

邹正洋

学术简历

联系方式

助理教授 (Assistant Professor)

月球与行星科学国家重点实验室

澳门科技大学, 中国澳门

出生年月: 1989.06.8

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ResearchGate 网页: https://www.researchgate.net/profile/Zhengyang_Zou

教育经历

- 2012.1–2017.12 **硕博连读**, 武汉大学电子信息学院空间物理系
研究方向: 短波无线电探测系统, 磁层物理学
导师: 赵正予 (硕导), 倪彬彬 (博导)
博士论文: 地球辐射带和等离子体片电子分布观测与模拟
- 2016.9–2017.5 **国际交换生**, 德国地球科学中心地球磁场部
研究方向: 磁层物理学
导师: Y.Shprits教授
- 2008.9–2012.6 **本科**, 武汉科技学院电子信息工程系
电子信息工程专业

工作经历

- 2021.1–至今 **助理教授**
澳门科技大学月球与行星国家重点实验室
研究方向: 内磁层物理, 空间大数据
- 2018.7–2020.12 **博士后**
哈尔滨工业大学空间科学与应用技术研究院
合作导师: 魏奉思 院士
研究方向: 地球辐射带物理

教学经历

2021下半学期 研究生课程（空间大数据专业）：

- 大数据基本算法
- 空间大数据高级专题

澳门科技大学月球与行星国家重点实验室

学术奖励

2016 武汉大学学术创新奖

2015 武汉大学研究生一等奖学金

武汉大学集泰学术奖学金

科研兴趣

1. 太阳风与地球磁层耦合

- 辐射带相对论电子受太阳风CME和CIR事件的加速作用
- 行星际激波引起的地球磁场压缩对于辐射带高能电子的加速和损失作用
- 不同地磁条件和太阳风条件下地球内磁层ELF/VLF波动的分布和动态演化

2. 地球辐射带高能电子动力学模拟

- 基于准线性理论和试验粒子模拟方法的辐射带波粒相互作用建模
- 基于二维和三维福克-普朗克偏微分方程的辐射带高能电子动态演化建模

3. 地球磁层等离子体数据驱动模型

- 基于深度学习的地球辐射带和等离子体片高能电子的数据驱动模型
- 基于机器学习方法的地球内磁层等离子体动态演化预报

科研技能

1. 卫星和雷达数据的处理和分析

- a) 针对风云系列, Van Allen Probes, THEMIS等卫星电磁场、带电粒子数据的获取、处理与分析。
- b) 对于短波电离层探测系统的天线（雷达）仿真、系统调试以及回波信号的接收与分析。

2. 空间等离子体以及波动的建模

- a) 辐射带高能电子以及等离子体波动的经验建模。
- b) 基于波粒相互作用理论、test particle方法以及三维福克-普朗克方程的辐射带高能电子动态演化建模。

3. 基于机器学习方法的空间大数据建模

- a) 利用深度学习方法的多参量建模，包轮CNN，RNN解决拟合和分类问题。
- b) 利用PCA, SVM等大数据处理技术的空间数据处理。

科研项目

邹正洋，“非磁暴期间地球辐射带相对论电子的动态演化研究”，澳门科学发展基金（正在审核中）。

左平兵, 邹正洋等, “太阳高能粒子在近日冕区域的加速过程研究”, 广东省自然科学基金, 2019A1515011067, 2020-2022.

付松, 邹正洋等, “地球辐射带内磁声波的波粒相互作用研究”, 国家自然科学基金, 41704162, 2018-2020.

倪彬彬, 邹正洋等, “基于多卫星观测的地球辐射带电子相空间密度时空分布特性研究”, 国家自然科学基金, 41674163, 2017-2020.

石润, 邹正洋等, “基于经典Kennel-Petschek理论的等离子体层嘶声激发机制研究”, 国家自然科学基金, 41674162, 2017-2020.

顾旭东, 邹正洋等, “地球磁层电子回旋谐波与哨声波合声的关联性分析及物理机制研究”, 国家自然科学基金, 41574160, 2016-2019.

倪彬彬, 邹正洋等, “地球磁层准线性共振波粒相互作用的热等离子体效应研究”, 国家自然科学基金, 41474141, 2015-2018.

陈罡, 邹正洋等, “重力波驱动中纬度Es层场向不均匀体研究”, 国家自然科学基金 41474132, 2015-2018.

科研文章

1. **Zhengyang Zou**, Geng Wang, Pingbing Zuo et al. (2021), Evidence of Wave-wave Coupling Between Frequency Harmonic Bands of Magnetosonic Waves. *Plasma of Phys.* (本人一作, 正在审稿)
2. **Zhengyang Zou**, Yuri Shprits, Binbin Ni, Nikita Aseev, Pingbing Zuo and Fengsi Wei (2020), An Artificial Neural Network Model of Electron Fluxes in The Earth's Central Plasma Sheet: A THEMIS Survey. *Astrophys. Space. Sci.*, 365, 100. doi: 10.1007/s10509-020-03819-0. (本人一作, **SCI 3区**)
3. **Zhengyang Zou**, Pingbing Zuo, Binbin Ni, Zhonglei Gao, Geng Wang, Zhengyu Zhao, Xueshang Feng, and Fengsi Wei (2020), Two-step dropouts of radiation belt electron phase space density induced by a magnetic cloud event, *Astrophys. J. Lett.*, 895(1), L24. doi:10.3847/2041-8213/ab9179. (本人一作, **SCI 1区顶级期刊**)
4. **Zhengyang Zou**, Pingbing Zuo, Binbin Ni, Fengsi Wei, Xing Cao, Song Fu, Sudong Gu, Zhengyu Zhao (2019), Wave Normal Angle Distribution of Fast Magnetosonic Waves: A Survey of Van Allen Probes EMFISIS Observations. *J. Geophys. Res: Space Phys*, doi:10.1029/2019JA026556. (本人一作, **SCI 2区**)
5. Zhonglei Gao, Xiongjun Shang, Pingbing Zuo, **Zhengyang Zou**, Geng Wang, Xueshang Feng, Chunyi Guan and Fengsi Wei (2020), Lag-correlated rising tones of electron cyclotron harmonic and whistler-mode upper-band chorus waves, *Plasma of Phys*, doi: 10.1063/5.0008812.
6. Zhonglei Gao, **Zhengyang Zou**, Pingbing Zuo, Yi Wang, Zhaoguo He, and Fengsi Wei (2019), Low-

frequency hiss-like whistler-mode waves generated by nonlinear three-wave interactions outside the plasmasphere, *Plasma of Phys*, doi: 10.1063/1.5115542.

7. Binbin Ni, **Zhengyang Zou**, Song Fu, Xing Cao, Xudong Gu, and Zheng Xiang (2018), Resonant Scattering of Radiation Belt Electrons by Off-Equatorial Magnetosonic Waves, *Geophys. Res. Lett.*, 43, doi: 10.1002/2017GL075788. (导师一作本人二作, SCI 1区顶级期刊)
8. Binbin Ni, **Zhengyang Zou**, Xinlin Li, Jacob Bortnik, Lun Xie, and Xudong Gu (2016), Occurrence characteristics of outer zone relativistic electron butterfly distribution: A survey of Van Allen Probes REPT measurements, *Geophys. Res. Lett.*, 43, doi:10.1002/2016GL069350. (导师一作本人二作, SCI 1区顶级期刊)
9. Binbin Ni, **Zhengyang Zou**, Xudong Gu, Chen Zhou, Richard M. Thorne, Jacob Bortnik, Run Shi, Zhengyu Zhao, Daniel N. Baker, Shrikhanth G. Kanekal, Harlan E. Spence, Geoffrey D. Reeves, Xinlin Li (2015), Variability of the pitch angle distribution of radiation belt ultrarelativistic electrons during and following intense geomagnetic storms: Van Allen Probes observations. *J. Geophys. Res: Space Phys*, doi: 10.1002/2015JA021065. (导师一作本人二作, SCI 2区)
10. Binbin Ni, Xing Cao, **Zhengyang Zou**, Chen Zhou, Xudong Gu, Jacob Bortnik, Jichun Zhang, Song Fu, Zhengyu Zhao, Run Shi, and Lun Xie (2015), *J. Geophys. Res: Space Phys*, doi: 10.1002/2015JA021466
11. Xing Cao, Binbin Ni, Danny Summers, **Zhengyang Zou**, Song Fu, and Wenxun Zhang (2017), Bounce resonance scattering of radiation belt electrons by low-frequency hiss: comparison with cyclotron and landau resonances, *Geophys. Res. Lett.*, doi: 10.1002/2017GL075104.
12. Wenxun Zhang, Song Fu, Xudong Gu, Binbin Ni, Zheng Xiang, Danny Summers, **Zhengyang Zou**, Xing Cao, Yuequn Lou, and Man Hua (2018), Electron scattering by plasmaspheric hiss in a nightside plume, *Geophys. Res. Lett.*, doi: 10.1002/2018GL077212.
13. Yuequn Lou, Xudong Gu, Danny Summers, Binbin Ni, Kaijun Liu, Song Fu, Zheng Xiang, **Zhengyang Zou**, Xing Cao, Wenxun Zhang, He Huang, and Ying He (2018), Statistical distributions of dayside ECH waves observations by MMS, *Geophys. Res. Lett.*, doi: 10.1002/2018GL0801252.
14. Yang Zhang, Binbin Ni, Zheng Xiang, Xianguo Zhang, Xiaoxin Zhang, Xudong Gu, Song Fu, Xing Cao, and **Zhengyang Zou** (2018), Inter-satellite calibration of Fengyun 3 medium energy electron fluxes with POES electron measurements, *Adv Space Res.*, doi: 10.1016/j.asr.2018.02.017.
15. Yang Zhang, Run Shi, Binbin Ni, Xudong Gu, Xianguo Zhang, Pingbing Zuo, Song Fu, Zheng Xiang, Qi Wang, Xing Cao, and **Zhengyang Zou** (2016), Inferring electromagnetic ion cyclotron wave intensity from low altitude POES proton flux measurements: A detailed case study with conjugate Van Allen Probes observations, *Adv Space Res.*, doi: 10.1016/j.asr.2016.12.035.
16. Zheng Xiang, Binbin Ni, Chen Zhou, **Zhengyang Zou**, Xudong Gu, Zhengyu Zhao, Xianguo Zhang, Xiaoxin Zhang, Shenyi Zhang, Xinlin Li, Pingbing Zuo, Harlan Spence, and Geoffrey Reeves (2016), Multi-satellite simultaneous observations of magnetopause and atmospheric losses of radiation belt electrons during an intense solar wind dynamic pressure pulse, *Ann. Geophys.*, 34, 493-509, doi: 10.5194/angeo-34-493-2016.
17. 顾旭东,殷倩,倪彬彬,项正,曹兴,邹正洋,周晨,付松,石润,赵正予,谈家强,王豪,郑程耀,贺丰明 (2017) 基于Van Allen Probes EMFISIS波动仪器观测的内磁层下频带哨声合声波全球分布的统计分析. *地球物理学报*, 60(4), doi: 10.6038/cjg20170401.

18. 顾旭东,殷倩,周若贤,易娟,倪彬彬,项正,曹兴,邹正洋,付松,周晨,石润,赵正予,贺丰明,谈家强,郑程耀,王豪 (2017), A statistical analysis of the global distribution of inner magnetospheric upper-band chorus waves based on VanAllen Probes EMFISIS observations. *地球物理学报*, 60(4), doi: 10.6038/cjg20170402.
19. Zheng Xiang, Jiaqiang Tan, Binbin ni, Xudong gu, Xing Cao, **Zhengyang Zou**, Chen Zhou, Song Fu, Run Shi, Zhengyu Zhao, Fengming He, Chengyao Zheng, Qian Yin, Hao Wang (2017), A statistical analysis of the global distribution of plasmaspheric hiss based on Van Allen Probes wave observations, *Acta Physica Sinica*, doi: 10.7498/aps.66.039401.

学术会议

1. 邹正洋,左平兵等,大数据技术在空间科学研究中的应用,口头报告,第12届全国空间天气学研讨会(2021),四川成都.
2. 邹正洋,左平兵等,快磁声波谐波的首次观测,口头报告,2020中国地球科学年会(2020),重庆.
3. 邹正洋,左平兵,倪彬彬等,基于多层神经网络的地球等离子体片电子通量建模,第18届全国日地空间物理学研讨会(2019),青海西宁.
4. 邹正洋,大数据在空间环境中的应用概述,口头报告,第一届空间大数据与行星科学扰动会议(2019),陕西汉中.
5. 邹正洋, Resonant Scattering of Radiation Belt Electrons by Off-Equatorial Magnetosonic Waves,口头报告,第12届全国空间天气学研讨会(2018),云南西双版纳.
6. 邹正洋,倪彬彬, Global distributions of the energetic electron fluxes in the Earth's Plasmasheet based on THEMIS observations,口头报告,第17届全国日地空间物理学研讨会(2017),山东青岛.
7. 邹正洋 Occurrence characteristics of outer zone relativistic electron butterfly distribution: A survey of Van Allen Probes REPT measurements, 2016亚洲及太平洋空间科学年会,北京
8. 邹正洋 Occurrence characteristics of outer zone relativistic electronbutterfly distribution: A survey of Van Allen Probes REPT measurements, 2015美国地球物理学年会,美国洛杉矶
9. 邹正洋,倪彬彬,基于范阿伦探针观测的地球辐射带超相对论电子分及在强磁暴之后的变化,第16届全国日地空间物理学研讨会(2015),湖南长沙.
10. 邹正洋,倪彬彬,地球辐射带相对论电子的时空演化,口头报告,第9届全国空间天气学研讨会(2014),江苏无锡.

空间大数据高级专题

Advanced Topics in Spatial Big Data Applications

Date & Time: Monday 10:00–12:40 PM (160 mins in total)

Credit: 3

Number of students: 2

Instructor: Zhengyang Zou
Office: A510a-9
Phone: 4312

Grading: Course (30%) + Oral Presentation (70%)

GitHub Repository:

<https://github.com/ZhengyangZou/Advanced-Topics-in-Spatial-Big-Data-Applications-SSI>

Intended Learning Outcomes

This course is to introduce common algorithms in big data analysis. At the end of this course, you will be able to:

1. Master the commonly used big data analysis algorithms in space physics research
2. Applying the big data analysis algorithms into one's research areas

Examination

Every student need give **oral presentation** (ppt, 20-30 mins) on one project including:

1. Big data processes in Space Physics
2. Big data algorithms, machine learning or other data process method in one's research areas
3. Other big data algorithms or machine learning method in website (e.g., git-hub)

References

1. 日地空间物理学, 涂传诒 (1998), 科学技术出版社
2. 等离子体物理, 刘万东 (2002), 中国科学技术大学近代物理系
3. 地球辐射带及等离子体片高能电子观测与模拟, 邹正洋 (2017), 博士毕业论文
4. Machine Learning Techniques for Space Weather, 2018, E. Camporeale, S. Wing, J. Johnson.

Tentative Course Schedule

Module	Date	Contents	Assignment/Project
1	9/6	<i>Introduction to this Course</i>	
2	9/13	<i>Earth's space environment and Earth's radiation belt</i>	
3	9/20	<i>Plasma physics: single particle motion</i>	
4	9/27	<i>Plasma physics: plasma waves</i>	
5	10/4	<i>Traditional Statistical research in radiation belt</i>	
6	10/11	<i>Untangling the Solar Wind Drivers of Radiation Belt</i>	
7	10/18	Emergence of Dynamical Complexity in the Earth's Magnetosphere	
8	10/25	Application of NARMAX to Space Weather	
9	11/1	Probabilistic Forecasting of Geomagnetic Indices Using Gaussian Process Models	
10	11/8	Prediction of MeV Electron Fluxes With Autoregressive Models	
11	11/15	Artificial Neural Network for Magnetospheric Conditions	
12	11/24	Reconstruction of Plasma Electron Density From Satellite Measurement Via Artificial Neural Networks	
13	11/29	Classification of Magnetospheric Particle Distribution Using NN	
14	12/6	Solar Wind Classification Via the K-Means Clustering	
15	12/13	<u>Oral Presentation</u>	