Magnetic Field Background Spectrum, from Fluid to Kinetic Scales, as Observed in the Solar Wind

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Abstract

Power spectra of interplanetary magnetic field fluctuations show an unpredicted behavior at kinetic scales. Irrespective of what happens at fluid scales, the power spectral density level of kinetic scales remains largely unchanged when analysing either fast or slow wind belonging to corotating streams. These conclusions apply to canonical/pristine solar wind neither reprocessed by dynamical interactions, which develop during the expansion nor affected by transient solar phenomena.

Because of this and because of the roughly fixed location of the break point separating fluid from kinetic scales, at a given heliocentric distance, we can establish, for the slow wind, a sort of background spectrum extending from fluid to proton scales. The power spectral level of this spectrum remains frozen when we look at the slow wind region of different corotating streams even if they are largely separated in time, i.e. coming from different solar source regions.

This background spectrum would be common to both fast and slow wind but, any time the observer would cross the inner part of a fluxtube channeling the fast wind into the interplanetary space, a turbulent and large amplitude Alfvénic spectrum would be overimposed to it.