

The interaction between shocks and plasma turbulence: hybrid-PIC simulations

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Physical processes associated with shocks and turbulence are ubiquitous phenomena in the Universe that are pivotal to understand several key features of astrophysical systems. Novel insights about this interaction will be discussed. In particular, we will present kinetic simulations of the interaction between an oblique, supercritical shock and pre-existing, fully developed plasma turbulence. The role of turbulence strength, a crucial ingredient to enhance phase space diffusion leading to efficient particle acceleration, is addressed using a novel technique, relying on the coarse-graining of the Vlasov equation. These results will then be put in the context of in-situ observations of long-lasting anisotropic field-aligned beams before the passage of interplanetary shocks. Finally, as a further application, novel aspects of solar wind turbulent structures transmission across the Earth's bow shock will be discussed using a combination of in-situ observations and kinetic simulations.