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**Sahraoui *et al.* Reply:** In the preceding comment [1], Alexandrova, Bale, and Lacombe (ABL) argue that (1) the observations reported in Ref. [2] (S09) contained foreshock electrons, (2) the foreshock spectra follow a  $f^{-7/3}$  scaling and have a knee near  $f_{\rho_e}$ , and (3) the SW spectra are steeper, curved (i.e., have no break), and follow an exponential-like law [3,4]. Claim 1, although correct, was already discussed in Refs. [3,5,6]. In S09, the satellites spent  $\sim 30\%$  of the total time in the free-streaming SW (see the WHISPER and PEACE data in Figs. 1(a) and 1(b) of ABL). Claim 2 is incorrect as shown by the counterexamples of Figs. 1(a) and 1(b), showing foreshock spectra steeper than  $-7/3$  with a scaling  $\sim f^{-2.6}$ , no knee, and a close similarity to SW spectra [see Fig. 1(c) and Fig. 1(bottom) in ABL]. Claim 3 is also incorrect as demonstrated by Fig. 1(c) showing a spectrum in the free-streaming SW that is not curved near  $f_{\rho_e}$ , but rather has a clear break. This spectra characteristic has been confirmed by hundreds of spectra in a ten year survey of Cluster SW data [6,7]. Some of the authors themselves reported in Ref. [4] that 30% of the analyzed spectra were consistent with the break model used in S09. Figure 1 and the results of Ref. [6] invalidate the main ABL claims and rather indicate a lack of universality of electron scale turbulence. We emphasize that the presence of a break rather than a curvature near  $f_{\rho_e}$  is in agreement with several theoretical or numerical predictions [8–12], not cited in ABL or in Ref. [4]. The curvature reported near  $f_{\rho_e}$  may indeed result from, or be enhanced by, several instrumental

artifacts, e.g., the subtraction of the instrument sensitivity from the spectra with low signal-to-noise-ratio done in Ref. [3] or the smoothing of breaks by time or frequency averaging [6].

The noise above a few hertz in the  $E_y$  spectrum of S09 was discussed therein, where we warned that scales  $k\rho_i \gtrsim 20$  in Fig. 6 are not reliable. With the parameters given in S09,  $f_{\rho_i} \sim 0.4$  Hz and  $\theta_{kv} = 50^\circ$ ,  $k\rho_i \sim 20$  corresponds to  $f \sim 5$  Hz, where the spectrum hits the noise of the electric field instrument.

We recall that the scaling above  $f_{\rho_e}$  is only tangential to the major result reported in S09: the first evidence of a cascade at electron scales dominated by kinetic alfvén wave turbulence. This result has been confirmed since by several other studies (e.g. Refs. [7,13]), and is now widely accepted as a major feature of SW turbulence.

We conclude that the scaling of the energy spectra and the physics reported in S09 are representative of SW turbulence. The intermittent presence of a knee near  $f_{\rho_e}$  in the data of S09 is only tangential and is reported both in the SW [see Fig. 1(d)] and in the foreshock. The strong claim in ABL on “what should be the scaling of the spectra in the foreshock and in the SW,” which recalls those on universality claimed in Ref. [3], is contradicted by the data of Fig. 1 and the results of Ref. [6].

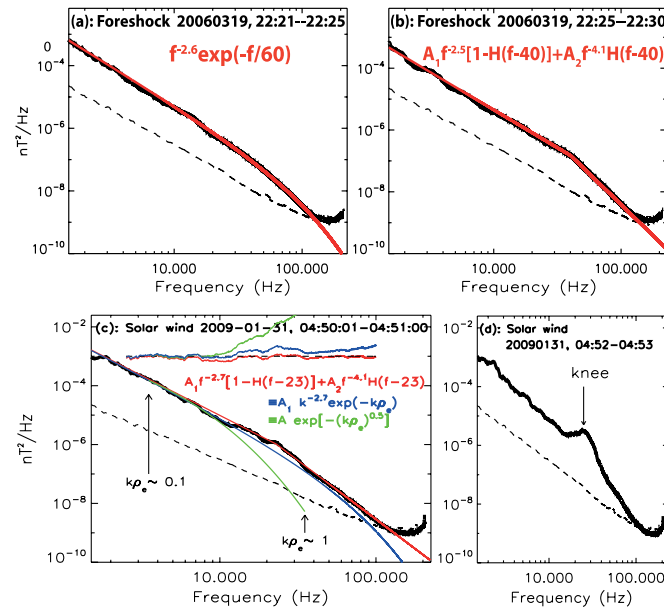


FIG. 1 (color online). Magnetic spectra in the foreshock showing no knee that are well fit by an exponential (a) or by a break model (b), and in the SW showing a clear break (c) and a knee (d). The compensated spectra in (c) show that the break model (red) fits the spectrum better than do the curved models of Refs. [3,4] (green and blue).

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