

Magnetohydrodynamic Simulations of the Solar Forcing of Planetary Magnetospheres

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Abstract: Magnetized wind outflow from a star gets modified as the star becomes old [1]. This magnetized plasma flow from a host star interacts with the planets and give rise to various interesting magnetohydrodynamic processes like bow-shock, magnetopause, magnetotail, planet-bound current sheets, magnetic reconnections, atmospheric mass loss as well as particle injection into the planetary atmosphere, etc. [2]. We use 3D compressible magnetohydrodynamic simulation of a star-planet system and study the age-dependency of these interaction phenomena. We vary the properties of the stellar wind [3] and planet's intrinsic magnetosphere and we expect to observe a change in magnetopause distances, magnetotail length, atmospheric mass loss and other dynamical steady-state properties of the planet with the age of the star. This study is important for exploring the consequences of earth's and exoplanet's atmospheric dynamics, intrinsic magnetic field's variation and habitability due to the ageing of the host star.

References: [1] Vidotto A. A. et. al. (2014) MNRAS, 441(3), 2361-2374. [2] Strugarek A. (2017) Handbook of Exoplanets. Springer, pp 1-23. [3] Parker, E.N. (1965) Space Sci Rev 4: 666.