Reply to SC1

We greatly thank the UCL/MSSL plasma group for the valuable comments and suggestions that we tried to consider in the re-submission. We have revised and improved the manuscript in response to the comments. All revised parts are marked in red in the text. Detailed answers to the comments are listed below.

Interactive comment on "A new method to identify flux ropes in space plasmas" by Shiyong Huang et al.

1. The specific method seems simple but rather non-convincing since it will probably work for one specific type of flux rope model which is used to determine the Test Function to be Correlated (TFC). There are studies in the literature, where flux rope signatures were identified in CME structures with a lot more input models.

Thanks for your comments. In our method, we utilized the non-force-free model based the fact that most of flux ropes are not consistent to the fore-free model (may be close to quasi force-free). Our method can be also applied easily to other flux rope models.

2. The specific method does not consider plasma data for the flux rope identification. When analysing Cluster observations, due to the highly inclined orbit of the spacecraft and the flapping motion of the magnetotail, it is possible to get magnetic field signatures that are similar to those predicted by the model but in reality are not related to a flux rope.

We proposed the method to identify flux rope only using the magnetic field data from single spacecraft in our paper because the plasma measurements are not available sometimes for many spacecraft in the planet's magnetosphere. We agree with you that the spacecraft can detect some magnetic field signatures caused by the flapping motion of the magnetotail and highly inclined orbit. One can combine with plasma data to rule out some magnetic structures from the detection if the plasma data is available.

*3. The paper does not mention which correlation coefficient is considered. If the Pearson correlation coefficient is calculated, then the study detects the times when there is a linear relation between the data and the TFC such as: data=A*TFC+B (where A and B constants). It is not clear in the paper that this relation is expected. If the purpose is to identify E-R flux ropes features in the data, then why not fitting the specific functions instead of correlating them? It is important to note that maximizing the correlation coefficient is not a fitting method but investigation of the linear relation between the data and the TFC.*

We agree with your comments. We calculated the Pearson correlation coefficients in our method, which is different with the fitting on the signal. It is considered that the magnetic structures can be identified as flux ropes when the correlation coefficients are close to 1. Since we want to identify possible flux ropes from big database and the huge time is required to fit the flux rope mode with the data, we choose to calculate the correlation coefficients that require shorter time.

We revised the introduction of the method in the new version of the manuscript

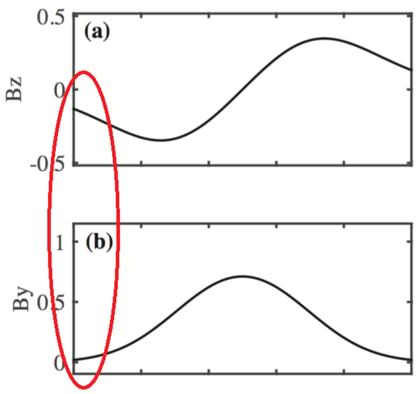
accordingly.

4. How does the path of the spacecraft affect the results? Is the TFC constructed considering only one path of the spacecraft through the flux rope? Then, it is not clear how the results will not be biased due to that. For example, if different path is considered for the same flux rope, what will the method derive and how the correlation coefficients will be affected.

Considering the symmetric of the flux rope model, the different path of the spacecraft will affect the amplitudes and the scale of the TFC. However, this would not affect to identify the flux ropes in our method, but only bring some small errors on the calculation of the scales.

5. As shown in the paper (Figure 3), the TFC is a "part" of the ideal model shown in Figure 2. More specifically, TFC does not include the "edges" where the B field drops to zero. Under which criteria the specific part of the ideal model is selected. How this selection affects the determined scales?

As show below, TFC didn't include the edge when B_z is zero, but include the edge when B_z and B_y is close to 0. Actually, B_y is hard to reach zero in the real signal. Thus, we choose one appropriate TFC to identify the flux ropes. The scales are determined by the parameter r in the E-R model. If r is set, the edge of TFC will not affect the determination of the scale in our method.



6. The method correlates the signatures of two components and the total magnitude. Does it matter which two of the three components you use?

We used the bipolar variation component and core field component in the method. In the magnetotail, bipolar variation component is usually B_z, and core field component is B_y.

7. As mentioned in the paper, the correlation coefficient could be very large at small scales. Does the study consider the statistical significance of those coefficients? It is also mentioned that the method will be improved in order to be applied to data-sets in the turbulent magnetosheath. Is there a specific plan for the future?

We didn't consider the statistical significance of those coefficients. We considered two ways in order to apply our method in the turbulent plasma: 1) all correlation coefficients of two components and the amplitude of magnetic field should be high (larger than the given threshold) at the same time and the same scale; 2) set the threshold

for the amplitude and the scale. If the amplitude is too small, the magnetic structures will be not selected as flux rope.

We plan to statistically survey and investigate the scales and global distribution of flux ropes in the magnetosheath using MMS data.

Minor point: It probably worth adding references to previous studies that have used maximizing the correlation coefficient methods.

Thanks for your suggestions. We added some references there.