

GEP-ExoMars: a Geophysics and Environment Observatory on Mars. J. Biele¹, S. Ulamec¹, T. Spohn¹, D. Mismoun², P. Lognonné², and the GEP team, ¹Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Institute for Planetary Research, Rutherfordstr. 2, D-12489 Berlin, Germany (jens.biele@dlr.de), ²Institute de Physique du Globe du Paris, Space Studies and Planetology, 4 avenue de Neptune, 94107 Saint-Maur cedex, France.

Introduction: The goal of the Long-Lived Geoscience Observatory on Mars, GEP (Geophysics and Environmental Package) is to complement the exobiological investigations by PASTEUR (the ExoMars rover payload) with longterm geophysical measurements. It will be precursor mission for a setup of a permanent network of fixed stations on the planet, with the objective to operate for several (≥ 6) years. GEP will monitor with high resolution the seismic activity and the rotation of the planet, the magnetic field and its variations. It will measure the heat flux of the planet and monitor and study the environmental conditions (meteorology and atmospheric electric fields). By providing new geophysical models of Mars' interior as well as the actual geologic activity of the surface (heat flow, seismic activity), GEP will provide a major step in our understanding of the geological evolution of the planet and the habitability conditions during the first billion years. In addition, GEP will monitor the present Martian climate and meteorology, will provide a unique data set on potential hazards for future human exploration missions (radiation, atmospheric electricity, dust storms) and will perform high resolution characterization of the Martian surface.

System: GEP will be accommodated on the Descent Module (DM) of ExoMars, i.e. the fixed station that remains on the Martian surface after the rover egress. It is fully autonomous and relies on solar power for this mission, working for at least 2 years. A 40 Wh Li-Ion secondary battery is used to buffer peak power demands (mainly for telecommunications). The full payload mass (including margins) is about 5 kg. The full mass of the autonomous package is 20 kg.

Payload: The core instruments will be a Very Broad Band Seismometer, a heat flow and thermal diffusivity probe in a sub-surface mole, an atmospheric/dust package, a magnetometer, a radio science experiment and a ionising radiation monitor.

Programmatics: The GEP is currently onboard the EXOMARS 2013 mission of ESA's AURORA program. Other opportunities might be considered for the deployment of a GEP package. The GEP stations are a unique contribution to the International Mars exploration in the next decade and will complement the Pasteur-EXOMARS and MSL payloads, which are more

focused on exobiology, surface mineralogy and atmospheric composition.

This paper will discuss in detail the scientific merit and the foreseen technical realization of the GEP package.