SEIS-NL : a VBB 3 Axis Seismometer to study Mars internal structure

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The Space Department of IPGP has started to develop seismometers for the Mars 96 Russian mission. Since 1994, we have started to design a new seismometer for future Martian exploration programs. A VBB 3 axis mock-up was realized and tested in 1997. This instrument proposed an interesting concept with a very low mass <1 kg, a low volume: diameter <20 cm, a low power consumption <500 mW and it reached performances close to reference terrestrial seismometer like STS-2. In the framework of the Netlander mission which will install 4 landers on Mars in 2007, we started to up-grade the VBB seismometer to fit its performances to the objectives of the first seismic network planned to be installed on Mars. First results of this new version are shown. Significant improvement is reached: sensitivity is multiplied by a factor of 30, high quality factor and low sensitivity to thermal variations are still reached. This new instrument is now equipped with 2 dedicated displacement transducers providing for the first one, a digital tidal output coded using 32 bit dynamic, for the second one, one analog seismic output offering 140 dB dynamic. A specific feedback, mixed analog and digital, has been developed to adjust sensitivity, bandwidth and stability. Autonomous leveling/locking/installing device will be developed for end of phase B to provide high quality installation of the seismometer on Mars. Objective is to mechanically uncouple the instrument from the lander, to use it as a thermal/wind shield, to minimize influence of pressure and temperature on data.