Identification and preliminary analysis of dust impacts on the MAVEN spacecraft

Klára Ševčíková¹, František Němec¹, Libor Nouzák¹, Jakub Vaverka¹, and Laila Andersson²
¹Charles University, Faculty of Mathematics and Physics, Czechia (kkk.klarka@seznam.cz)
²Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO, USA

Electric field data obtained by the Langmuir Probe and Waves (LPW) instrument on board the Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft are used to identify signals related to dust impacts on the spacecraft body and/or on the instrument probes. The analyzed waveform snapshots are 62.5 ms long (4,096 points sampled at 65,536 Hz). An automatic procedure to identify short electric field pulses with signatures corresponding to those expected for the dust impacts has been developed and applied to available data in years 2014–2018, resulting in about 40,000 of events. Each of the identified pulses is characterized by several quantitative parameters (polarity, magnitude, relaxation time, magnitude of a possible pre-spike). The event occurrence and respective quantitative parameters of detected pulses are then analyzed as a function of local plasma conditions in the Martian ionosphere (electron density and temperature), the spacecraft location, and the spacecraft potential. The obtained results are compared with a simple scheme of the signal formation upon a dust impact.