

CHEN, Hongru

17A Bd Jourdan
Paris 75014
France

Month of Birth: April, 1988
Gender: Female
Nationality: China
Email: hongru.chen@obspm.fr
hongru.chen@hotmail.com

Research Interests

astrodynamics; trajectory optimization; space mission design

Education, Internship, & Working Experience

- Oct 2017-
present **Post-Doc, Observatoire de Paris - IMCCE, Université PSL, France**
Trajectory optimization in high-fidelity model intended for Martian Moons eXploration mission and CubeSat BIRDY
- Nov 2015-
Aug 2017 **Research Associate, Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences (CSU, CAS), China**
Researches: Luni-solar gravity assists for asteroid capture; deployment trajectories in the three-body problem
Other: To advise students' lunar CubeSat project
- Apr 2013-
Sep 2015 **Joint Research Fellow, Institute of Space and Astronautical Science / Japan Aerospace Exploration Agency (ISAS / JAXA), Japan**
Disciplines: space astronomy, solar system exploration
Projects: Reachable asteroids search for PROCYON mission (launched) which uses ion engine and Earth gravity assists; Mission analysis for DESTINY, etc.
PhD thesis: **Escape trajectories utilizing unstable manifolds and lunar gravity assists for Sun-Earth halo orbit missions** | Advisor: Yasuhiro 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** | Imperial University
Main disciplines: orbital mechanics; control theories | GPA: 2.9/3
- Oct 2010-
Sep 2012 **Research Student, Aeronautics & Astronautics, Kyushu University, Japan**
Projects: Attitude control systems for CANSAT and small satellite IDEA; coupled attitude-orbit simulator; in-situ debris observation mission
Research: **Storm-time atmospheric density modelling using neural networks and its application in orbit prediction** | Advisors: Huixin Liu and Toshiya Hanada
The study applies artificial neural networks to model the upper atmosphere densities 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 **Trainee, Ecole Nationale Supérieure des Arts et Métiers (ENSAM), France**
Undergraduate thesis: **Parallel Computation with CUDA** | Advisors: Olivier Gibaru and Eric Nyiri
- Sep 2006-
Aug 2010 **B.Eng, Detection, Guidance & Control, Northwestern Polytechnical University (NPU), China** | Member of Project 985
Main disciplines: guidance & control, servos & actuators, flight dynamics | GPA: 82/100

Scholarships, Awards, & Grant-in-aids

Mar 2018	Travel Grant, Committee on Space Research (COSPAR)
Jul 2017	Outstanding Paper Award at National Symposium on Space Flight Dynamics, Chinese Society of Astronautics
Aug 2014	Outstanding Paper Award for Young Scientists, COSPAR
Dec 2009	Outstanding Student Honor & First-class Scholarship, NPU
Jun 2009	First Prize, Micro-Computer Application and Experiment Contest, NPU
Nov 2005	Second Prize, Chinese Physics Olympiad, Chinese Physical Society
Oct 2018- Sep 2019	PostDoc fellowship sponsored by Centre National d'Études Spatiales (CNES)
Oct 2017-Sep 2018	PostDoc fellowship sponsored by ESEP/PSL
Aug 2017 ⁻¹	Grant-in-aid from China Manned Space Engineering Office
Jan 2017 ⁻¹	Grant-in-aid for Advanced Studies, CSU
Oct 2014- Sep 2015	Scholarship for Outstanding PhD Candidates, Kyushu University
Oct 2010- Sep 2014	Scholarship for Abroad Graduate Programs, Chinese Scholarship Council

Languages

Mandarin, Hainanese (mother tongues); English (good); Japanese (fair); French (basic knowledge)

Technical Skills

Good Knowledge: Matlab/Simulink, C/C++

Basic Knowledge: STK, VB, Fortran, HTML, Linux, L^AT_EX, micro-computers, assembly, UML, GIT, MPI

Publications

Peer-reviewed articles

Hongru Chen, Jian 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.

Hongru Chen, Yasuhiro Kawakatsu and Toshiya Hanada, "Phasing Delta-V for transfers from Sun-Earth halo orbits to the Moon", *Acta Astronautica*, Vol. 127, 2016, pp.464-473.

Hongru Chen, Yasuhiro Kawakatsu and Toshiya 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*, Vol.59, No. 5, 2016, pp. 269-277.

Hongru Chen, Huixin Liu and Toshiya Hanada, "Storm-time atmospheric density modeling using neural networks and its application in orbit propagation", *Advances in Space Research*, Vol. 53, No. 3, 2014, pp. 558-567. (COSPAR Outstanding Paper Award)

Toshiya Hanada, Hideaki Hinagawa, Hongru 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.

Long Long, Jiangkai Liu, Huan Song, Long Li, Lingchao Zhu, Hongru Chen, "Preliminary Design and Testing of a Lunar CubeSat System", *Chinese Space Science and Technology*. (under review; as advisor)

Conference talks (selected)

H. Chen, E. Canalias, D. Hestroffer, "Stability Analysis of Quasi-satellite Orbits around Phobos", *69th International Astronautical Congress*, Germany, Oct 1-5, 2018

H. Chen, J. Liu, L. Long, et al. "Lunar Far Side Positioning Enabled by a Deployed CubeSat System in an Earth-moon Halo Orbit", *42nd COSPAR Scientific Assembly*, Pasadena, Jul 14-22, 2018

¹handed over to CSU colleagues because of resignation

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

Hongru Chen, Lei Liu, Yazhe Meng, et al., "Preliminary Design and Analysis of a Lunar Far-side Positioning CubeSat Mission", to be presented at *26th International Symposium on Space Flight Dynamics*, Japan, Jun 3-9, 2017 (1st author chaired the session Trajectory Design & Optimization 3).

Hongru Chen, "The Use of Luni-solar Gravity Assists for Asteroid Retrieval", *27th AAS/AIAA Space Flight Mechanics Meeting*, San Antonio, TX, USA, Feb 4-11, 2017.

Hongru Chen, Jian Ma and Yazhe Meng, "Phasing Trajectories for a CubeSat Lunar Far-side Positioning Mission", *26th Workshop on JAXA Astrodynamics and Flight Mechanics*, ISAS/JAXA, Japan, Jul 25-26, 2016.

Hongru Chen, Yasuhiro Kawakatsu and Toshiya Hanada, "Earth Escape from a Sun-Earth Halo Orbit Using Unstable Manifolds and Lunar Gravity Assists", *25th Workshop on Astrodynamics and Flight Mechanics*, ISAS/JAXA, Japan, Jul 28-29, 2015.

Hongru Chen, Yasuhiro Kawakatsu and Toshiya Hanada, "Phasing Problem for Sun-Earth Halo Orbit to Lunar Swingby Encounter Transfers", *25th AAS/AIAA Space Flight Mechanics Meeting*, Williamsburg, VA, USA, Jan 11-15, 2015.

Hongru Chen, Yasuhiro Kawakatsu and Toshiya Hanada, "Analysis for the Earth Escape Strategy Using Unstable Manifolds and Lunar Gravity Assists", *24th Workshop on JAXA Astrodynamics and Flight Mechanics*, ISAS/JAXA, Japan, Jul 28-29, 2014.

Stefano Campagnola, Naoya Ozaki, Yoshihide Sugimoto, Chit Hong Yam, Hongru Chen, and 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.

Chit Hong Yam, Yoshihide Sugimoto, Naoya Ozaki, Bruno Sarli, Hongru Chen, Stefano 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.

Hongru Chen, Yasuhiro Kawakatsu and Toshiya Hanada, "Low-energy Escape from the Sun-Earth L2 Utilizing Unstable Manifolds and Lunar Gravity Assist", *24th AAS/AIAA Space Flight Mechanics Meeting*, Santa Fe, NM, USA, Jan 26-30, 2014.

Hongru Chen, Huixin Liu and Toshiya Hanada, "Storm-time Atmospheric Density Model Using Neural Networks and the Application in Orbital Decay Prediction", *29th International Symposium on Space Technology and Science*, Nagoya-Aichi, Japan, June 2-9, 2013.

Hongru Chen, Huixin Liu and Toshiya Hanada, "Atmospheric Density Modeling Using Neural Networks", *Japan Geoscience Union Meeting*, Chiba, Japan, May 19-24, 2013.

Hongru Chen and Toshiya Hanada, "Debris Environment Monitoring Using Small Satellite as Secondary Payload", *28th International Symposium on Space Technology and Science*, Okinawa, Japan, June 7, 2011.

Akira Doi, Hiroaki Hamada, Hideaki Hinagawa, Masahiko Uetsuhara, Shingo Ikemura, Kazuaki Ae, Dong changzhi, Mitsuhiko Tasaki, Satoshi Furuta, Chen Hongru, Makoto Tagawa, Saori Ikeda, Toshiya Hanada, the IDEA project team, "IDEA: In-situ Debris Environmental Awareness", *Innovative Ideas for Micro/Nano-satellite Missions*, IAA Book Series, Vol.1, No.3, 2012.

Referees

Dr. Elisabet Canalias, CNES

Prof. Daniel Hestroffer, Observatoire de Paris - IMCCE, PSL

Prof. Yang Gao, CSU

Prof. Yasuhiro Kawakatsu, Dept. Space Flight Systems, ISAS/JAXA

Assoc. Prof. Huixin Liu, Dept. Earth Planet. Sci, Kyushu Univ.

Prof. Toshiya Hanada, Dept. Aero. Astro., Kyushu Univ.
Assist. Prof. Eric Nyiri, Dept. Applied Math., ENSAM

Miscellaneous

Group Awards:

First Prize, 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:

Astrophysics and Space Science;
Iranian Journal of Science and Technology, Transactions A: Science;
Transactions of the Japan Society for Aeronautical and Space Sciences, Aerospace Technology Japan

Outreach activities:

TA at Summer Program 2015 for promoting science subjects among Japanese high-school girls;
Lecture on space mission and trajectory design at the Beihang-CSU Space Summer Camp 2017

Memberships:

COSPAR associate;
Japan Geoscience Union;
Japan Society for Aeronautical and Space Sciences;
American Astronautical Society

Hobbies:

Chinese calligraphy, painting, basketball, ping-pong

陈泓儒

个人简历

女

1988年04月生

研究方向

空间任务设计, 飞行力学, 轨道优化

科研、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, 航空宇宙工学专业, 航天器动力学研究室, 研究生.

- CanSat 竞赛; IDEA 轨道碎片监测小卫星姿态控制软硬件; 多类轨道摄动下的姿轨耦合仿真等;
 - 主要研究: 使用神经网络建模磁暴对高层大气密度的影响并应用于轨道预测 | 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, 航空宇宙工学专业, 航天器动力学研究室, 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
 - 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; 日地晕轨道任务 DESTINY 和一些 JAXA 火星、金星深空任务分析
 - 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增速, 并讨论晕轨道到月球转移轨道的调相机制

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.

- 推进指导学生进行月球立方星项目, 参与任务和星座部署轨道设计
- 研究日月引力辅助的轨道设计和在小行星捕获上的应用

2017.10

法国文理研究大学, 法国巴黎天文台, 天体力学与星历计算研究所, 博士后.

火卫任务 MMX 的轨道计算与分析; BIRDY 立方星在高精度模型下的优化

获奖和科研资助

- 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
- 2010.04-2010.06 ENSAM 实习补助
- 2010.10-2014.09 国家留学基金委建设高水平大学公派研究生奖学金
- 2013.04-2015.09 JAXA 助研补助
- 2014.10-2015.09 九州大学博士研究生奖学金
- 2017.1-† 空间应用中心前瞻性课题
- 2017.8-† 载人航天办公室概念创新类项目
- 2017.10-2018.09 法国文理研究大学 ESEP 博后资助
- 2018.10-2019.09 法国国家太空研究中心 CNES 博后资助

技术能力

熟练 C/C++, Matlab/Simulink

基础 STK, \LaTeX , Fortran, VB, HTML, Linux, UML, Git, MPI, 汇编

外语水平

英语: 托福 92, 雅思 6.5

日语: N3, 阅读, 日常会话

法语: A2, 阅读, 简单会话

发表情况

- 期刊论文 Hongru Chen, Jian Ma, "Phasing Trajectories to Deploy a Constellation in a Halo Orbit", *Journal of Guidance, Control, and Guidance*, Vol. 40, No. 10, 2017, pp. 2662-2667
- Hongru Chen, Yasuhiro Kawakatsu, Toshiya Hanada, "Phasing Delta-V for Transfers from Sun-Earth Halo Orbits to the Moon", *Acta Astronautica*, vol.127, 2016, pp. 464-473
- Hongru Chen, Yasuhiro Kawakatsu, Toshiya Hanada, "Earth Escape from a Sun-Earth Halo Orbit Using Unstable Manifolds and Lunar Gravity Assists", *Transactions of the Japan Society for Aeronautical and Space Sciences*, vol.59, no.5, 2016, pp. 269-277

文本内含多处超链接指向相关内容的详细介绍

† 因离职已交接于空间应用中心的同事

- Toshiya Hanada, Hideaki Hinagawa, Hongru 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
- Hongru Chen, Huixin Liu, Toshiya Hanada, "Storm-Time Atmospheric Density Modeling Using Neural Networks and Its Application in Orbit Propagation", *Advances in Space Research*, Vol. 53, No. 3, 2014, pp. 558-567. (COSPAR 优秀论文奖)
- 会议报告 (选) H. Chen, E. Canalias, D. Hestroffer, "Stability Analysis of Quasi-satellite Orbits around Phobos", *69th International Astronautical Congress*, Germany, Oct 1-5, 2018
- H. Chen, J. Liu, L. Long, et al. "Lunar Far Side Positioning Enabled by a Deployed CubeSat System in an Earth-moon Halo Orbit", *42nd COSPAR Scientific Assembly*, Pasadena, Jul 14-22, 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
- 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(导师)
- Hongru Chen, Lei Liu, Yazhe Meng, et al., "Preliminary Design and Analysis of a Lunar Far-side Positioning CubeSat Mission", *26th International Symposium on Space Flight Dynamics*, Japan, Jun 3-9, 2017 (主持 Trajectory Design & Optimization 3 分会)
- Hongru Chen, "The Use of Luni-solar Gravity Assists for Asteroid Retrieval", *27th AAS/AIAA Space Flight Mechanics Meeting*, San Antonio, TX, USA, Feb 4-11, 2017.
- Hongru Chen, Jian Ma, Yazhe Meng, "Phasing Trajectories for a CubeSat Lunar Far-side Positioning Mission", *26th Workshop on Astrodynamics and Flight Mechanics*, ISAS/JAXA, Jul 2016.
- Hongru Chen, Yasuhiro Kawakatsu, Toshiya Hanada, "Phasing Problem for Sun-Earth Halo Orbit to Lunar Swingby Encounter Transfers", *25th AAS/AIAA Space Flight Mechanics Meeting*, Williamsburg, VA, Jan 11-15, 2015.
- Stefano Campagnola, Naoya Ozaki, Yoshihide Sugimoto, Chit Hong Yam, Hongru 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
- Chit Hong Yam, Yoshihide Sugimoto, Naoya Ozaki, Bruno Sarli, Hongru Chen, Stefano 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
- Hongru Chen, Yasuhiro Kawakatsu, Toshiya Hanada, "Low-energy Escape from the Sun-Earth L2 Utilizing Unstable Manifolds and Lunar Gravity Assist", *24th AAS/AIAA Space Flight Mechanics Meeting*, Santa Fe, NM, Jan 26-30, 2014

Hongru Chen, Huixin Liu, Toshiya Hanada, "Storm-time Atmospheric Density Model Using Neural Networks and the Application in Orbital Decay Prediction", *29th International Symposium on Space Technology and Science*, Nagoya-Aichi, June 2-9, 2013

Hongru Chen, Huixin Liu, Toshiya Hanada, "Atmospheric Density Modeling Using Neural Networks", *Japan Geoscience Union Meeting*, Chiba, May 19-24, 2013

Hongru Chen, Toshiya Hanada, "Debris Environment Monitoring Using Small Satellite as Secondary Payload", *28th International Symposium on Space Technology and Science*, Okinawa, June 7, 2011

A. Doi, H. Hamada, H. Hinagawa, M. Uetsuhara, S. Ikemura, K. Ae, C. Dong, M. Tasaki, S. Furuta, H. Chen, M. Tagawa, S. Ikeda, T. Hanada, the IDEA project team, "IDEA: In-situ Debris Environmental Awareness", *Innovative Ideas for Micro/Nano-satellite Missions*, IAA Book Series, Vol.1, No.3, 2012.

推荐人

法国国家太空研究中心 CNES, Elisabet Canalias

巴黎天文台, Daniel Hestroffer

中科院空间应用中心, 高扬

日本航空宇宙开发机构 JAXA, Yasuhiro Kawakatsu

日本九州大学, Huixin Liu

日本九州大学, Toshiya Hanada

法国国立高等工程技术学院, Eric Nyiri

西工大, 卢晓东

其他

期刊审稿: Astrophysics and Space Science

Transactions of the Japan Society for Aeronautical and Space Sciences

Iranian Journal of Science and Technology, Transactions A: Science

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)

教育推广: 2015.08 日本女初高中生暑期学校

2017.08 空间应用中心-北京航空大学“太空飞行动力学与控制”暑期学校

学会会员: 国际空间委员会; 日本地球惑星学会; 日本航空宇宙学会; 美国宇航学会

资格证书: 计算机二级: C; 计算机三级: 网络技术; 大学英语四六级; 驾驶证; 潜水证

兴趣爱好: 书法; 绘画; 球赛