



CHEN Hongru

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Langues : mandarin, anglais, français (B1), japonais (intermédiaire)

Année de naissance : 1988

EXPÉRIENCE PROFESSIONNELLE

04/2021 –

Maitre de conférence (CDI)

Kyushu University, Fukuoka, Japon | Designated National University

- Enseigner les cours mécanique orbitale et ingénierie des satellites
- Chercher indépendamment et guider l'étudiants sur la conception de trajectoires

05/2020 – 12/2021

Chercheuse Affiliée

IMCCE, Observatoire de Paris, Université PSL, France

10/2017 – 04/2020

Chercheuse Postdoctorale

IMCCE, Observatoire de Paris, Université PSL, France | QS44, ARWU38, THE40

- Conception de trajectoires autour de petits corps dans des environnements fortement perturbés | CNES R&T N° R-S18/BS-0005-039
- Radioscience CubeSat pour explorer les petits corps | projet CubeSat ESEP-BIRDY
- Détection de météores et débris spatiaux via CubeSats | projet CubeSat ESEP-Meteorix
- Développement d'un logiciel rapide parallèle d'optimisation de trajectoire dans la modèle haute fidélité (PHITO)

11/2015 – 08/2017

Maitre de conférence (CDI)

Engineering and Technology Center for Space Utilization, Chinese Academy of Sciences (CSU/CAS), Pekin, Chine

- Projet & tutorat : Conception de satellites et de missions, et développement le système CubeSat de positionnement lunaire de la face cachée | CSU advanced studies grant
- Recherche : Utilisation de la perturbation gravitationnelle luni-solaire pour la capture d'astéroïdes ; Trajectoires de phasage dans le problème à trois corps

04/2013 – 09/2015

Chercheuse Conjointe

Institute of Space and Astronautical Science, Japan Aerospace eXploration Agency (ISAS/JAXA), Sagamihara, Japon

- Cours : astronomie spatiale, exploration du système solaire
- Projets : rechercher des astéroïdes accessibles pour PROCYON (lancé) dans des scénarios utilisant un moteur ionique et des aides à la gravité terrestre ; Conception de mission étendue pour DESTINY, etc.
- Thèse de doctorat : «Escape trajectories utilizing unstable manifolds and lunar gravity assists for Sun-Earth halo orbit missions»

04/2010 – 06/2010

Stagiaire

École Nationale Supérieure d'Arts et Métiers, Lille, France

- Thèse de licence : «GPU Parallel Computing avec CUDA»

FORMATION

10/2012 – 09/2015

Doctorat

Kyushu University, Fukuoka, Japon | QS126

- Principales disciplines : mécanique orbitale ; contrôle nonlinéaire | GPA : 2.9/3

10/2010 – 09/2012	Étudiante en recherche Kyushu University, Fukuoka, Japon - Projets : Simulateur de mouvement couplé attitude-orbite; Concours CANSAT Arliss ; Contrôle d'attitude et analyse de mission pour le satellite d'observation des débris in situ IDEA (lancé) - Recherche: «Modélisation de la densité atmosphérique en temps de tempête à l'aide de réseaux de neurones et son application dans la prédiction d'orbite»
09/2006 – 08/2010	Licence Northwestern Polytechnical University (NPU), Xi'an, Chine Programme 985 Principales disciplines : technologies de contrôle, servomoteurs et actionneurs, dynamique de vol GPA : 82/100

BOURSES DE RECHERCHE

04/2022 – 03/2025	«Conception et contrôle d'orbite pour les missions à petit corps non héliocentriques» (PI), JSPS, N°22K14424, 4,550,000 yen.
12/2021 – 11/2022	«Identification et atténuation de l'impact des erreurs d'éphémérides sur les missions à petit corps non héliocentriques» (PI), CASIO Science Promotion Foundation, N°39-27, 100,000 yen.
07/2021 – 03/2022	«Parallel Full-dynamics Propagator and the Application to Orbit Analysis and Design» (PI), Kyushu University Data Science Research Program, 150,000 yen.
10/2018 – 09/2019	« Conception de trajectoires autour de petits corps dans des environnements fortement perturbés » (exécuteur principal), L'activité « Recherche et Technologie » du CNES, N°R-S18/BS-0005-039, 60,000 €
01/2017 – 12/2018	« Système CubeSat pour le positionnement lunaire lointain » (PI), CSU Advanced Studies Program, CSU-QZKT-201711, CN¥220,000

PRIX ET BOURSES

04/2020	Outstanding Paper Award for Young Scientists, Committee on Space Research (COSPAR)
07/2017	Prix du papier exceptionnel, Chinese Society of Astronautics
04/2014	Outstanding Paper Award for Young Scientists, COSPAR
06/2009	Premier prix, Concours d'application et d'expérimentation micro-informatique, NPU
11/2005	Deuxième prix, Olympiade chinoise de physique, Chinese Physical Society
04/2019	Bourse de voyage pour iCubeSat Workshop, Europlanet
07/2018	Bourse de voyage pour Scientific Assembly, COSPAR
10/2014 – 09/2015	Bourse pour les étudiants exceptionnels, Kyushu University
10/2010 – 09/2014	Bourse pour les programmes d'études supérieures à l'étranger, Chinese Scholarship Council
09/2009 – 06/2010	Honneur aux étudiants des "Trois Biens" & Bourse de première classe, NPU

COMPÉTENCES

bonne maîtrise	Matlab/Simulink, C/C++, GIT
maîtrise de base	Python, Fortran, Assembly, VB, STK, HTML, Linux, $\text{\LaTeX}$, MPI, micro-computers

EXPÉRIENCE D'ENSEIGNEMENT

- 04/2021 – Aerospace Engineering IIA (16h) et Artificial Satellite Engineering (32h) à KU
- 04/2018 - 01/2020 Supervision de stagiaires (5 étudiants M1 au total) sur le propagateur d'orbite, l'analyse de mission et l'estimation à IMCCE
- 04/2018 - 01/2020 Supervision d'étudiants (4 doctorats et 5 masters) sur la conception de la trajectoire, le développement du système CubeSat lunaire, et conférences sur la conception de missions spatiales à CSU/CAS

PUBLICATIONS

- Articles évalués : [1] H. Chen, N. Rambaux, V. Lainey, D. Hestroffer, "Mothership-Cubesat Radioscience for Phobos Geodesy and Autonomous Navigation", *Remote Sensing*, 14(7):1619, 2022. [demo video](#)
- [2] H. Chen, N. Rambaux, J. Vaubaillon, "Accuracy of meteor position from space- and ground- based observations", *Astronomy and Astrophysics*, 642, 2020
- [3] H. Chen, E. Canalias, D. Hestroffer, X. Hou, "Effective stability of quasi-satellite orbits in the spatial problem for Phobos exploration", *Journal of Guidance, Control, and Dynamics*, 43(12), pp. 2309-2320, 2020
- [4] H. Chen, J. Liu, L. Long, et al., "Lunar far side positioning enabled by a CubeSat system deployed in an Earth-Moon halo orbit", *Advances in Space Research*, 64(1), pp. 28-41, 2019 (**COSPAR Outstanding Paper Award**) [presentation et video](#)
- [5] H. Chen, J. Ma, "Phasing Trajectories to Deploy a Constellation in a Halo Orbit", *Journal of Guidance, Control, and Dynamics*, Vol. 40, No. 10, pp. 2662-2667, 2017
- [6] H. Chen, Y. Kawakatsu, T. Hanada, "Phasing Delta-V for transfers from Sun-Earth halo orbits to the Moon", *Acta Astronautica*, Vol. 127, pp.464-473, 2016
- [7] H. Chen, Y. Kawakatsu, T. Hanada, "Earth Escape from a Sun-Earth Halo Orbit using Unstable Manifold and Lunar Swingbys", *Transactions of the Japan Society for Aeronautical and Space Sciences*, 59(5), pp. 269-277, 2016.
- [8] H. Chen, H. Liu, T. Hanada, "Storm-time atmospheric density modeling using neural networks and its application in orbit propagation", *Advances in Space Research*, 53(3), pp. 558-567, 2014 (**COSPAR Outstanding Paper Award**)
- [9] C. Yang, L. Long, J. Liu, H. Song, L. Li, L. Zhu, Y. Bin, H. Chen, H. Zhang, "Preliminary Design and Test of the Attitude Control System of Lunar CubeSats", *Zhongguo Kongjian Kexue Jishu/Chinese Space Science and Technology*, 39(4), pp. 28-35, 2019 (en tant que conseiller)
- [10] T. Hanada, H. Hinagawa, H. Chen, et al., "Attitude Motion under Full Orbit Perturbations", *Transactions of the Japan Society for Aeronautical and Space Sciences, Aerospace Technology Japan*, 13, pp. 45-50, 2015
- Notes techniques internes • H. Chen, "Stability, Stationkeeping, and Application of Quasi-Satellite Orbits around Phobos in the Spatial problem", CNES technical report, DYNVOL-NT-MAN/RTD-1020-CNES, 2019.
- Conférences (sélectionné) • E. Canalias, L. Lorda, H. Chen, H. Ikeda, "Trajectory design and operational challenges for the exploration of Phobos", *AAS/AIAA Astrodynamics Specialist Virtual Lake Tahoe Conference*, 2020.
- H. Chen, N. Rambaux, V. Lainey, D. Hestroffer, "Mothercraft-CubeSat Radio Measurement for Phobos Survey", *5th IAA Conference on University Satellite Missions*, Rome, January 28-31, 2020.

- H. Chen, E. Canalias, D. Hestroffer, X. Hou, "Sensitivity Analysis and Stationkeeping of Three-Dimensional Quasi-Satellite Orbits around Phobos", *32nd International Symposium on Space Technology and Science*, Fukui, Japan, Jun 17-21, 2019. (hosting Orbit Dynamics and Control 2)
- H. Chen, E. Canalias, D. Hestroffer, "Stability Analysis of Three-dimensional Quasi-satellite Orbits around Phobos", *69th International Astronautical Congress*, Germany, Oct 1-5, 2018
- D. Hestroffer, M. Agnan, S. Boris, H. Chen, et al. "BIRDY - Planetary Geodesy of Small Bodies through CubeSats in Autonomous Navigation", *42nd COSPAR Scientific Assembly*, Pasadena, Jul 14-22, 2018
- H. Chen, M. Gastineau, D. Hestroffer, V. Viswanathan, "Parallel High-fidelity Trajectory Optimization with Application to CubeSat Deployment in an Earth-moon Halo Orbit", *Proceedings of the 7th Interplanetary CubeSat Workshop*, Paris, France, 2018.
- H. Chen, "The Use of Luni-solar Gravity Assists for Asteroid Retrieval", *Advances in the Astronautical Sciences*, Vol.160, pp. 4043-4060; also *27th AAS/AIAA Space Flight Mechanics Meeting*, San Antonio, TX, USA, Feb 4-11, 2017.
- S. Campagnola, N. Ozaki, Y. Sugimoto, C.H. Yam, H. Chen, and et al, "Low-thrust trajectory design and operations of PROCYON, the first deep-space micro-spacecraft", *66th International Astronautical Congress*, Oct 12-16, 2015

INFORMATIONS COMPLÉMENTAIRES

Prix d'équipe	Premier prix (1/64), Sino-Russian University Students Satellite Innovation Design Contest 2016 (en tant que conseillère); Dean Award of the Year 2014, University of Tokyo (pour PROCYON); General Prize, 19th Satellite Design Contest, Japan Society of Mechanical Engineers (pour IDEA)
Affiliations	COSPAR; American Astronautical Society; American Institute of Aeronautics & Astronautics; etc
Arbitres de journaux	Journal of Guidance, Control, and Dynamics; Celestial Mechanics and Dynamical Astronomy; Advances in Space Research; Astrophysics and Space Science; etc.
Médias	02/2021, Science Thursdays, Ambassade de France à Canberra
Permis de conduire	B1
Intérêts	Calligraphie chinoise, peinture, tennis de table, basket-ball

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hongru.chen@aero.kyushu-u.ac.jp

Birth year: 1988

Nationality: China

Languages: Chinese, English, French (B1),
Japanese (intermediate)

Homepage: <https://www.imcce.fr/annuaire/hongru-chen>

Research Interests

Astrodynamics; Trajectory design and optimization; Planetary geodesy; NanoSat design; Space environment: upper atmosphere and space debris

Education & Working Experience

- Feb 2021 - **Assistant Professor (tenured), Dept. Aero. & Astro., Kyushu University, Japan** | Designated National University
- Teach orbital mechanics and satellite engineering;
 - Develop parallel computation tools for orbit optimization and determination, and planetary geodesy
- Oct 2017 - **Postdoctoral Researcher / Research Affiliate, IMCCE, Paris Observatory, Université PSL, Sorbonne University, France**
Dec 2021
- Trajectory design in the highly perturbed environment around Phobos | CNES R&T grant
Within the framework of JAXA-CNES joint flight dynamics study for the Martian Moons eXploration (MMX) mission, I computed three-dimensional quasi-satellite orbits (3D-QSO) around Phobos, analyzed orbit stability, and addressed orbit transfer and maintenance.
 - Radioscience CubeSat for surveying small bodies | ESEP-BIRDY CubeSat project
System design and radio measurement error analysis; Analysis of the determination accuracy of the spacecraft orbits, physical parameters (C_{20} , C_{22} , and libration amplitude) of small bodies (i.e. Phobos and 2016 HO₃) and the impact on the determination of interior structure
 - Meteor and space debris observation with CubeSats | ESEP-Meteorix CubeSat project
 - Development of a fast Parallel High-fidelity Trajectory Optimization tool (PHITO)
- Nov 2015 - **Assistant Researcher, Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences (CSU / CAS), China**
Aug 2017
- Project & tutoring: Mission and system design, and hardware development for the lunar far-side positioning CubeSat system | CSU advanced studies grant
 - Research: Use of luni-solar gravity perturbation for asteroid capture; Phasing trajectories in the three-body problem
- Apr 2013 - **Joint Research Fellow, Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (ISAS / JAXA), Japan**
Sep 2015
- Disciplines: space astronomy, solar system exploration
 - Projects: Search reachable asteroids for PROCYON (launched) in scenarios using ion engine and Earth gravity assists; Extended mission design for DESTINY, etc.
 - PhD thesis: **Escape trajectories utilizing unstable manifolds and lunar gravity assists for Sun-Earth halo orbit missions** | Advisor: Y. Kawakatsu
The thesis consists of the analysis of the Earth escape strategy using Sun-Earth unstable manifolds and lunar gravity assists, graphical analysis of luni-solar perturbation on Earth escape, algorithms of computing perturbed Moon-to-Moon transfers and multiple solutions of a two-point boundary value problem, and phasing planning for transfers from Sun-Earth halo orbit to the Moon.

Oct 2012 - Sep 2015	Ph.D, Aeronautics & Astronautics, Kyushu University, Japan QS126 Main disciplines: orbital mechanics; nonlinear control GPA: 2.9/3
Oct 2010 - Sep 2012	Research Student, Aeronautics & Astronautics, Kyushu University, Japan • Projects: Arliss CANSAT Contest; Attitude control and mission analysis for the in-situ debris observation small-sat IDEA (launched); Coupled attitude-orbit motion simulator • Research: Storm-time atmospheric density modeling using neural networks and its application in orbit prediction Advisors: H. Liu and T. Hanada The study applies artificial neural networks to model the upper atmosphere density during geomagnetic storms. The model performance is evaluated through the comparison with observed density data and the application to orbit prediction. The study reveals merits and demerits of different geomagnetic proxies, capability of network modeling, and flaws of conventional models in different aspects.
Apr 2010 - Jun 2010	Intern, Applied Math., Ecole Nationale Supérieure d'Arts et Métiers (ENSAM), France Undergraduate thesis: GPU Parallel Computation with CUDA Advisors: E. Nyiri and O. Gibaru
Sep 2006 - Aug 2010	B.Eng, Detection, Guidance & Control, Northwestern Polytechnical University (NPU), China

Awards & Scholarships (selected)

Apr 2020	Outstanding Paper Award for Young Scientists, Committee on Space Research (COSPAR)
Jul 2017	Outstanding Paper Award at the 5th National Symposium on Space Flight Dynamics, Chinese Society of Astronautics
Aug 2014	Outstanding Paper Award for Young Scientists, COSPAR
Jun 2009	First Prize, Micro-Computer Application and Experiment Contest, NPU
Nov 2005	Second Prize, Chinese Physics Olympiad, Chinese Physical Society
Apr 2019	iCubeSat Workshop travel grant, Europlanet
Jul 2018 & 2022	Scientific Assembly Financial Support, COSPAR
Oct 2014- Sep 2015	Scholarship for Outstanding PhD Candidates, Kyushu University

Research Grants (selected)

Apr 2022- Mar 2024	"Orbit Design and Control for the Non-heliocentric Small-body missions", PI, JSPS Grant-in-Aid for Early-Career Scientists, 4.55 million JPY
Dec 2021- Nov 2022	"Identification and mitigation of the impact of ephemeris errors on non-heliocentric small-body missions", PI, CASIO Science Promotion Foundation, 1 million JPY
July 2021- Mar 2022	"Parallel Full-dynamics Propagator and the Application to Orbit Analysis and Design", PI, Kyushu University Data Science Research Program, 1.5 million JPY
Oct 2018- Sep 2019	"Trajectory design in the vicinity of small bodies in highly perturbed dynamical environment", main performer, CNES R&T Action, R-S18/BS-0005-039, 60,000 €
Jan 2017-Dec 2018 *	"CubeSat system for lunar far-side positioning" (PI), CSU Advanced Studies Program, CSU-QZKT-201711, CN¥220,000

Technical Skills

Good Command: Matlab/Simulink, C/C++, Git, Slurm

Basic Knowledge: Python, Fortran, Assembly, VB, STK, HTML, Linux, L^AT_EX, MPI, micro-computers

Tutoring Experience

- Aerospace Engineering IIA: Orbital Engineering (16h), Artificial Satellite Engineering (32h), Aerospace Experiment: Rendezvous Simulation (2h) at KU (Apr. 2021 -);

*handed over to CSU colleagues at the end of Aug 2017 because of resignation

- Supervised interns (total 5 M1 students) on orbit propagator, mission analysis, estimation at IMCCE (Apr. 2018 - Jan. 2020);
- Supervised graduate (4 doctoral and ~5 master) students on trajectory design, Lunar CubeSat system design and hardware development at CAS (Jan. 2016 - Aug. 2018).

Publications

Peer-reviewed articles

- [1] H. Chen, N. Rambaux, V. Lainey, D. Hestroffer, "Mothership-Cubesat Radioscience for Phobos Geodesy and Autonomous Navigation", *Remote Sensing*, 14(7):1619, 2022. [demo video](#)
- [2] H. Chen, N. Rambaux, J. Vaubailon, "Accuracy of meteor positioning from space- and ground-based observations", *Astronomy and Astrophysics*, 642, 2020.
- [3] H. Chen, E. Canalias, D. Hestroffer, X. Hou, "Effective stability of quasi-satellite orbits in the spatial problem for Phobos exploration", *Journal of Guidance, Control, and Dynamics*, 43(12), 2020, pp. 2309-2320.
- [4] H. Chen, J. Liu, L. Long, et al., "Lunar far side positioning enabled by a CubeSat system deployed in an Earth-Moon halo orbit", *Advances in Space research*, 64(1), 2019, pp. 28-41. **(COSPAR Outstanding Paper Award)**
- [5] H. Chen, J. Ma, "Phasing Trajectories to Deploy a Constellation in a Halo Orbit", *Journal of Guidance, Control, and Dynamics*, 40(10), 2017, pp. 2662-2667.
- [6] H. Chen, Y. Kawakatsu, T. Hanada, "Phasing Delta-V for transfers from Sun-Earth halo orbits to the Moon", *Acta Astronautica*, Vol. 127, 2016, pp.464-473.
- [7] H. Chen, Y. Kawakatsu, T. Hanada, "Earth Escape from a Sun-Earth Halo Orbit using Unstable Manifold and Lunar Swingbys", *Transactions of the Japan Society for Aeronautical and Space Sciences*, 59(5), 2016, pp. 269-277.
- [8] H. Chen, H. Liu, T. Hanada, "Storm-time atmospheric density modeling using neural networks and its application in orbit propagation", *Advances in Space Research*, 53(3), 2014, pp. 558-567. **(COSPAR Outstanding Paper Award)**
- [9] C. Yang, L. Long, J. Liu, H. Song, L. Li, L. Zhu, Y. Bin, H. Chen, H. Zhang, "Preliminary Design and Test of the Attitude Control System of Lunar CubeSats", *Zhongguo Kongjian Kexue Jishu/Chinese Space Science and Technology*, 39(4), 2019, pp. 28-35. (as advisor)
- [10] T. Hanada, H. Hinagawa, H. Chen, et al., "Attitude Motion under Full Orbit Perturbations", *Transactions of the Japan Society for Aeronautical and Space Sciences, Aerospace Technology Japan*, 13, 2015, pp. 45-50.

Internal technical notes (selected)

- [11] H. Chen, "Stability, Stationkeeping, and Application of Quasi-Satellite Orbits around Phobos in the Spatial problem", CNES internal report, DYNVOL-NT-MAN/RTD-1020-CNES, 2019.

Conference talks (selected)

- [12] E. Canalias, L. Lorda, H. Chen, H. Ikeda, "Trajectory design and operational challenges for the exploration of Phobos", *AAS/AIAA Astrodynamics Specialist Virtual Lake Tahoe Conference*, 2020.
- [13] H. Chen, N. Rambaux, V. Lainey, D. Hestroffer, "Mothercraft-CubeSat Radio Measurement for Phobos Survey", *5th IAA Conference on University Satellite Missions*, Rome, January 28-31, 2020.
- [14] H. Chen, E. Canalias, D. Hestroffer, X. Hou, "Sensitivity Analysis and Stationkeeping of Three-Dimensional Quasi-Satellite Orbits around Phobos", *32nd International Symposium on Space Technology and Science*, Fukui, Japan, Jun 17-21, 2019. (Also chaired the technical session, Orbit Dynamics and Control 2)

- [15] H. Chen, E. Canalias, D. Hestroffer, X. Hou, "Stability Analysis of Three-dimensional Quasi-satellite Orbits around Phobos", *69th International Astronautical Congress*, Germany, Oct 1-5, 2018
- [16] H. Chen, M. Gastineau, D. Hestroffer, V. Viswanathan, "Parallel High-fidelity Trajectory Optimization with Application to CubeSat Deployment in an Earth-moon Halo Orbit", *Proceedings of the 7th Interplanetary CubeSat Workshop*, Paris, France, 2018.
- [17] D. Hestroffer, S. Boris, H. Chen et al., "BIRDY - Planetary Geodesy of Small Bodies through CubeSats in Autonomous Navigation", *42nd COSPAR Scientific Assembly*, Pasadena, USA, 2018.
- [18] H. Chen, L. Liu, Y. Meng, et al., "Preliminary Design and Analysis of a Lunar Far-side Positioning CubeSat Mission", *26th International Symposium on Space Flight Dynamics (ISSFD)*, Japan, Jun 3-9, 2017 (Also chaired the technical session, Trajectory Design & Optimization 3; initiated the proposal of holding ISSFD in China in 2021).
- [19] H. Chen, "The Use of Luni-solar Gravity Assists for Asteroid Retrieval", *Advances in the Astronautical Sciences*, Vol.160, pp. 4043-4060; also *27th AAS/AIAA Space Flight Mechanics Meeting*, San Antonio, TX, USA, Feb 4-11, 2017.
- [20] S. Campagnola, N. Ozaki, Y. Sugimoto, C. Yam, H. Chen et al, "Low-thrust trajectory design and operations of PROCYON, the first deep-space micro-spacecraft", *66th International Astronautical Congress*, Jerusalem, Oct 12-16, 2015.

Referees

Prof. Yasuhiro Kawakatsu, Project Manager of MMX, ISAS/JAXA

Dr. Elisabet Canalias, Flight Dynamics and Mission Analysis Engineer, CNES

Prof. Xiyun Hou, Nanjing University

Prof. Daniel Hestroffer, Astronomer, Paris Observatory - IMCCE

Miscellaneous

Team Awards:

First Prize (1/64), Sino-Russian University Students Satellite Innovation Design Contest 2016 (as advisor);

Dean Award of the Year 2014, University of Tokyo (for PROCYON);

General Prize, 19th Satellite Design Contest, Japan Society of Mechanical Engineers (for IDEA)

Journal Referees:

Journal of Guidance, Control, and Dynamics;

Celestial Mechanics and Dynamical Astronomy;

Advances in Space Research;

Astrophysics and Space Science, etc.

Members:

COSPAR associate;

American Astronautical Society;

Media:

Science Thursday, The Embassy of France in Australia, Feb. 2021

九州大学（日本）助理教授（长聘）

近十年唯一在国外航天机构（JAXA、CNES）的深空探测工程中工作过的中国人

迄今国内唯一两度国际空间研究委员会 COSPAR 青年学者优秀论文奖获得者

女

1988 年生

Try not to become a man of success. Rather become a man of value.

- Albert Einstein

研究方向

空间任务设计与分析（定轨、行星测量、卫星系统），小天体探测与防御，轨道动力学、设计与优化，空间环境（热层大气、轨道碎片）

工作、学习、实习经历

2006.9
2010.8

西北工业大学，航天学院，探测制导与控制技术专业，工学学士。

主要课程：飞行力学，控制技术，传感器与伺服；

2010.4
2010.6

法国国立高等工程技术学院（ENSAM），实习生。

学士论文：利用 CUDA 进行并行计算的研究 | 导师：Olivier Gibaru, Eric Nyiri

2010.10
2012.9

日本九州大学，航空航天工程系，研究生。

- 参与项目：CanSat 竞赛；轨道碎片监测小卫星 IDEA 的姿控软硬件；各类轨道摄动下的姿轨耦合仿真；
- 主要研究：人工神经网络对磁暴期间高层大气密度建模并应用于轨道预测 | 导师：Huixin Liu, Toshiya Hanada
使用神经网络和不同电磁指数输入，建立磁暴期间大气密度模型，并应用于轨道预测。同几大传统模型比较，以密度数据和轨道数据为基准，反映出几类电磁指数与大气密度变化的相关性和优劣。网络模型和传统模型（MSIS、JB2008）在各项指标上的比较，显出神经网络的优势和传统模型某些方面的缺陷。

2012.10
2015.9

日本九州大学 QS126，航空航天工程系，工学博士。

主要课程：轨道力学，控制理论；

2013.4
2015.9

日本航空宇宙开发机构（JAXA）宇宙科学研究所（ISAS），川口川勝研究室，特别共同利用研究员 #。

- 主要课程：太阳系探测，空间天文系统
- 深空项目：为使用小推力和地球借力的深空小探测器 PROCYON(已发射) 搜索可达小行星目标；轨道技术验证任务 DESTINY 的扩展任务调研；其他 JAXA 火星、金星任务分析
- 博士论文：利用日地限制性三体问题的不稳定流形与月球借力的逃逸轨道设计 | 导师：Yasuhiro Kawakatsu
利用不稳定流形和月球借力扩展日地晕轨道任务为深空任务，图表分析日月引力对轨道能量的影响，求解在日地三体问题中多次月球借力的轨道，多解两点数值问题，以及晕轨道到月球转移的最优调相机动。研究表明最大可达的轨道能量，预示可观的相遇小行星的机会（使得 DESTINY 将任务计划和目标改为小行星飞掠）

2015.11
2017.8

中国科学院空间应用工程与技术中心，助理研究员。

- 主导项目：月球背面定位的立方星系统：部署轨道设计和任务分析，指导学生设计、搭建、测试立方星
- 自主调研：日月引力辅助的轨道设计和在小行星捕获上的应用

2017.10
2021.12

巴黎天文台，IMCCE，巴黎文理研究大学 QS44, 上交大 38, 泰晤士 40，博士后，研究成员。

- 高摄动环境下火卫探测轨道设计 | 法国国家太空研究中心 (CNES) 空间技术研究项目
通过 CNES 参与 JAXA 下一旗舰任务 MMX 火卫一采样返回任务的飞行力学的共同研究。内容包括计算火卫一周三维 QSO 轨道族，分析稳定运行区域，讨论轨道保持和轨道转移等问题（是使得 MMX 通过正式立项的重要工作之一）。
- BIRDY 深空 radioscience 立方星任务设计 | ESEP 立方星项目
对协同母星对小天体进行 radioscience 探测的立方星的方案，分析立方星质量、功耗、轨道转移燃料需求，设计系统和工作方案。分析星历误差对定规和推定目标天体（如火卫一和 HO3（巴黎天文台与五院合作内容））引力场 C20 和 C22 项及平动幅度的精度影响，由此得到推断目标内部结构（如均质，破碎，或空隙）的确信度。

文本内多处附超链接指向相关内容的介绍网页

- 立方星勘探 HO3 2016 小行星方案 | 所推动并参与的巴黎天文台和航天五院关于郑和任务的合作内容
- METEORIX 流星和轨道碎片观测立方星任务分析 | ESEP 立方星项目
- 星历模型下的并行轨道优化软件 PHITO

2021.2 日本九州大学 指定国立大学, 航空航天工程系, 助理教授 (永久职位).

科研项目 (选)

- 2017.01-2018.12[†] 空间应用中心前瞻性课题, CSU-QZKT-201711, 应用于月球背面定位的自主编队立方星系统, 22 万元, 项目负责人
- 2018.10 - 2019.09 法国国家太空研究中心 (CNES) 空间技术研究项目, R-S18/BS-0005-039, 小天体附近强摄动环境下的轨道设计, 6 万欧元, 合约首要执行人
- 2021.07 - 2022.03 九州大学数理科学中心, 并行快速高精度轨道积分器, 150 万日元, 项目负责人
- 2021.11 - 2022.10 卡西欧科学振兴财团研究助成, 非绕日小天体任务中星历误差影响的定量化和减轻, 100 万日元, 项目负责人
- 2022.04 - 2024.03 日本学术振兴会青年项目, 非绕日小天体任务中的轨道设计与控制, 455 万日元, 项目负责人

教学经验

- 2016 - 2017 指导学生设计、搭建和测试月球立方星, 于空间应用中心
- 2019 - 2020 指导实习生轨道推演, 于巴黎天文台
- 2021.4 - 宇航工程 II: 轨道力学 (16 学时), 人工卫星工程 (32 学时), 交会对接仿真实验 (21 学时), 于九州大学

奖励荣誉

- 2005.11 全国中学生物理竞赛二等奖
- 2009.06 西工大微型计算机的应用与实验一等奖
- 2009.12 西工大三好学生称号及一等奖学金
- 2014.08 国际空间委员会 (COSPAR) 青年学者优秀论文奖
- 2017.07 全国航天飞行动力学技术研讨会优秀论文奖
- 2018.03 COSPAR 科学大会旅费资助
- 2020.04 COSPAR 青年学者优秀论文奖
- 2010.10 - 2014.09 国家留学基金委公派研究生奖学金
- 2014.10 - 2015.09 九州大学优秀博士研究生奖学金

技术能力

- 熟练 C/C++, Matlab/Simulink, Git, Slurm(群算)
- 基础 STK, L^AT_EX, Fortran, Python, VB, HTML, Linux, MPI, CUDA/GPU, 汇编

外语水平

- 英语: 托福 2014: 92/120, 流利使用
- 法语: B1: 84/100, 基础书信、会话

[†]因离职 2017.8 已交接于空间应用中心的同事

发表情况

同行审稿论文

- [1] H. Chen, N. Rambaux, V. Lainey, D. Hestroffer, "Mothership-Cubesat Radioscience for Phobos Geodesy and Autonomous Navigation", *Remote Sensing*, 14(7), 2022 (行星科学 JCR Q1, top %10 期刊)
- [1] H. Chen, N. Rambaux, J. Vaubailon, "Accuracy of meteor position from space- and ground-based observations", *Astronomy and Astrophysics*, 642, L11, 2020 (天文 JCR Q1)
- [2] H. Chen, E. Canalias, D. Hestroffer, X. Hou, "Effective stability of quasi-satellite orbits in the spatial problem for Phobos exploration", *Journal of Guidance, Control, and Dynamics*, 2020 (宇航工程 JCR Q1, top %10 期刊)
- [3] H. Chen, J. Liu, L. Long, et al., "Lunar far side positioning enabled by a CubeSat system deployed in an Earth-Moon halo orbit", *Advances in Space Research*, 64(1), 2019, pp. 28-41. (宇航工程 JCR Q1) (**COSPAR 优秀论文奖**)
- [4] H. Chen, J. Ma, "Phasing Trajectories to Deploy a Constellation in a Halo Orbit", *Journal of Guidance, Control, and Dynamics*, Vol. 40, No. 10, 2017, pp. 2662-2667. (宇航工程 JCR Q1, top %10 期刊)
- [5] H. Chen, Y. Kawakatsu, T. Hanada, "Phasing Delta-V for transfers from Sun-Earth halo orbits to the Moon", *Acta Astronautica*, Vol. 127, 2016, pp.464-473. (宇航工程 JCR Q1, top %10 期刊)
- [6] H. Chen, Y. Kawakatsu, T. Hanada, "Earth Escape from a Sun-Earth Halo Orbit using Unstable Manifold and Lunar Swingbys", *Transactions of the Japan Society for Aeronautical and Space Sciences*, 59(5), 2016, pp. 269-277.
- [7] H. Chen, H. Liu, T. Hanada, "Storm-time atmospheric density modeling using neural networks and its application in orbit propagation", *Advances in Space Research*, 53(3), 2014, pp. 558-567. (宇航工程 JCR Q1) (**COSPAR 优秀论文奖**)
- [7] 杨驰航, 刘江凯, 龙龙, 宋欢, 李龙, 朱凌超, 叶炳旭, 陈泓儒, 张皓, "月球立方星姿态控制系统的初步设计与测试", *中国空间科学技术*, 2019, 39(4): 28-35. (作为导师)
- [8] T. Hanada, H. Hinagawa, H. Chen and et al, "Attitude Motion under Full Orbit Perturbations", *Transactions of the Japan Society for Aeronautical and Space Sciences, Aerospace Technology Japan*, Vol. 13, 2015, pp. 45-50

内部技术报告 (选)

- H. Chen, "Stability, Stationkeeping, and Application of Quasi-Satellite Orbits around Phobos in the Spatial problem", CNES technical report, DYNVOL-NT-MAN/RTD-1020-CNES, 2019.

会议报告 (选)

- E. Canalias, H. Chen, L. Lorda, H. Ikeda, "Trajectory design and operational challenges for the exploration of Phobos", *AAS/AIAA Astrodynamics Specialist Virtual Lake Tahoe Conference*, 2020.
- H. Chen, N. Rambaux, V. Lainey, D. Hestroffer, "Mothercraft-CubeSat Radio Measurement for Phobos Survey", *5th IAA Conference on University Satellite Missions*, Rome, January 28-31, 2020.

- H. Chen, E. Canalias, D. Hestroffer, X. Hou, "Sensitivity Analysis and Stationkeeping of Three-Dimensional Quasi-Satellite Orbits around Phobos", *32nd International Symposium on Space Technology and Science*, Fukui, Japan, Jun 17-21, 2019. (并主持 Orbit Dynamics and Control 2 分会)
- D. Hestroffer, M. Agnan, S. Boris, H. Chen, et al. "BIRDY - Planetary Geodesy of Small Bodies through CubeSats in Autonomous Navigation", *42nd COSPAR Scientific Assembly*, Pasadena, Jul 14-22, 2018
- 龙龙, 刘江凯, 宋欢, 李龙, 朱凌超, 陈泓儒, "月球立方星的系统设计和测试", 第五届全国航天飞行动力学技术研讨会, 海南文昌, 2017 年 6 月 (作为导师)
- H. Chen, L. Liu, Y. Meng, et al., "Preliminary Design and Analysis of a Lunar Far-side Positioning CubeSat Mission", *26th International Symposium on Space Flight Dynamics*, Matsuyama, Japan, Jun 3-9, 2017 (并主持 Trajectory Design & Optimization 3 分会; 发起次届 ISSFD 在中国召开的提案, ISSFD 将于 2022 在中国举行)
- H. Chen, "The Use of Luni-solar Gravity Assists for Asteroid Retrieval", *Advances in the Astronautical Sciences*, Vol.160, pp. 4043-4060; also *27th AAS/AIAA Space Flight Mechanics Meeting*, San Antonio, TX, USA, Feb 4-11, 2017.
- S. Campagnola, N. Ozaki, Y. Sugimoto, C.H. Yam, H. Chen, and et al, "Low-thrust trajectory design and operations of PROCYON, the first deep-space micro-spacecraft", *66th International Astronautical Congress*, Oct 12-16, 2015
- C. H. Yam, Y. Sugimoto, N. Ozaki, B. Sarli, H. Chen, S. Campagnola and et al, "Launch Window and Sensitivity Analysis of an Asteroid Flyby Mission with Miniature Ion Propulsion System: PROCYON", *65th International Astronautical Congress*, Toronto, Canada, Sept 29-Oct 3, 2014
- H. Chen, T. Hanada, "Debris Environment Monitoring Using Small Satellite as Secondary Payload", *28th International Symposium on Space Technology and Science*, Okinawa, June 7, 2011

推荐人

日本航空宇宙开发机构 JAXA, Dr. Yasuhiro Kawakatsu, 教授/MMX 任务总师
 法国国家太空研究中心 CNES, Dr. Elisabet Canalias, 飞行力学工程师
 巴黎天文台, Dr. Daniel Hestroffer, Dr. N. Rambaux 等高级天文学家

其他

论文审稿: *Journal of Guidance, Control, and Dynamics*; *Celestial Mechanics and Dynamical Astronomy*; *Advances in Space Research*; *Astrophysics and Space Science* 等期刊
 JAXA 某 2022 年博士论文

团队荣誉: 2011.11 日本机械学会第十九届卫星设计大赛优秀奖 (IDEA 小卫星)
 2014.02 东京大学校长奖 (PROCYON 探测器)
 2016.08 中俄大学生卫星设计创新竞赛一等奖 (指导老师)

学会会员: *Space: Science & Technology* 期刊编委; 国际空间委员会; 日本航空宇宙学会; 美国宇航学会

新闻记事: 2021.02 Science Thursday, 法国驻澳洲大使馆

兴趣爱好: 书法、绘画、乒乓、篮球、看球赛;