

Jiannan Tu

Space Science Laboratory, University of Massachusetts Lowell

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Research Professor

Strong background in physics and electromagnetics, excellent skills in C/C++, Python, MATLAB programming languages, and software engineering. Experienced in fluid and electromagnetic modeling, data analysis and data visualization. Served and serving as Principal Investigator or Co-Investigator for various research projects, leading the team and instructing graduate students and postdoc researchers.

Skills

C/C++, Python, MATLAB programming, MS Visual Studio, Advanced Statistical Analysis, Data visualization, High performance computing

Magnetohydrodynamic Modeling, FDTD, Computational fluid dynamics, computational electromagnetics

Excellent communication, presentation and writing skills, problem-solving oriented and self-motivated.

Education

Ph.D. in physics

University of Alabama in Huntsville – Huntsville, AL

Master's degree in electrical engineering

University of Electronic Science and Technology – Chengdu, China

Bachelor's degree in electrical engineering

Zhejiang University – Hangzhou, China

Work Experience

Research Professor

University of Massachusetts - Lowell, MA

November 2012 -

- Develop electromagnetic simulation models of the Earth's ionosphere-thermosphere, using cutting edge high-performance computing techniques.
- Conducted theoretical investigations and statistical data analysis of very low frequency wave transmission experiments from the Air Force Research Laboratory's DSX satellite. Discovered frequency dependence of very low-frequency antenna resistance in space plasma and resolved outstanding issues about VLF wave transmission in magnetized plasma.
- Lead or co-lead more than ten research projects funded by the NASA, NSF, and Air Force Office of Research, as Principal Investigator or Co-Investigator

- Advise Ph.D. students and postdoctoral research fellows.
- Serve as an associate editor for Journal of Geophysical Research -Space Physics.

Assistant Research Professor

University of Massachusetts - Lowell, MA
October 2008 to October 2012

- Developed numerical simulation models to investigate ionosphere/thermosphere dynamics.
- Provided new prospects for understanding the magnetosphere-ionosphere coupling.
- Advised Ph.D. students to analyze IMAGE satellite data as part of their Ph.D. thesis.

Research Associate

University of Massachusetts - Lowell, MA
June 2005 to September 2008

- Designed and implemented a full particle simulation model for studying radio frequency antenna in plasma.
- Investigated plasma-antenna interactions and plasma sheath structures around a high-voltage antenna in plasma using particle simulations.

Postdoctoral Research Fellow

University of Massachusetts - Lowell, MA
June 2004 to May 2005

- Developed several data analysis programs.
- Obtained first plasma density images of middle- and high-latitude magnetosphere (an image from the published paper is presented as one of the figures on the book cover: Magnetospheric Imaging, Elsevier Press, 2021)

Selected Publications

- Song, P., J. Tu, S. W. H. Cowley, C. Wang and H. Li, How stellar winds reach supersonic speed, *Monthly Notices of the Royal Astronomical Society*, 540(4), 2975–2990, <https://doi.org/10.1093/mnras/staf771>, 2025
- Tu, J., P. Song, I. A. Galkin, B. W. Reinisch, W. R. Johnston, M. J. Starks, et al., Whistler-mode transmission experiments in the radiation belts: DSX TNT circuit simulation and data analysis, *Journal Geophysical Research - Space Physics*, 128(4). <https://doi.org/10.1029/2022JA030564>, 2023
- Song, P., J. Tu, I. A. Galkin, J. P. McCollough et al., Discovery and insights from DSX mission's high-power VLF wave transmission experiments in the radiation belts, *Nature Scientific Reports*, 12, 14304. <https://doi.org/10.1038/541598-022-185429-2>, 2022
- Tu, J., and P. Song, On the momentum transfer from high to equatorial latitudes, *Journal Geophysical Research - Space Physics*, 124. <https://doi.org/10.1029/2019JA026760>, 2019
- Tu, J., and P. Song, A two-dimensional global simulation study of inductive-dynamic magnetosphere-ionosphere coupling, *Journal Geophysical Research - Space Physics*, 121. <https://doi.org/10.1002/2016JA023393>, 2016

- Tu, J., P. Song, and V. M. Vasyliunas, Inductive-dynamic magnetosphere-ionosphere coupling via MHD waves, *Journal Geophysical Research*, 119. <https://doi.org/10.1002/2013JA018982>, 2014
- Tu, J., and P. Song, A study of Alfvén wave propagation and heating the chromosphere, *Astrophysical Journal*, 777:53, <https://doi.org/10.1088/0004-637X/777/1/53>, 2013
- Tu, J., P. Song, and V. M. Vasyliunas, Ionosphere/thermosphere heating determined from dynamic magnetosphere-ionosphere/thermosphere coupling, *Journal Geophysical Research*, 116, A09311. <https://doi.org/10.1029/2011JA016620>, 2011
- Tu, J., P. Song, and B. W. Reinisch, Plasma sheath around a radio frequency antenna, *Journal Geophysical Research*, 113, A07223. <https://doi.org/10.1029/2008JA013097>, 2008
- Tu, J., P. Song, and B. W. Reinisch, On the concept of penetration electric field, in *Radio Sounding and Plasma Physics*, edited by P. Song et al., *American Institute of Physics Conference Proceedings*, vol.974, pp. 81-85. <https://doi.org/10.1063/1.2885036>, 2008

Groups

American Geophysical Union

November 2000 to Present

Massachusetts Teacher's Associate

August 2008 to Present

Volunteering Experience

Mar 2023 - present

Email account services for New England Chinese Information and Networking Association (NECINA)