner institutes. From this test bench and kit of ExoGeoLab instruments, we plan to operate comprehensive instruments packages that could help in the technical research and science preparation of lander/rover missions studied in the frame of Cosmic Vision or the Exploration programme. The ExoGeoLab research incubator project includes a sequence of activities:
- Data analysis and interpretation of remote sensing data (MEX, SMART-1, VEX, Cassini-Huygens) and in-situ (Huygens, MER) , and merging of multi-scale data sets
- Procurement and integration of geophysical, geochemical and astrobiological breadboard instruments in an surface station and rover (ExoGeoLab)
- Research operations and exploitation of ExoGeoLab test bench for various conceptual configurations (Moon, Mars, NEO, Titan)
- Contribution to the exploitation of surface lander results (MER, Phenix, MSL, preparation Exomars)
- Scientific simulation of planetary surfaces using laboratory and modelling tools
- Support research for definition and design of science surface packages on the Moon, Mars, NEO, Titan
- Research support to community preparation of payload for surface lander opportunities

Specific goals and methods of ESTEC ExoGeoLab: we have started to integrate instruments in an ExoGeoLab crossing various techniques. The methodic steps for this hands-on research are:
1) We have procured and adapted instruments to equip a mid-size ExoGeoRover (made available in collaboration with ESTEC robotics section), and a small surface station.
2) This terrestrial payload (instruments, sensors, data handling) will be deployed, operated and used as collaborative research pilot facility (ExoGeoLab), first tested and operated at ESTEC, and later transportable
3) We shall perform functional tests of these instruments, and operate them in terrestrial conditions to correlate measurements using various techniques.
4) We shall implement progressively the possibility of remote control of instruments from an adjacent habitat (ExoHab 6-crew caravan recently acquired as part of ESTEC skunks pilot project), and a remote science desk.
5) The suite of measurements includes a comprehensive set with telescopic imaging reconnaissance and monitoring, geophysical studies, general geology and morphology context, geochemistry (minerals, volatiles, organics), subsurface probe, sample extraction and retrieval, sample analysis.
6) We shall reproduce some simulation of diverse soil and rocks conditions (mixture of minerals, organics, ice, penetrations of water, oxydant, organics) and diagnostics
7) We shall use these instrument packages to characterise geological context, soil and rock properties,
8) Science investigations will include geology, geochemistry, measurements relevant to penetration/survival of water, oxydant, organics, mineral and volatiles diagnostics.
9) After first validations we shall exploit the facility for collaboration with partners that will provide some additional guest instruments, and perform specific investigations,
10) We shall organise field campaigns in specific locations of scientific and exploration interest, making use of the ExoHab habitat for logistics support and local operations