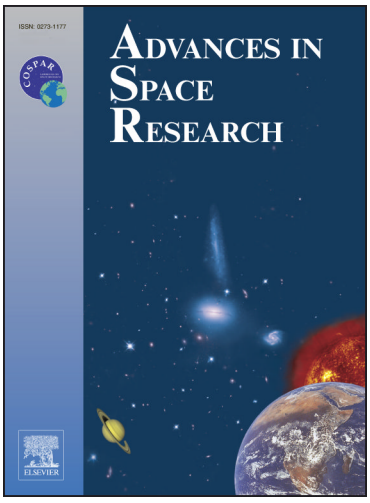
Accepted Manuscript




# Tube dynamics and low energy Earth–Moon transfers in the 4-body system

Kaori Onozaki, Hiroaki Yoshimura, Shane D. Ross

PII: S0273-1177(17)30556-2
DOI: http://dx.doi.org/10.1016/j.asr.2017.07.046
Reference: JASR 13356

To appear in: *Advances in Space Research*

Received Date: 26 January 2017
Accepted Date: 31 July 2017

Please cite this article as: Onozaki, K., Yoshimura, H., Ross, S.D., Tube dynamics and low energy Earth–Moon transfers in the 4-body system, *Advances in Space Research* (2017), doi: http://dx.doi.org/10.1016/j.asr.2017.07.046

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

# Tube dynamics and low energy Earth–Moon transfers in the 4-body system[☆]

Kaori Onozaki

*Department of Applied Mechanics and Aerospace Engineering, Waseda University, 3-4-1, Okubo, Shinjuku, Tokyo 169-8555, Japan*

Hiroaki Yoshimura[*]

*Department of Applied Mechanics and Aerospace Engineering, Waseda University, 3-4-1, Okubo, Shinjuku, Tokyo 169-8555, Japan*

Shane D. Ross

*Engineering Mechanics Program, Virginia Tech, 495 Old Turner Street, Blacksburg, VA 24061, USA*

**Abstract**

In this paper, we show a low energy Earth–Moon transfer in the context of the Sun–Earth–Moon–spacecraft 4-body system. We consider the 4-body system as the coupled system of the Sun–Earth–spacecraft 3-body system perturbed by the Moon (which we call the Moon-perturbed system) and the Earth–Moon–spacecraft 3-body system perturbed by the Sun (which we call the Sun-perturbed system). In both perturbed systems, analogs of the stable and unstable manifolds are computed numerically by using the notion of Lagrangian coherent structures, wherein the stable and unstable manifolds play the role of separating orbits into transit and non-transit orbits. We obtain a family of non-transit orbits departing from a low Earth orbit in the Moon-perturbed system, and a family of transit orbits arriving into a low lunar orbit in the Sun-perturbed system. Finally, we show that we can construct a low energy transfer from the Earth to the Moon by choosing

[☆]This template can be used for all publications in Advances in Space Research.

[*]Corresponding author

*Email addresses:* green-11street@ruri.waseda.jp (Kaori Onozaki), yoshimura@waseda.jp (Hiroaki Yoshimura), sdross@vt.edu (Shane D. Ross)

Download English Version:

https://daneshyari.com/en/article/5486060

Download Persian Version:

https://daneshyari.com/article/5486060

Daneshyari.com