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Interactive comment on "The current sheet flapping motions induced by non-adiabatic ions: case study" *by* Xinhua Wei et al.

Anonymous Referee #1

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Review on "The current sheet flapping motion. . ."

First, I should note that this manuscript is the slightly revised version of draft that has been reviewed for possible publication in JGR (several months ago) and, as I understand, has been rejected. During that revision, there were set of important questions that Authors did not try to address. As the current version of the manuscript is almost identical to the previous (rejected from JGR) version, I assume Authors still need to consider following comments and questions:

(A) The theta distribution of ion fluxes (that is shown for quite broad energy range) can demonstrate a simple anisotropy induced by the current sheet motion (i.e., anisotropy related to change of the direction of plasma flow along the current sheet normal direction), and does not relate to a fine structure of a nonadiabatic ion velocity distribution.

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Much more work is needed to prove that Authors indeed observe some nonadiabatic ions and to properly remove the effect of flapping motion from observed ion distributions. To make a final conclusion about presence of nonadiabatic ions, Authors have to show ion velocity distributions in the current sheet reference frame and these distributions should be similar to model predictions for nonadiabatic ions (see, e.g., ion distrobutions in Burkhart et al. 1992 doi:10.1029/92JA00495 or Sitnov et al. 2004 doi:10.1029/2003JA010123).

(B) Antisymmetric shear in the current sheet occurs due to field-aligned currents with a proper polarity and spatial distribution, i.e. Bx∼By relation does not guarantee any shear but can be due to flaring effect (a coordinate system rotation). To prove that there is an antisymmetric shear, Authors should reconstruct the local coordinate system (LMN) and plot Bm(Bl) hodograph.

(C) The symmetrical shear means that By maximizes at the Bx reversal... I do not see this effect in the shown three events.

(D) Note, there is no theory showing that the asymmetry of nonadiabatic ion sources can induce the flapping motion. Cited Malova et al. 2007 study describes the stationary asymmetric current sheet model and, to my best knowledge, there is no simulation showing that the flapping can appear in this model.

(E) The discussion about By effects on the noadiabatic ion motion is based on several publications by Delcourt et al., but all these papers (as well as many other studied related to this topic) deal with the constant By... whereas Authors show observations with By strong varying and reversing around equatorial plane.

(F) In the last event, the field Bz almost vanishes around the equatorial plane... how can one calculate kappa parameter for so small and fluctuating Bz? This is important to show that the curvature of magnetic field lines can be reliably estimates for such events.

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