

# Properties of Foreshock Compressive Structures and their Relation with Jet-like Structures in the Magnetosheath

**Niki Xirogiannopoulou**, O. Goncharov, J. Safrankova,  
Z. Nemecek, A. Salohub

Contact: [niki@aurora.troja.mff.cuni.cz](mailto:niki@aurora.troja.mff.cuni.cz)

Charles University, Faculty of Mathematics and Physics, Prague, CZ  
EGU General Assembly, May 2022



FACULTY  
OF MATHEMATICS  
AND PHYSICS  
Charles University

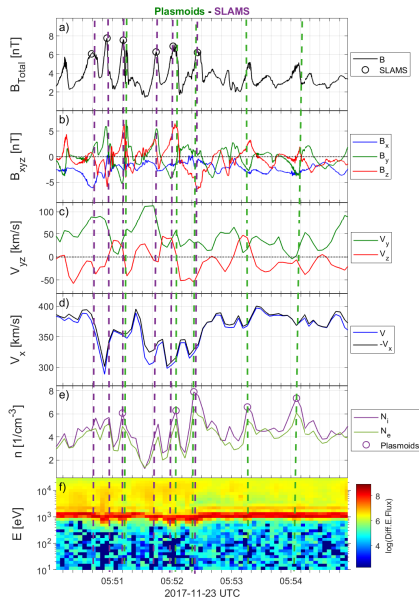


# Outline

- ▶ Data Collection & Information
- ▶ Evolution of basic parametres
- ▶ Occurrence Rate
- ▶ Conclusion

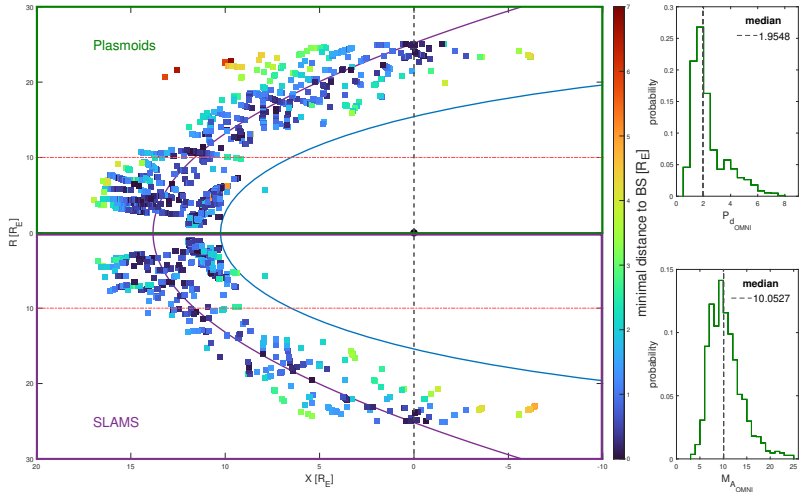
# Data Collection

- ▶ Data collected by MMS in foreshock regions between October 2015 - March 2018.
- ▶ Criteria
  1. 1348 Plasmoids were detected by Karlsson et al. 2012 criterion for the MSH plasmoids ( $N > 1.5N_0$ ).
  2. 1276 SLAMS obtained from Carl Foghammar Nömtak & Tomas Karlsson dataset, reduced to SLAMS exclusively in foreshock regions ( $B > 2B_0$ ).
- ▶ In our analysis, we used high resolution OMNI data and median values inside the structures with 3' median values around the structures.
- ▶ Approximately  $\sim 50\%$  of the datasets overlap.



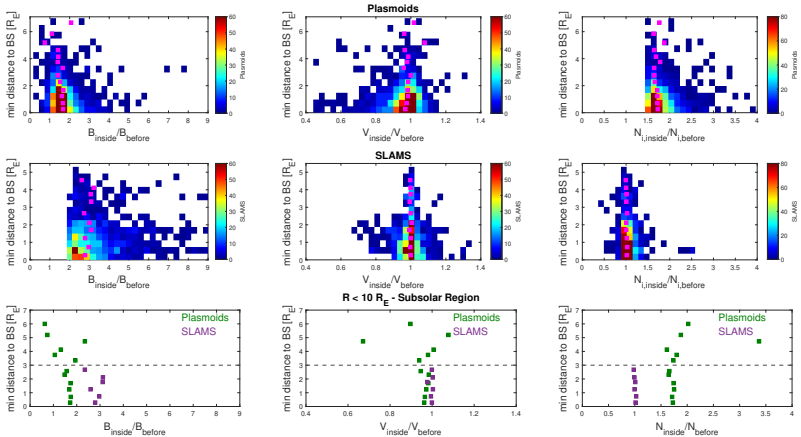
# Location of Structures

- ▶ The structures appear in different foreshock regions, from the subsolar point up to the flanks, in high variety of the solar wind dynamic pressure and Alfvénic Mach numbers.



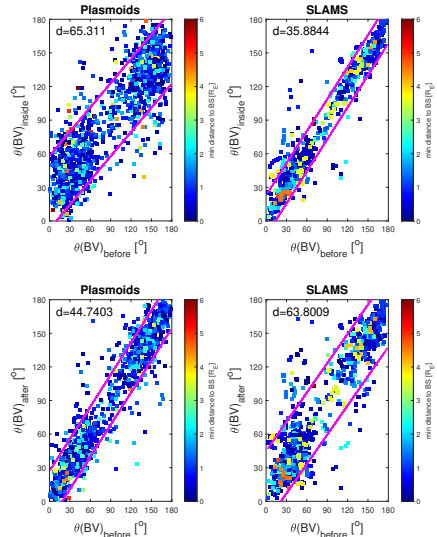
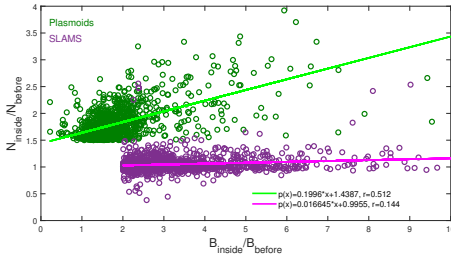
# Evolution of Plasmoids & SLAMS I

- ▶ Previous studies: paramagnetic plasmoids associated with SLAMS, one of the main sources of MSH jets.
- ▶ In contrast to SLAMS, paramagnetic plasmoids observed far away from the BS and slow down as they approach the bow shock.
- ▶ In the subsolar region, the evolution of both structures is quite similar, but only below  $\simeq 3R_E$ .



# Evolution of Plasmoids & SLAMS II

- ▶ In contrast to SLAMS, plasmoids manifest a good correlation between the relative changes of B and N.
- ▶ Higher changes in the angles between B and V inside plasmoids and their lower effect on surrounding foreshock, contrary to SLAMS, may be connected with different generation mechanisms.





# Summary & Conclusion

Our analysis of the 1348 plasmoids and 1276 SLAMS in the foreshock regions from the subsolar point up to flanks showed:

- ▶ Differences in evolution of plasmoids and SLAMS.
  - Evolution of plasmoids is highly affected by the distance to BS.
- ▶ The occurrence rate of the structures is affected by the solar wind modification in the foreshock.
  - The occurrence rate of plasmoids increases closer to the BS in denser and more magnetised foreshock.
  - Our analysis is in agreement with previous studies as far as pristine solar wind is concerned, but when the solar wind interacts with the foreshock the preferable conditions for the creation of the structures differs substantially.
- ▶ Overall, more detailed analysis of the plasmoid and SLAMS, their generation and connection with MSH jets is necessary and will be done in near future.
  - A significant question that rises is whether pristine solar wind or foreshock should be considered as the upstream parameters for the creation of MSH jets.

Thank you for your attention.