Geophysical Research Abstracts,
Vol. 11, EGU2009-10489, 2009
EGU General Assembly 2009

Mars Riometer System

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The aim of Mars Riometer System project is to develop a riometer (relative ionospheric opacity meter) that can measure ionisation levels in the upper atmosphere of Mars, especially at altitudes below those accessible to existing orbiter-based instruments. Riometer measurements will provide a range of information on the physical environment in which exploration must take place, e.g. the effect of energetic radiation (charged particles or electromagnetic waves) on the atmosphere/ionosphere of Mars and the resulting impact on radio wave propagation and absorption. The latter will become increasingly important as exploration activities make more use of radio links within Mars atmosphere, e.g. for distributed sensor networks and navigation systems. In addition to energy precipitation, the riometer will be able to detect radio emissions from micro-lightning in the Martian atmosphere. Electric fields associated with lightning represent a hazard to electronic equipment and cause an increase in the electromagnetic noise level. The riometer will be a valuable tool for remote sensing of Martian electrical discharges and the assessment of level of risk that exploration activities must consider. At present we are working to develop a prototype that will provide proof-of-concept that existing terrestrial riometer technology can be adapted for use on a planetary lander. This includes a vital element of enabling science – using existing knowledge of Mars' environment to model the signals that the riometer will measure. This science will help us develop the technical specification of the instrument and thus guide the development and testing of the prototype. The short-term aim is to demonstrate scientific and technology readiness at a level that will allow us to compete for flight opportunities on future mission opportunities.