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Global 3D simulation of the interaction between a turbulent solar wind and a magnetic dipole

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Far from an ideal laminar flow, the solar wind impacting planetary magnetospheres contains a spectrum of fluctuations extending to virtually all scales. The study of the effects of such fluctuations on a magnetosphere was until recently lacking a numerical tool which would provide a self-consistent global picture of such an interaction. Using a novel 2-step approach, the open source, hybrid-PIC code *Menura* is employed to first develop a 3D turbulent cascade in an otherwise homogeneous plasma, to then inject this turbulent solution in a domain containing a permanent dipole. We show how solar wind turbulence is affected by the crossing of the shock, and conversely how the global shape of the magnetosphere is evolving compared to its laminar counterpart. We additionally highlight how transient phenomena and coherent structures are naturally occurring in the foreshock and the sheath due to the local direction of the turbulent magnetic field.