

EGU21-9157

<https://doi.org/10.5194/egusphere-egu21-9157>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



## Dynamics of the Martian bow shock location

**Philippe Garnier**<sup>1</sup>, Christian Jacquey<sup>1</sup>, Vincent Génot<sup>1</sup>, Beatriz Sanchez-Cano<sup>2</sup>, Xavier Gendre<sup>3</sup>, Christian Mazelle<sup>1</sup>, Xiaohua Fang<sup>4</sup>, Jacob R Gruesbeck<sup>5,6</sup>, Benjamin Hall<sup>7</sup>, Jasper S Halekas<sup>8</sup>, and Bruce M Jakosky<sup>4</sup>

<sup>1</sup>IRAP, Université Toulouse 3, IRAP, Toulouse, France (philippe.garnier@irap.omp.eu)

<sup>2</sup>Physics and Astronomy Department, University of Leicester, Leicester, UK

<sup>3</sup>ISAE-SUPAERO, Université de Toulouse, France

<sup>4</sup>Laboratory for Atmospheric and Space Physics University of Colorado, Boulder, US

<sup>5</sup>Department of Astronomy, University of Maryland, College Park, MD, US

<sup>6</sup>NASA Goddard Space Flight Center, Greenbelt, MD, US

<sup>7</sup>Space & Planetary Physics Group, Department of Physics, Lancaster University, Lancaster, UK

<sup>8</sup>Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa, USA

The Martian interaction with the solar wind is unique due to the influence of multiple internal and external drivers, including remanent crustal magnetic fields that make the interaction unique. In this work we focus on the analysis of the dynamics of the plasma boundaries that shape the interaction of the planet with its environment, and in particular of the shock whose location varies in a complex way. We use multi spacecraft datasets from three missions (Mars Global Surveyor, Mars Express, Mars Atmosphere and Volatile Evolution) to provide a coherent picture of the shock drivers. We show how the use of different statistical parameters or cross correlations may modify conclusions. We thus propose the use of refined methods, such as partial correlation analysis or Akaike Information Criterion approach to analyse the multiple drivers of the shock location and rank their relative importance: solar wind dynamic pressure, extreme ultraviolet fluxes, magnetosonic mach number, crustal magnetic fields, but also solar wind orientation parameters. Seasonal effects of crustal fields on the shock, through ionospheric coupling, are also investigated.