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Geodesy with landers for obtaining information on the interior of Mars

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Our fundamental understanding of the interior of the Earth comes from geophysics, geodesy, geochemistry, geomagnetism, and petrology. Measurements in these fields have revealed the basic internal layering of the Earth, its thermal structure, its gross compositional stratification, as well as significant lateral variations in these quantities. For Mars, a mission involving at least two landers at the surface of Mars, If selected, will certainly contain a direct-to-Earth radio system (even at the system level for telemetry and telecommand) and this will allow us to performed radioscience and in particular, for appropriate lander separation, single beam interferometry. These future observations will allow us to perform measurements of Mars deformation, rotation and orientation with an unprecedented accuracy. Radioscience with such a precision will allow us to focus on interior processes and the early evolution of Mars, providing essential constraints for models of the thermal, geochemical, and geologic evolution of Mars. This paper shows how well radioscience in that case can answer major questions related to the internal structure of Mars, as well as to its climate and to the global circulation of its atmosphere. Questions related to the interior of Mars would be addressed using precession and nutation observations while atmospheric questions would be addressed using observations of length-of-day variations.