



SAVE OUR PLANET FROM SPACE INTRUDERS



Tuesday, April 10, 2018

3:30 p.m.

3164 Martin Hall, Aerospace Conference Room

TOSHI HIRABAYASHI

Assistant professor of Aerospace Engineering
at Auburn University

ABSTRACT

Asteroid deflection is a technology for deflecting natural objects in space that may threaten the human society by impacting the Earth, later called hazardous objects. Recent observations have discovered such objects, and some of them were reported to fly-by the Earth recently. The NASA Double Asteroid Redirection Test (DART) mission, a part of the Asteroid Impact & Deflection Assessment (AIDA) mission, has been targeting the binary Near-Earth asteroid (65803) in September 2022. In this mission, the DART spacecraft is going to collide with the secondary of Didymos. One of the mission goals is to measure the momentum transfer coefficient of the impact experiment, β , which is a key parameter of the asteroid deflection technology. This parameter will be calculated based on the orbital perturbation of Didymos after the DART impact experiment. In this problem, there are two potential issues. First, the primary of Didymos is rotating with a spin period of 2.1 hr, which is above the spin limit, and would be structurally unstable at present. Second, the impact ejecta after the DART impact would be likely to hit the primary. Such impacts of the ejecta on the primary might cause the significant shape modification of the primary, perturbing the orbital motion of the system. In this talk, we quantify orbital perturbation caused by the shape deformation and propose a method for removing this "noise" to determine a proper β value.

BIO

Toshi Hirabayashi is an assistant professor of Aerospace Engineering at Auburn University. He graduated from an undergraduate school of Mechanical and Aerospace Engineering at Nagoya University in Japan in 2007 and obtained an M.S. degree in Aerospace Engineering at the University of Tokyo in 2010. After moving to the U.S., he got an M.S. degree in 2012 and a Ph.D. degree in December in 2014 in Aerospace Engineering at University of Colorado Boulder. After joining the Planetary Science group at Purdue University for two years, he joined Auburn in August 2017. He is currently a directory of the Space Technology Application Research (STAR) lab at Auburn. His research focuses on using orbital mechanics, structure, impact physics, and planetary sciences to solve engineering and scientific problems in planetary missions. Toshihirabayashi is named after him as an honor to his contribution to planetary science communities. He has published more than 20 peer-reviewed journal papers, and has actively been involved in multiple space missions. During his M.S. program, he was involved in the operation team of the Hayabusa mission and served as a primary engineer of the IKAROS mission. He is currently a Co-I of the Optimal Navigation Camera team in the Hayabusa 2 mission (Japan's second asteroid sample return mission) and a participating scientist of the DART/AIDA (NASA-ESA joint) mission.

