



Anton Ermakov

Assistant Professor of Aeronautics and Astronautics and, by courtesy, of Geophysics and of Earth and Planetary Sciences

Bio

BIO

Dr. Ermakov's research lies at the intersection of planetary science and planetary exploration by robotic means and focuses on studying the internal structure and evolution of the Solar System bodies ranging from asteroids to gas giants. In his research, Dr. Ermakov combines a diverse range of spacecraft data (e.g., spacecraft radiometric tracking, stereo-imaging, magnetometry, microwave radiometry and geologic mapping) with geophysical and orbital dynamics modeling to probe the interiors and histories of Solar System bodies.

Dr. Ermakov has been a member of the NASA Dawn mission team. Dawn was the first mission to orbit two small bodies in the Solar System: asteroid Vesta and dwarf Ceres. Small bodies are a time machine that lets us explore the environment in which planets formed. Combining gravity and topography data sets is one of the most powerful tool to study deep planetary interiors from orbit. Dr. Ermakov used gravity and shape data for detailed studies of asteroid Vesta's and dwarf planet Ceres's internal structures. The Dawn data have established a framework for future geophysical investigations of water-rich worlds in the outer Solar System such as Europa and Enceladus.

Currently, Dr. Ermakov is a participating scientist in the NASA's Juno mission. Juno is currently orbiting Jupiter and has performed several flybys of the Jovian moons. Dr. Ermakov uses the data from the Juno's instrument suite to study the interior of Jupiter and its satellites in context of their formation and evolution models.

He received an Engineer Degree in Space Geodesy from the Moscow State University of Geodesy and Cartography in 2010 and a Ph.D. in Planetary Sciences from the Massachusetts Institute of Technology in 2017. After receiving his doctorate degree, Dr. Ermakov was a post-doctoral scholar at the Jet Propulsion Laboratory and at the Earth and Planetary Science Department of the University of California, Berkeley. From 2021 to 2023, Dr. Ermakov was a research scientist at UC Berkeley's Space Sciences Lab.

ACADEMIC APPOINTMENTS

- Assistant Professor, Aeronautics and Astronautics
- Assistant Professor (By courtesy), Geophysics
- Assistant Professor (By courtesy), Earth & Planetary Sciences

HONORS AND AWARDS

- Robert N. Noyce Faculty Fellow, School of Engineering, Stanford University (2024)
- Team Award for the development the Mercury gravity field model, Jet Propulsion Laboratory (2019)

- Asteroid 10680 Ermakov, Minor Planet Center (2017)
- NASA Group Achievement Award to the Dawn Gravity Team, NASA (2016)

PROFESSIONAL EDUCATION

- Ph.D., Massachusetts Institute of Technology , Planetary Science (2017)
- Engineer, Moscow State University of Geodesy and Cartography , Space Geodesy (2010)

LINKS

- Personal Website: <https://www.planetarygeodesy.com/>
- Google Scholar: <https://scholar.google.com/citations?user=WhD0yYwAAAAJ&hl=en&authuser=2>
- 10680 Ermakov: https://ssd.jpl.nasa.gov/tools/sbdb_lookup.html#/?sstr=10680

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

I am interested in the formation and evolution of the Solar System bodies and the ways we can constrain planetary interiors by geophysical measurements.

Teaching

COURSES

2025-26

- How to Design a Space Mission: from Concept to Execution: AA 118N (Aut)
- Orbital and Attitude Mechanics: AA 179 (Spr)
- Planetary Science and Exploration Seminar: AA 299, EPS 375, GEOPHYS 375 (Aut, Win, Spr)
- Space Mechanics: AA 279A (Win)

2024-25

- How to Design a Space Mission: from Concept to Execution: AA 118N (Aut)
- Orbital and Attitude Mechanics: AA 179 (Spr)
- Planetary Geophysics: Theory, Observational Techniques and Data Analysis: AA 234, EPS 233, GEOPHYS 243 (Win)
- Planetary Science and Exploration Seminar: AA 299, EPS 375, GEOPHYS 375 (Aut, Win, Spr)

2023-24

- Orbital Mechanics and Attitude Dynamics: AA 179 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Zahra Ahmed, Keidai Iiyama, Shane Lowe

Doctoral Dissertation Advisor (AC)

Ian Fu, Riley Tam

Orals Evaluator

Keidai Iiyama

Master's Program Advisor

Michael Chhay, Alexander Mescher, Ryan Ota, Nidhi Sonwalkar, Santiago Thorup

Doctoral (Program)

Yueyang Li

Publications

PUBLICATIONS

- **Synchronized Eruptions on Io: Possible Evidence of Interconnected Subsurface Magma Reservoirs** *JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS*
Mura, A., Lopes, R., Nimmo, F., Bolton, S., Ermakov, A., Keane, J. T., Tosi, F., Zambon, F., Sordini, R., Radebaugh, J., Rathbun, J., McKinnon, W., Goossens, et al
2026; 131 (1)
- **Europa's ice thickness and subsurface structure characterized by the Juno microwave radiometer** *NATURE ASTRONOMY*
Levin, S. M., Zhang, Z., Bolton, S. J., Brown, S., Ermakov, A. I., Feng, J., Hand, K., Misra, S., Siegler, M., Stevenson, D., Mckinnon, W., Akiba, R.
2025
- **An orbital gravity mission could decipher the global dichotomy on Mars** *NATURE GEOSCIENCE*
Sori, M., Ermakov, A., Keane, J.
2025
- **A small core in Vesta inferred from Dawn's observations** *NATURE ASTRONOMY*
Park, R. S., Ermakov, A. I., Konopliv, A. S., Vaughan, A. T., Rambaux, N., Bills, B. G., Castillo-Rogez, J. C., Fu, R. R., Jacobson, S. A., Stewart, S. T., Toplis, M. J.
2025
- **(16) Psyche's Different Possible Formation Scenarios and Internal Structures From Current Constraints** *JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS*
Bierson, C. J., Courville, S. W., Ermakov, A., Elkins-Tanton, L. T., Wiczorek, M., Park, R. S., Bajjal, N.
2025; 130 (4)
- **Evaluating the Use of Seasonal Surface Displacements and Time-Variable Gravity to Constrain the Interior of Mars** *JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS*
Wagner, N. L., James, P. B., Ermakov, A. I., Sori, M. M.
2024; 129 (6)
- **Microwave Observations of Ganymede's Sub-Surface Ice: I. Ice Temperature and Structure** *JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS*
Brown, S., Zhang, Z., Bolton, S., Bonnefoy, L. E., Ermakov, A., Feng, J., Hartogh, P., Levin, S., Misra, S., Siegler, M., Stevenson, D.
2023; 128 (6)
- **Next Generation Planetary Geodesy**
Sori, M., Keane, J., Ermakov, A.
Keck Institute for Space Studies.
2023
- **Probing the Icy Shell Structure of Ocean Worlds with Gravity-Topography Admittance** *PLANETARY SCIENCE JOURNAL*
Akiba, R., Ermakov, A. I., Militzer, B.
2022; 3 (3)
- **Geophysics of Vesta and Ceres** *Vesta and Ceres: Insights from the Dawn Mission for the Origin of the Solar System*
Ermakov, A., Raymond, C.
Cambridge University Press.2022: 173-196
- **A Recipe for the Geophysical Exploration of Enceladus** *PLANETARY SCIENCE JOURNAL*
Ermakov, A. I., Park, R. S., Roa, J., Castillo-Rogez, J. C., Keane, J. T., Nimmo, F., Kite, E. S., Sotin, C., Lazio, T. W., Steinbrugge, G., Howell, S. M., Bills, B. G., Hemingway, et al
2021; 2 (4)

- **Surface Roughness and Gravitational Slope Distributions of Vesta and Ceres** *JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS*
Ermakov, A. I., Kreslavsky, M. A., Scully, J. E. C., Hughson, K. H. G., Park, R. S.
2019; 124 (1): 14-30
- **Power Laws of Topography and Gravity Spectra of the Solar System Bodies** *JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS*
Ermakov, A. I., Park, R. S., Bills, B. G.
2018; 123 (8): 2038-2064
- **Constraints on Ceres' Internal Structure and Evolution From Its Shape and Gravity Measured by the Dawn Spacecraft** *JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS*
Ermakov, A. I., Fu, R. R., Castillo-Rogez, J. C., Raymond, C. A., Park, R. S., Preusker, F., Russell, C. T., Smith, D. E., Zuber, M. T.
2017; 122 (11): 2267-2293
- **Ceres's obliquity history and its implications for the permanently shadowed regions** *GEOPHYSICAL RESEARCH LETTERS*
Ermakov, A. I., Mazarico, E., Schroeder, S. E., Carsenty, U., Schorghofer, N., Preusker, F., Raymond, C. A., Russell, C. T., Zuber, M. T.
2017; 44 (6): 2652-2661
- **Constraints on Vesta's interior structure using gravity and shape models from the Dawn mission** *ICARUS*
Ermakov, A. I., Zuber, M. T., Smith, D. E., Raymond, C. A., Balmino, G., Fu, R. R., Ivanov, B. A.
2014; 240: 146-160