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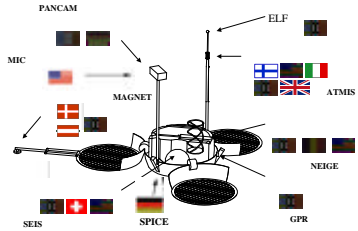
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# THE NETLANDER SEIS EXPERIMENT : A MULTIPARAMETER STATION ON MARS

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**NetLander 2007 :** The NetLander mission will deploy in 2007 a network of 4 stations on Mars for one Martian year of operation.



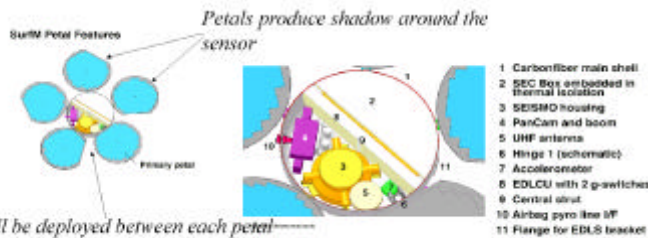
*Nine Instruments selected by an AO in 1999*

- All instruments are now funded by their responsible agencies
- Grouped in 4 Packages :  
*Geophysics, Atmospheric, Ionospheric, Mineralogy/geology*

**Geophysical package :** The geophysical package will sound the deep interior (D) and the subsurface with the following multi-parameters approach

- Seismometer (SEIS, seismic velocities and attenuation, D, S)
- Seismometer and infrasounds (SEIS, compliance and shear modulus, S)
- Magnetometer (MAGNET, electrical conductivity, D, S)
- Ground penetrating Radar ( permittivity, S)
- SPICE (Thermal conductivity, S)
- Geodesy experiment, NEIGE ( density, D)

## Surface Module structure :

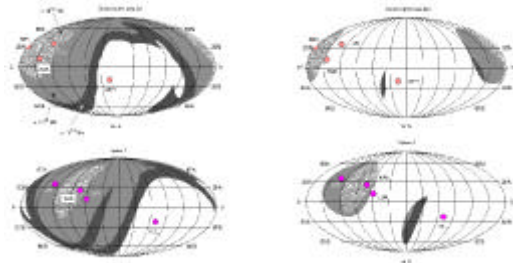


*Skirt will be deployed between each petal for a full wind/shadow protection*

Seismo is protected against direct wind by housing and mylar sheet and is DECOUPLED from lander. Direct contact with ground by 3 spikes.

**Global detection capability :** Seismic activity, from thermoelastic cooling of the lithosphere indicates about 50 quakes with Moment  $> 10^{14}$  N.m per year (10 with Moment  $> 10^{15}$  N.m)

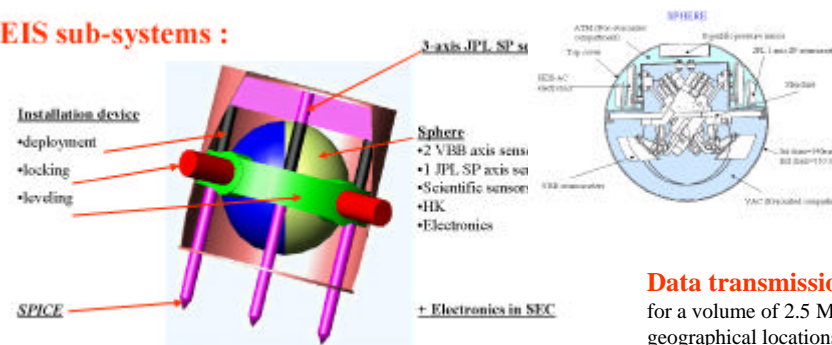
- For realistic noise level ( $10^{-9}$  ms<sup>-2</sup>/Hz<sup>1/2</sup> in 0.1-1 Hz), 60 % of the quakes might be detected, Mocquet, 1999



**SEIS-NL experiment :** This experiment will integrate a VBB 2 axis seismometer, a 4 axis short period seismometer and a series of environmental sensors for pressure, infrasounds and temperature. IPGP has the overall responsibility of the experiment and is responsible for the VBB and environmental sensors. ETHZ is responsible for the electronics of the experiment and JPL for the short period sensors. SEIS-NL is also in charge of data acquisition for SPICE experiment.

**Scientific objective :** The SEIS-NL instrument will perform both the seismic and tidal measurements. It was proposed onboard the NetLander by a large team of scientists, mostly involved in Earth seismology and Earth tides. The seismic data analysis will determine the mean values of the shear and bulk elastic moduli and seismic attenuation as a function of depth, mainly from the transmitted phases. The reflected phases will mainly constrain the position of the interfaces between the mantle and core, the state of the core, the position and characteristics of mantle discontinuities and crustal thickness.

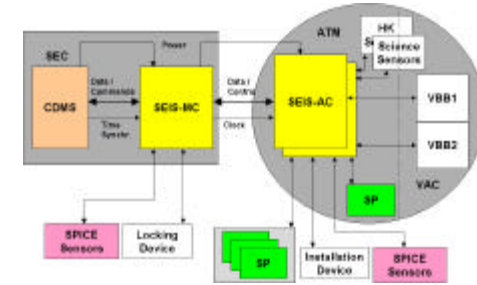
## SEIS sub-systems :



**Technical description :** The overall mass of the SEIS experiment is 2 kg, including all sensors and the data control processor. Acquisition will be performed by a series of 24 bits A/D, while the thermal and drift control will be performed by a feedback generated by a 24 bits D/A.

- The package of sensors will allow :
- to measure signals in an ultra-broad band, from the tidal frequencies ( 0.05 mHz) up to the short period frequencies (50 Hz)
  - to perform environmental decorrelations of the temperature and pressure variation on Mars, allowing the sensor to operate in a thermal environment with daily variations of about 40K
  - to search for infrasounds which might be associated to dust devils and atmospheric discharge.

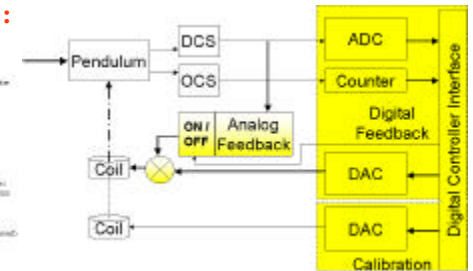
**Technologie and collaboration :** The experiment is done by a consortium between France (white), Switzerland (yellow) and USA (green). Funding by PRODEX for Switzerland, NASA for USA and CNES/INSU for France.



## VBB feedback block-diagram :

- in yellow, ETHZ responsibility
- in white, IPGP responsibility

## Sphere sub-system :



**Data transmission :** We expect a daily transmission of LP data (1 sps) for a volume of 2.5 Mbits/day. The seismometer team, in at least two geographical locations, will perform the quick-look on the Earth of these data, in order to maximise the turn-around time during regular shift hours (Paris and Pasadena, UT+1 and UT-8). From these data, a set of time will be identified, and a table of parameters will be up-linked to each of the 4 landers in order to flag and to save the interesting data in the main memory of the CDMS (e.g. when quakes are tentatively identified). The corresponding VBB (20 sps) and SP data (100 sps) will then be progressively sent as EVENT data at a rate of about 5 Mbits/day.

**Reference :** Lognonné P. & B. Mosser, Planetary Seismology, 14, 239-302 Survey in Geophysics, 1993. P. Lognonné et al. The NetLander Very Broad band seismometer, Planet. Space Sc., 48,1289-1302, 2000.

## On the web:

- <http://ganymede.ipgp.jussieu.fr/homeng/projects/netlander/sismo/>,
- <http://orfeus.knmi.nl/newsletter/vol2no2/>