

**INSPIRE – A FUTURE EUROPEAN MARS NETWORK SCIENCE MISSION.** A. F. Chicarro<sup>1</sup>, <sup>1</sup>European Space Agency, Solar System Division, ESTEC, Code SRE-SM, Postbus 299, 2200AG Noordwijk, The Netherlands (agustin.chicarro@esa.int).

Following ESA's launch a decade ago of the successful Mars Express [1, 2] mission, European efforts in Mars Exploration are taking place within ESA's Robotic Exploration Programme, starting in 2016 with the Trace Gases Orbiter (TGO) focusing on atmospheric trace gases and in particular methane, and with the Entry and Descent Module (EDM). In 2018, an ESA rover (ExoMars) will perform geological, geochemical and exobiological measurements of the surface and the subsurface of Mars. Both of these missions are being carried out in collaboration with the Russian Space Agency (Roscosmos). A number of missions for possible launch in 2020 and beyond are currently under study in ESA. Among those, a potential candidate is a Mars Network Science Mission (named INSPIRE) including 3 small landers with a robotic arm to be launched on a Soyuz rocket and using direct-to-Earth communications, to investigate the interior structure of the planet, its rotational parameters and its atmospheric dynamics. These important science goals have not been fully addressed by Mars exploration so far and can only be achieved with simultaneous measurements from a number of landers located on the surface of the planet such as a Mars Network mission. In addition, the geology, mineralogy and astrobiological significance of each landing site would be addressed, as new locations on Mars would become available for in-situ study.

Such Mars Network Science Mission has been considered a significant priority by the planetary science community worldwide for the past two decades. INSPIRE has a long heritage and demonstrated technical feasibility. A larger network could be put in place through international collaboration, whereby different international partners could provide additional surface stations. In fact, NASA's INSIGHT mission to be launched in 2016 will be an extremely valuable precursor to INSPIRE, as it will lay the foundation of seismology on Mars and determine the internal activity of the red planet.

The proposed INSPIRE Mission would focus on Mars evolution, providing essential constraints on geophysical, geochemical, and geological models of Mars' evolution and a better understanding of SNC meteorites and future returned Martian samples. Measurements of the seismology, geodesy, magnetic field and surface heat flow would reveal the internal structure, activity and composition of Mars, its thermal structure and its magnetic evolution. Meteorological surface measurements would allow monitoring the atmospheric dynamics at the boundary layer to infer climate pat-

terns. Such mission can also provide important insights into the astrobiological conditions of Mars over time.

The Mars Network Science Mission represents a unique tool to perform new investigations of Mars, which could not be addressed by any other means. It would fill a longstanding gap in the scientific exploration of the Solar System by performing in-situ investigations of the interior of an Earth-like planet other than our own and provide unique and critical information about the fundamental processes of terrestrial planetary formation and evolution. The long-term goal of Mars robotic exploration in Europe remains the return of rock and soil samples from the Martian surface before eventually Humans explore Mars, but INSPIRE would provide the context in which returned samples should be interpreted.

**References:** [1] Mars Express – The Scientific Payload, European Space Agency, SP-1240, 216 pages, Noordwijk, The Netherlands (2004). [2] Mars Express – The Scientific Investigations, European Space Agency, SP-1291, 281 pages, Noordwijk, The Netherlands (2009).

