

Interactive comment on “Lifetime estimate for plasma turbulence” by Yasuhito Narita and Zoltán Vörös

j. valdivia (Referee)

alejo@macul.ciencias.uchile.cl

Received and published: 8 August 2017

The authors present an interesting method, based on the Breit-Wigner model for non Gaussian frequency broadening, to look at the stream wavenumber frequency spectrum constructed from cluster measurements in the solar wind and try estimate a dispersion relation (ω vs k) and the dissipation rate of turbulence.

An interesting result is that this dissipation rate at small scales, but larger than the ion inertial length, seem to be larger than the random sweeping and eddy turnover time.

The manuscript is of interest. The authors need to improve the writing a little.

Particular suggestions (in [1])

Printer-friendly version

Discussion paper



Abstract:

... yielding [] the result that the decay rate on spatial scales of about 1000 km (about 10 times larger than the ion inertial length) [which] is higher ...

... of plasma physical (and not fluid mechanical) [processes].

Introduction

... [A] Fourier representation of the two-time[] two-point...

... [Our] experimental access ...

... [For] the goal of measuring the ...

... Taylor's frozen-in hypothesis in the spectral domain [(Taylor 1938)].

Breit-Wigner spectrum

... One may extend the frequencies from the real numbers (as oscillatory part)[] to the complex numbers ...

... rate \sim) [is] ...

... frequency ~ 0 is given as $f_{BW} = 2/\pi\gamma$, so that the] half-value of the peak is and [the] half-value width is realized when the decay rate \sim satisfies the condition

Streamwise wavenumber-frequency spectrum

... of [xxx] and a frequency of [xxx]. The spectral extension is almost linear, and the slope of the extension (the propagation speed estimated [] from the ratio of the frequency to the wavenumber) roughly agrees with the mean flow speed, [xxx] km/s ...

... broadening is a function [of wavenumber].

Please explain better how the stream wavenumber-frequency spectrum is constructed. In particular, how many spacecrafts are used? What is the time resolution of the data? etc. This would make the manuscript more self-consistent. When constructing this

spectrum, is it possible to construct the stream wavenumber-frequency spectrum in normalized form with the local value of Ω and V_A ?

Fitting to the Breit-Wigner spectrum

... [A] fluctuation amplitude of 0.2

... lifetime of the fluctuation components is shorter [than that of] fluid turbulence ...

What are the meaning of these 2 sentences:

Interpretation as fluid picture. Doppler shift and Breit-Wigner type broadening rough estimate of mapping quality of Taylor's hypothesis

Some missing sentences?

Please put the fitting errors in Fig. 6 and in the comparison with particular wave modes (whistlers or kinetic Alfvén) in the previous reply. I believe that a nominal value for Ω and V_A was used? How much do they vary in this interval. A factor of 2?

What is the value of the proton Larmor gyroradius. Can it be placed in Fig. 6? Does it vary much?

Discussion and Outlook

... the invariance of the spectral index is not [yet] guaranteed ...

Interactive comment on Nonlin. Processes Geophys. Discuss., <https://doi.org/10.5194/npg-2017-24>, 2017.