

Kenshiro Oguri (KEN)

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EDUCATION

Ph.D. student (2017-2020/2021 (expected))

Department of Aerospace Engineering Sciences, **University of Colorado Boulder**
Advisor: Prof. Jay McMahon

M.S. in Aeronautics and Astronautics (2017)

Department of Aeronautics and Astronautics, **the University of Tokyo**, Japan
Advisor: Prof. Shin-ichi Nakasuka and Prof. Ryu Funase
Thesis: "*Optimal Attitude and Trajectory Control for Spinning Solar Sails Steered by Reflectivity Control Devices Considering Arbitrary Membrane Deformation*"

B.S. in Aeronautics and Astronautics (2015)

Department of Aeronautics and Astronautics, **the University of Tokyo**, Japan
Advisor: Prof. Shin-ichi Nakasuka and Prof. Ryu Funase

PROFESSIONAL EXPERIENCE

NASA JPL visiting student researcher (2018), working on science orbit design for the Psyche mission¹. Group: outer planet mission analysis. Mentor: Dr. Gregory Lantoine & Dr. Jon Sims

CCAR graduate research assistant (2017-present), working on SRP-based orbit control around asteroids; NIAC 2017 project²; risk-aware trajectory planning at asteroids. Colorado Center for Astrodynamics Research (CCAR), University of Colorado Boulder.

JSPS DC1 research fellow (2017), working on attitude control & trajectory optimization of solar sailing spacecraft. JSPS DC1 research fellowship: the most prestigious fellowship for Ph.D. students in Japan³. JSPS: Japan Society for the Promotion of Science.

JAXA ISAS assistant researcher (2015-2017), working on trajectory & system design of deep-space small-sat projects (PROCYON and EQUULEUS projects).

UTokyo graduate teaching assistant (2016), *Exercise in Space Engineering* (junior-level class). Department of Aero&Astro, The University of Tokyo.

PROJECTS

Psyche mission (Summer 2018)¹, PI: Dr. L. Elkins-Tanton (Arizona State University)

- NASA discovery mission program
- working on *science orbit design at (16)Psyche*

NIAC 2017: Dismantling Rubble Pile Asteroids with AoES² (2017-present), PI: Prof. J. McMahon (CU Boulder)

- funded by NASA Innovative Advanced Concepts (NIAC) program (Phase I & II)
- working on *trajectory design & mission analysis around small asteroids*

EQUULEUS⁴ (2016-present), PI: Prof. T. Hashimoto & Prof. R. Funase (JAXA/UTokyo)

- JAXA's CubeSat mission to explore cis-lunar space with low energy transfer, one of 13 CubeSat payloads on NASA's SLS-EM1
- working on *trajectory design & mission analysis* (quasi-halo orbit design & stationkeeping control in the ephemeris model)
- working on *high-level mission & system design, as a project engineer lead*

Guidance & Control of solar sailing spacecraft (2014-2017), PI: Prof. R. Funase (UTokyo)

- collaboration with ISAS/JAXA solar sail working group
- working on *guidance & control algorithm development for attitude-orbit coupled dynamics, interplanetary trajectory design*

PROCYON⁵ (2014-2017), PI: Prof. R. Funase & Prof. Y. Kawakatsu (UTokyo/JAXA)

¹<https://www.jpl.nasa.gov/missions/psyche/>

²https://www.nasa.gov/directorates/spacetechniac/2018_Phase_I_Phase_II/Dismantling_Rubble_Pile_Asteroids_with_AoES

³<https://www.jsps.go.jp/english/e-pd/index.html>

⁴EQUULEUS: Equilibrium Lunar-Earth point 6U Spacecraft

⁵PROCYON: Proximate Object Close Flyby with Optical Navigation

- JAXA's small-sat mission, the world-first 50kg-class deep-space explorer, successfully launched and operated
- working on *attitude determination & control system engineer* (flight data analysis & flight software development)

Nano-JASMINE⁶ (2014-2017), PI: Dr. N. Sako & Prof. N. Goda (UTokyo/NAOJ)

- National Astrometrical Observatory of Japan (NAOJ)'s small-sat mission, to be the world-first 30kg-class astrometry satellite
- working on *development of attitude control & determination system (ADCS) as an ADCS engineer lead*

AWARDS

Individual awards

John V. Breakwell student award (2018), from American Astronautical Society. Paper: "*SRP-based Orbit Control with Application to Small Body Landing*"

Tuition fee half exemption for outstanding students (2017), from the University of Tokyo.

Outstanding Student Presentation Award (2016), from Japan Society for Aeronautical and Space Sciences. Paper: "*Time-Optimal Attitude Control and its Application to Orbital Control of Spinning Solar Sail Driven by Reflectivity Control*"

Traveling awards for international conferences (2016), from Tokyo electric power company holdings memorial foundation (~\$2,000); from Murata science foundation, Japan (~\$1,200); from Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan (~\$4,000)

Young Researcher Award (2015), from Japan Society for Aeronautical and Space Sciences, as the third author. Paper: "*Preliminary Study of Angular Momentum Control by Solar Radiation Pressure for 50 kg-class Spacecraft PROCYON*"

Group awards

Japanese government MEXT⁷ Commendation for Science and Technology (2017), for PROCYON project.

The University of Tokyo President Award (2015), for PROCYON project.

Fellowships

Study abroad fellowship (2017-present), from Nakajima science foundation, Japan. Total support up to ~\$50,000/year for two years (including tuition); selection ratio ~14%

Departmental fellowship (2017), from Department of Aerospace Engineering Sciences, University of Colorado Boulder. \$5,000.

JSPS DC1 research fellowship for young scientist (2017), from Japan Society for the Promotion of Science (declined when starting study abroad). **The most prestigious fellowship for Ph.D. students in Japan.** Total support up to ~\$30,000/year for three years (including research grants); selection ratio ~20%

Japanese Government MEXT fellowship (2015-2017), from Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan. Total support up to ~\$10,000/year for two years.

Research grants

Research grant for foundation members (2017), from Masayoshi-Son foundation, Japan. ~\$3,000; selection ratio ~8.7%

Grants-in-Aid for Scientific Research <KAKENHI> (2017), from Japan Society for the Promotion of Science. Total budget up to ~\$30,000/3year (declined when starting study abroad)

PEER-REVIEWED JOURNAL PUBLICATIONS

1. K. Oguri, R. Funase, Maneuverability-constrained Trajectory Design for Reflectivity-controlled Spinning Solar Sails using the Optimality Principle, to be submitted to *AIAA Journal of Guidance, Control, and Dynamics*. **in preparation.**
2. K. Oguri, K. Kakihara, S. Campagnola, K. Oshima, N. Ozaki, R. Funase, EQUULEUS Mission Analysis: Design of the Science Orbit Phase, *The Journal of the Astronautical Sciences*, **submitted.**
3. K. Oshima, S. Campagnola, C. H. Yam, Y. Kayama, Y. Kawakatsu, N. Ozaki, Q. Vespieren, K. Kakihara, K. Oguri, R. Funase, EQUULEUS Mission Analysis: Design of the Transfer Phase, *The Journal of the Astronautical Sciences*, **submitted.**
4. S. Ikari, T. Inamori, T. Ito, K. Ariu, K. Oguri, et.al, Attitude Determination and Control System for the Micro Spacecraft PROCYON, *Transactions of the Japan Society for Aeronautical and Space Sciences*.

⁶Nano-JASMINE: Nano Japan Astrometry Satellite Mission for Infrared Exploration

⁷MEXT: Ministry of Education, Culture, Sports, Science and Technology

CONFERENCE PROCEEDINGS

First author (selected)

1. K. Oguri and J. W. McMahon. SRP-based Orbit Control with Application to Small Body Landing. In *AAS/AIAA Astrodynamics Specialist Conference*, pages 1–19, Snowbird, UT, 2018, **John V. Breakwell student award**
2. K. Oguri, K. Kakihara, S. Campagnola, N. Ozaki, K. Oshima, T. Yamaguchi, and R. Funase. EQUULEUS Mission Analysis: Design of the Science Orbit Phase. In *26th International Symposium on Space Flight Dynamics*, Ehime, Japan, 2017
3. K. Oguri, A. Ishikawa, S. Ikari, T. Kudo, and R. Funase. Precision Evaluation of Reduced Dynamics Model for Non-uniform Spinning Solar Sail Driven by Reflectivity Control. In *4th International Symposium on Solar Sailing, 17045*, Kyoto, Japan, 2017
4. K. Oguri, T. Kudo, and R. Funase. Design Criteria of Reflectivity Control System Under Uncertainty in Sail Property for Maneuverability Requirement of Spinning Solar Sail. In *AIAA/AAS Astrodynamics Specialist Conference, AIAA2016-5674*, Long beach, CA, 2016
5. K. Oguri and R. Funase. Time-optimal Attitude Control Law with a Strategy of Applying to Orbital Control for Spinning Solar Sail Driven by Reflectivity Control. *Advances in the Astronautical Sciences (also paper of 26th AAS/AIAA Space Flight Mechanics Meetings, AAS 16-329)*, 158:933–951, 2016
6. K. Oguri, T. Kudo, and R. Funase. Time-Optimal Attitude Control and its Application to Orbital Control of Spinning Solar Sail Driven by Reflectivity Control. In *60th Space Sciences and Technology Conference, 2016-P34*, Hokkaido, Japan, 2016, **Outstanding student presentation award**
7. K. Oguri, T. Furumoto, and R. Funase. Optimal Attitude Control of Spinning Solar Sail with Reflectivity Control. In *30th International Symposium on Space Technology and Science, 2015-d-26*, Kobe, Japan, 2015
8. K. Oguri, T. Furumoto, and R. Funase. Time-Optimal Attitude Control of Spinning Solar Sail by Reflectivity Control. In *25th Workshop on JAXA Astrodynamics and Flight Mechanics, 2015-C-11*, pages 1–6, Kanagawa, Japan, 2015
9. K. Oguri, T. Inamori, S. Ikari, R. Hamaguchi, S. Nakajima, K. Ariu, N. Ozaki, T. Asoma, T. Furumoto, Y. Yamagishi, K. Yoshino, Y. Kawasoe, K. Nagata, M. Fujimoto, S. Otsuka, T. Kudo, Y. Koshiro, and S. Nomura. On-Orbit Estimation of ADCS Parameters for micro-astrometry satellite "Nano-JASMINE". In *59th Space Sciences and Technology Conference, 2015-3J13*, Kagoshima, Japan, 2015

Co-author (selected)

1. S. Campagnola, N. Ozaki, J. Hernando-ayuso, K. Oshima, T. Yamaguchi, K. Oguri, Y. Ozawa, T. Ikenaga, K. Kakihara, S. Takahashi, R. Funase, Y. Kawakatsu, and T. Hashimoto. Mission Analysis for EQUULEUS and OMOTENASHI. In *31st International Symposium on Space Technology and Science*, pages 1–5, 2017
2. R. Funase, N. Ozaki, S. Nakajima, K. Oguri, K. Miyoshi, S. Campagnola, H. Koizumi, Y. Kobayashi, T. Ito, T. Kudo, Y. Koshiro, and S. Nomura. Mission to Earth to Moon Lagrange Point by a 6U CubeSat : EQUULEUS. In *31st International Symposium on Space Technology and Science*, pages 4–7, 2017
3. A. Ishikawa, K. Oguri, S. Ikari, R. Funase, and S. Nakasuka. Estimation of Shape and Optical Parameters of Spinning Solar Sail Equipped with Reflectivity Control Devices. In *26th International Symposium on Space Flight Dynamics*, pages 1–6, 2017
4. K. Oshima, S. Campagnola, C. H. Yam, Y. Kayama, Y. Kawakatsu, N. Ozaki, Q. Verspieren, K. Kakihara, K. Oguri, and R. Funase. EQUULEUS Mission Analysis: Design of the Transfer Phase. In *26th International Symposium on Space Flight Dynamics*, Ehime, Japan, 2017
5. S. Nomura, R. Takahashi, M. Ikura, K. Oguri, T. Obata, S. Ikari, and R. Funase. Initial Design of EQUULEUS Attitude Determination and Control System : How to Design an ADCS with High Reliability for a Deep Space CubeSat. In *31st International Symposium on Space Technology and Science*, pages 1–6, 2017
6. S. Campagnola, N. Ozaki, K. Oguri, Q. Verspieren, K. Kakihara, K. Yanagida, R. Funase, H. C. Yam, L. Ferella, T. Yamaguchi, Y. Kawakatsu, and G. D. Yarnoz. Mission Analysis for EQUULEUS , JAXA's Earth-Moon Libration Orbit Cubesat. In *67th International Astronautical Congress, IAC-16-B4.8.1*, pages 1–10, Guadalajara, Mexico, 2016
7. T. Ito, S. Ikari, K. Oguri, M. Fujimoto, K. Ariu, Y. Kawabata, T. Inamori, S. Sakai, Y. Kawakatsu, and R. Funase. Preliminary Study of Angular Momentum Control by Solar Radiation Pressure for 50 kg-class Spacecraft PROCYON. In *59th Space Sciences and Technology Conference, 2015-3J08*, pages 1–6, Kagoshima, Japan, 2015, **Young researcher award**
8. T. Ito, S. Ikari, T. Nakatani, M. Fujimoto, K. Ariu, K. Oguri, T. Inamori, S. Sakai, Y. Kawakatsu, and R. Funase. Reliable and Robust Implementation of Attitude Determination and Control Subsystem and Initial Flight Operation Results. In *25th International Symposium on Space Flight Dynamics ISSFD*, number 1, pages 1–12, Munich, Germany, 2015
9. S. Ikari, T. Inamori, T. Ito, K. Ariu, K. Oguri, M. Fujimoto, S. Sakai, Y. Kawakatsu, and R. Funase. Development and On-orbit Verification of Attitude Control System for the Interplanetary Micro-spacecraft PROCYON. In *25th Workshop on JAXA Astrodynamics and Flight Mechanics, 2015-C-10*, Kanagawa, Japan, 2015

PRESENTATIONS

Oral

1. K. Oguri: "EQUULEUS Mission Analysis: Design of the Science Orbit Phase", at *26th International Symposium on Space Flight Dynamics, ISSFD-2017-072*, Ehime, Japan, 2017.
2. K. Oguri: "Precision Evaluation of Reduced Dynamics Model for Non-uniform Spinning Solar Sail Driven by Reflectivity Control", at *4th International Symposium on Solar Sailing, ISSS-17045*, Kyoto, Japan, 2017.
3. K. Oguri: "Attitude Maneuverability Estimation for Preliminary Mission Design of Spinning Solar Sail Driven by Reflectivity Control" at *the AIAA/AAS Astrodynamics Specialist Conference, AIAA2016-5674*, Long Beach, California, 2016.
4. K. Oguri: "Optimal Attitude and Orbital Control Strategy of Spinning Solar Sail Spacecraft via Reflectivity Control" at *26th AAS/AIAA Space Flight Mechanics Meeting, AAS 16-329*, Napa, California, 2016.
5. K. Oguri: "On-Orbit Estimation of ADCS Parameters for micro-astrometry satellite "Nano-JASMINE"" at *59th Space Sciences and Technology Conference, 2015-3J13*, Kagoshima, Japan, 2015.
6. K. Oguri: "Time-Optimal Attitude Control of Spinning Solar Sail by Reflectivity Control" at *25th Workshop on JAXA Astrodynamics and Flight Mechanics, 2015-C-11*, Kanagawa, Japan, 2015.
7. K. Oguri: "Optimal Attitude Control of Spinning Solar Sail with Reflectivity Control" at *30th International Symposium on Space Technology and Science, 2015-d-26*, Kobe, Japan, 2015.

Poster

1. K. Oguri: "Mission Concept and System Design of World-First Cis-Lunar Space Exploration CubeSat EQUULEUS", at *17th ISAS/JAXA Space Science Symposium, 2016-P-24*, Kanagawa, Japan, 2017.
2. K. Oguri: "Time-Optimal Attitude Control and its Application to Orbital Control of Spinning Solar Sail Driven by Reflectivity Control" at *60th Space Sciences and Technology Conference, 2016-P34*, Hokkaido, Japan, 2016. **Outstanding student presentation award**

MISCELLANEOUS

Languages: Japanese (native), English (fluent)

Professional memberships: AIAA, AAS, Japan Society for Aeronautical and Space Sciences (JSASS)

Programming: Matlab (proficient), Python (proficient), C (intermediate), C++ (intermediate)

Software, tools: SPICE (CSPICE, MICE), GMAT, jTOP (spacecraft trajectory optimization software developed by Dr. Stefano Campagnola), Microsoft Visual Studio, CAD software (SolidWorks, Autodesk inventor, PTC Creo), Subversion, GitHub