

SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Part 1 (3A)

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SEIS, THE SEISMOMETER FOR THE INSIGHT MISSION

Abstract

The INSIGHT mission was selected in August 2012 by NASA within the frame of the Discovery program. The name stands for Interior Exploration using Seismic Investigations, Geodesy and Heat Transport. This mission, under the responsibility of JPL, will provide scientific knowledge essential to understanding the fundamental processes of telluric planet formation and evolution. It will be launched towards Mars in March 2016, and will reuse extensively the cruise bus and the Entry-Descent and Landing System of PHOENIX, which performed a successful mission on Mars Northern terrains in 2008. INSIGHT's scientific goals are:

- understand the formation and evolution of terrestrial planets through investigation of the interior structure and processes of Mars,
- determine the present level of tectonic activity and impact flux on Mars.

To meet these goals, the scientific payload consists in two instruments and a deployment system which perform three experiments. The instruments are the Seismic Experiment for Interior Structure (SEIS) and the Heat Flow and Physical Properties Package (HP). The Rotation and Interior Structure Experiment (RISE), which uses the spacecraft X-band communication system (and is not considered as an instrument), performs the third experiment. SEIS is the critical instrument for characterising the deep interior structure of Mars, including the thickness and structure of the crust, the composition and structure of the mantle, and the size of the core. This seismometer will be provided by CNES, which will coordinate a wide set of international contributors from the Institut de Physique du Globe de Paris, the Institut de l'Aéronautique et de l'Espace from Toulouse JPL, the Imperial College from London and the Open University, the Max-Planck Institute of Lindau, and the École polytechnique fédérale de Zurich (ETHZ).

This paper will first give an overview of the scientific objectives of INSIGHT. The SEIS instrument will then be introduced from an historical perspective, summarising 20 years of technological efforts at IPGP together with their main contractor, the French SODERN company. Its design and main characteristics will be presented, together with the organisation that has been put in place for its development within the frame of INSIGHT. Finally, we will elaborate on various planetary and small body seismology missions which could in the future build upon the experience which will have been accumulated through SEIS development and operation.