

## ***Interactive comment on “Resolution dependence of magnetosheath waves in global hybrid-Vlasov simulations” by Maxime Dubart et al.***

### **Anonymous Referee #1**

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Review of “Resolution dependence of magnetosheath waves in global hybrid-Vlasov simulations” by Dubart, Ganse, Osmane, Johlander, Battarbee, Grandin, Pfau-Kempf, Turc and Palmroth The authors have written an article about a long-standing problem of whether mirror modes or ion cyclotron waves should dominate in the Earth’s magnetosheath. This topic has a long history and there have been many papers (which were not referenced) on this topic. However more importantly, there have been some recent works that appear to have solved the problem. These papers unfortunately supercede the work that you have done. I therefore cannot accept your work to AG in anything resembling the present version. I will try to guide you to do some reading to catch up on the topic and perhaps redo your work to make a contribution to the literature. Major Comments: Two papers which address this issue of mirror

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mode/ion cyclotron waves are: JGR, 114, A10203, doi:10.1029/2008JA014038, 2009 and JGRSP, 118, 785-793, 2013. Then a paper critical to the 2013 paper: JGR, 121, 5350–5365, doi:10.1002/2016JA022429, 2016. This was followed by a comment and reply: JGRSP, 122, 745–747, doi:10.1002/2016JA023148, 2017; JGRSP, 122, 748–752, doi:10.1002/2016JA023452, 2017.

The authors should also cite some of the earlier papers quoted in the 2009 and 2013 papers that address the issue of MM/EMIC growth rates. This will give more context to your work. These earlier papers state that the growth rate of the ion cyclotron wave is higher than the MM waves, contrary to your results. You will need to reconcile this point as well.

Minor Comments. The second sentence in the abstract may be incorrect. Please note that there are electron cyclotron waves in the magnetosheath called lion roars. Three references to this mode are: JGR, 81, 2261, 1976; JGR, 103, A3, 4615-4626, 1998; AnnGeo, 17, 1528-1534, 1999. Abstract lines 5-6. The authors should realize that ion cyclotron waves have been detected in the Earth's magnetosheath, perhaps under the right plasma circumstances: in Space Weather Study Using Multipoint Techniques, edited by L.-H. Lyu, Pergamon, 97, 2002. So the plasma conditions are necessary to take under consideration to determine what wave mode will grow. Two recent reviews on MM waves are: NPG, 17, 467-479, 2010 and JGR, 116, A02103, doi:10.1029/2010JA015913, 2011. Line 29. MM waves have also been detected at Jupiter's and Saturn's magnetosheaths as well. There are many references to this, including the original 1982 paper. Line 30: See introduction of 2011 JGR paper for more references to MM detection in interplanetary space (solar wind), in the Earth's geotail, and at comets. MMs have also been detected at heliopause. These references should be included. Line 255. I suggest that you add more references to some of the earlier work that focused on the issue of the growth of the two competing modes. This was mentioned earlier.

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