

Project Details

ROSES ID: NNH19ZDA001N

Selection Year: 2019

Program Element: Focused Science Topic

Topic: Fast Reconnection Onset

Project Title:

The role of O⁺ on reconnection onset in the Earth's magnetotail

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Project Member(s):

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Summary:

The goal of this proposal is to address the effects of multi-scales on the onset of collisionless magnetic reconnection in the earth's magnetotail, introduced by the presence of O⁺ of ionospheric origin, using a tandem of state-of-the-art kinetic simulations and in-situ observations from MMS and CLUSTER. The proposed work will contribute understanding of the following issues : i) effects of ionospheric outflows of O⁺ in the tail pressure build-up and reconnection onset in the magnetotail; ii) the role of O⁺ ions in the formation of multiple islands in the magnetotail, and in the structure of magnetic separatrices; iii) the influence of O⁺ on the reconnection rate.

For the first time 3D multi-species global hybrid simulations will be used to simulate the effects of the ionospheric outflows to the global magnetosphere and in particular how those affect reconnection in the earth's magnetotail. The proposed simulation model/experiments should be viewed as a kinetic model that will capture the most important aspects of global ion dynamics correctly and will enable the analysis of global-local coupling and the influence of O⁺ on the processes of current sheet formation and reconnection onset with a degree of realism that goes far beyond the previous (notably MHD) simulations of similar effects.

This work will provide for the first time insight how the global and local multi-scales interact in the earth's plasma sheet and how this interaction affects the dynamics of the magnetotail.

Publication References:

Summary: Blah

Reference: Omelchenko Y. A. , C. Mouikis, J. Ng, V. Roytershteyn and L-J Chen (2023), Multiscale hybrid modeling of the impact response of the Earth's magnetotail to ionospheric O⁺ outflow. Front. Astron. Space Sci. 10:1056497. doi: 10.3389/fspas.2023.1056497

- **Investigation Type:** Other Investigations
- Blah

Summary: Blah

Reference: Ardakani, A. (2023), Influence of O⁺ on Onset and Energy Release in the Earth's Magnetotail, PhD Thesis, University of New Hampshire

- **Investigation Type:** Other Investigations
- Blah