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Martian atmospheric mass loss induced by the Solar Wind

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Since 1971 several Mars orbiters measured significant atmospheric mass losses induced by solar wind interaction. Typically these losses are divided in two categories: ion pick-up and ionospheric plasma outflow. Plasma measurements along spacecraft trajectories provided measurements of ion outflow along spacecraft trajectories with subsequent extrapolation over 2-dimensional model or by averaging of multiple measurements performed over long period of time.
Majority of measurements show that the solar wind induced atmospheric losses may be significant factor of martian atmosphere evolution, both in its total mass and composition. Numerical models also indicate that solar wind induced atmospheric losses are not negligible factor of martian evolution of atmosphere.
Still the magnitude of average mass loss of Mars is not well known. This is due to limitations of used techniques such as possible uncertainties of sensitivity of used plasma analyzers and averaging methods of collected data. Non-stationary processes induced by CMEs and flow anomalies resulting from interplanetary current sheets interaction with the bow shock (HFAs) may be important factor in gross atmospheric losses.
Recent launch of MAVEN spacecraft dedicated to investigation of atmospheric losses of Mars shows importance of this research area and promises further progress by use of comprehensive suite of scientific instruments.
We discuss existing results of Martian atmospheric mass losses and some additional methods of measurements of these losses.