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## On the influence of solar wind turbulence on the Earth's foreshock dynamics

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We present the results of two numerical simulations of the interaction between the solar wind and a planetary Earth-like magnetosphere. We use the hybrid particle-in-cell (PIC) code Menura, which allows for injecting a turbulent solar wind [1]. The two numerical simulations we present only differ one from the other on the nature of the solar wind, which is laminar in one case and turbulent in the other. Even though we poorly resolve ion scales because of computational constraints, we observe the development of a foreshock in the quasi-parallel shock region formed by kinetic effects due to the presence of reflected particles.

We focus our analysis on the spatial properties of the reflected ion beams and compare them in the case of laminar and turbulent solar wind. In the laminar case, we observe the presence of fast modes excited by reflected particles and find homogeneous density and temperature of the ion beam in the foreshock region. Instead, in the turbulent case, we find that fluctuations in the foreshock are not simple fast waves but result from the interaction between solar wind turbulence and reflected particles. We also observe that density and temperature are modulated in space in contrast with the laminar case. We argue that this modulation arises from the complex shape of the magnetic field, in which field line random walk and perpendicular diffusion are enhanced with respect to the laminar case.

[1] Behar, E., Fatemi, S., Henri, P., & Holmström, M. (2022, May). Menura: a code for simulating the interaction between a turbulent solar wind and solar system bodies. In *Annales Geophysicae* (Vol. 40, No. 3, pp. 281-297). Copernicus GmbH.