



ICME events at Mars: MAVEN observations and models

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The MAVEN spacecraft has observed the Mars upper atmosphere, ionosphere, magnetic topology and interactions with the Sun and solar wind during numerous Interplanetary Coronal Mass Ejection (ICME) impacts spanning from March 2015 to January 2016. Observations include dramatic changes in the bow shock and magnetosheath boundaries, open and closed magnetic field lines, and extreme enhancements of escaping and precipitating pick-up ions. We will compare three ICMEs using MAVEN and MEX observations at Mars, with an emphasis on the response of the planetary pick-up ions. Additionally, we will present global MHD and test particle simulations of the ICMEs using MAVEN and MEX observations as initial conditions, which show a significant enhancement in the nonthermal escape of planetary ions during these events. We also will put the observed ICME events in context with a model of an idealized extreme ICME interacting with Mars. Accordingly, atmospheric escape during extreme solar events in Mars' early history may have been a significant contributor to the evolution of the Martian atmosphere and may also have implications for exoplanets interacting with younger, more active stars.