

An Introduction to the Exploration for the interior of Mars: InSight

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The InSight mission (Interior Exploration Using Seismic Investigations, Geodesy, and Heat Transport) will illuminate the fundamental processes of terrestrial-planet formation and evolution by performing the first comprehensive surface-based geophysical investigation of Mars. It will provide key information on the composition and structure of an Earth-like planet that has gone through most of the evolutionary stages of the Earth up to, but not including, plate tectonics. Thus, the traces of this history are still contained in the basic parameters of the planet: the size, state and composition of the core, the composition and layering of the mantle, the thickness and layering of the crust, and the thermal flux from the interior.

InSight will delineate these parameters with a focused set of three investigations centered on seismology and supported by precision-tracking and heat-flow measurements. Rather than relying on a geophysical network to provide this information, InSight will utilize state-of-the-art analysis techniques to derive interior information from a single station on the surface carrying two scientific instruments: an ultra-sensitive, very-broad-band seismometer (SEIS); and a Heat Flow and Physical Properties Probe (HP³) that consists of a self-penetrating mole trailing an instrumented tether. An X-band transponder (part of the communication system) to enable two-way precision Doppler tracking of the planet's rotation comprises the Rotation and Interior Structure Experiment (RISE). Monitoring surface environment is also performed by a high precision barometer, thermometer and anemometer (PTW), and magnetometer (MAG).

The launch and landing of InSight will be in Mar and Sept 2016 respectively, and the science operation period is one Mars year. The landing and deployment systems are inherited from Phoenix. A robotic arm and cameras are used to deploy the geophysical instruments to the surface. The system and instruments of InSight, and hence science objectives, are very similar to those investigated by the MELOS (Mars Exploration with Lander-Orbiter Synergy) EDL team. Thus InSight is of great interest to Japanese scientists and has many points from which they can learn. Conversely, the participation of Japanese scientists brings considerable strength to InSight as well, and we are pleased with their contributions.

The knowledge provided by the InSight mission will substantially advance understanding of the formation and evolution of terrestrial planets. This is a chance to open the door into the interior of Mars for the first time. We welcome your participation!

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