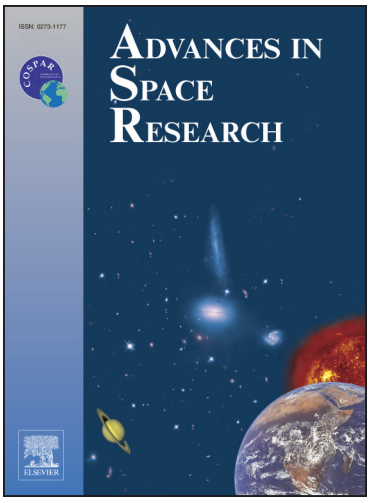

The YORP Effect on the GOES 8 and GOES 10 Satellites: A Case Study

Antonella A. Albuja, Daniel J. Scheeres, Rita L. Cognion, William Ryan, Eileen V. Ryan

PII: S0273-1177(17)30723-8
DOI: https://doi.org/10.1016/j.asr.2017.10.002
Reference: JASR 13434

To appear in: *Advances in Space Research*

Received Date: 23 October 2016
Accepted Date: 4 October 2017

Please cite this article as: Albuja, A.A., Scheeres, D.J., Cognion, R.L., Ryan, W., Ryan, E.V., The YORP Effect on the GOES 8 and GOES 10 Satellites: A Case Study, *Advances in Space Research* (2017), doi: https://doi.org/10.1016/j.asr.2017.10.002

The YORP Effect on the GOES 8 and GOES 10 Satellites: A Case Study

Antonella A. Albuja[1] and Daniel J. Scheeres [2]
University of Colorado at Boulder, Boulder, CO, 80309, USA

Rita L. Cognion [3]
Oceanit, Kihei, HI, 96753, USA

William Ryan[4] and Eileen V. Ryan[5]
New Mexico Institute of Mining and Technology, Socorro, New Mexico, 87801, USA

The Yarkovsky-O'Keefe-Radzievskii-Paddack (YORP) effect is a proposed explanation for the observed rotation behavior of inactive satellites in Earth orbit. This paper further explores the YORP effect for highly asymmetric inactive satellites. Satellite models are developed to represent the GOES 8 and GOES 10 satellites, both of which are currently inactive in geosynchronous Earth orbit (GEO). A simple satellite model for the GOES 8 satellite is used to analyze the short period variations of the angular velocity and obliquity as a result of the YORP effect. A more complex model for the rotational dynamics of the GOES 8 and GOES 10 satellites are developed to probe their sensitivity and to match observed spin periods and states of these satellites. The simulated rotation periods are compared to observations for both satellites. The comparison between YORP theory and observed rotation rates for both satellites show that the YORP effect could be the cause for the observed rotational behavior. The YORP model also predicts a novel state for the GOES 8 satellite, namely that it could

[1] Graduate Research Assistant, Aerospace Engineering Sciences, University of Colorado at Boulder, 429 UCB, Boulder, CO, 80309., antonella.albuja@colorado.edu, 314-435-4923
[2] A. Richard Seebass Endowed Chair Professor, Aerospace Engineering Sciences, University of Colorado at Boulder, 429 UCB, Boulder, CO, 80309.
[3] Senior Scientist, Oceanit, 1305 N. Holopono St, Ste 4A, Kihei, HI 96753.
[4] Research Faculty, Magdalena Ridge Observatory/R+ED, New Mexico Institute of Mining and Technology, 101 East Road, Socorro, NM, 87801.
[5] Director, 2.4-meter Telescope, Magdalena Ridge Observatory, New Mexico Institute of Mining and Technology, 101 East Road, Socorro, NM, 87801.