MIniMoon EXplorer (MIMEX) – A Mission to Study the Physical Characterstics of a Temporarily-Captured Asteroid

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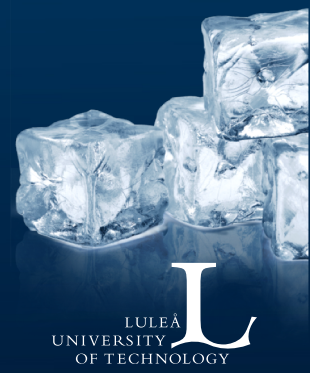

MINIMOONS

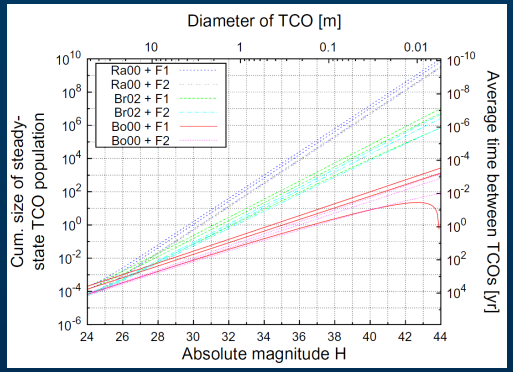

Figure 1: Size-Frequency Distribution of MiniMoons

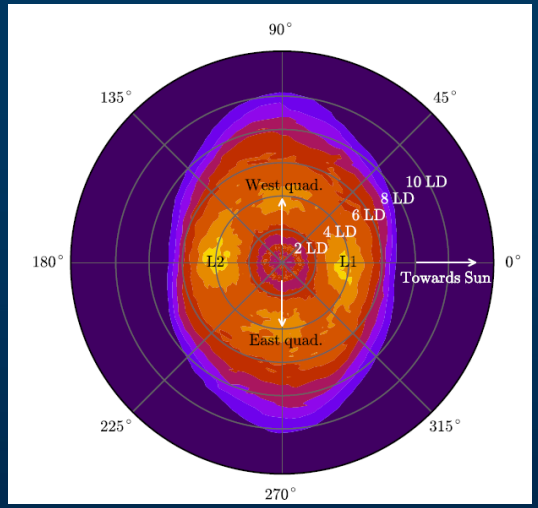

Figure 2: MiniMoon Residence Locations

[1] M. Granvik, J. Vaubaillon, R. Jedicke, "The Population of natural Earth satellites," *Icarus,* no. 218, pp. 262-277, 2012.
[2] B. Bolin, R. Jedicke, M. Granvik, P. Brown, E. Howell, M. C. Nolan, P. Jenniskens, M. Chyba, G. Patterson, R. Wainscoat, "Detecting Earth's temporarily-captured natural satellites—Minimoons," *Icarus,* no. 241, pp. 280-297, 2014.

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MIMEX – MINIMOON EXPLORER

- Mission constraints
  - MiniMoon detection rate
  - Time of stay
  - Holding orbit
  - CubeSat technology
- Orbital Dynamics
- Spacecraft Design

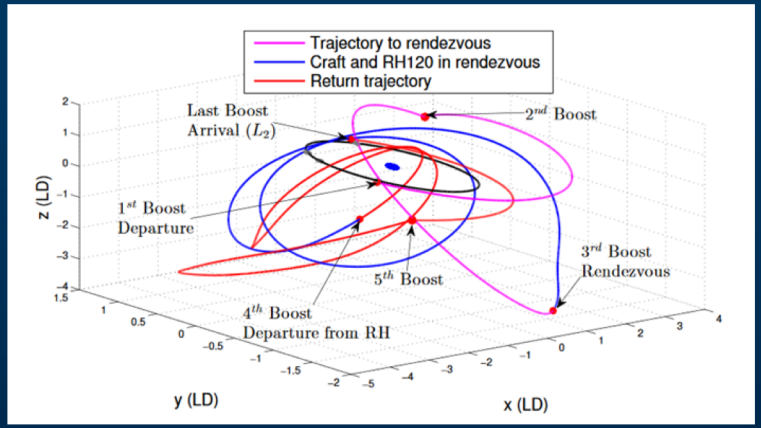

Figure 3: Rendezvous and Return to/from NEA 2006 RH_{120} from/to a Lunar L2 Halo Orbit.

[3] M. Chyba, T. Haberkorn, R. Jedicke, "Minimum fuel round trip from a L2 Earth-Moon Halo orbit to Asteroid 2006 RH_120," *Recent Advances in Celestial and Space Mechanics, Springer,* pp. 117-142, 2016.

FUTURE WORK

- Redirection
- Hardware

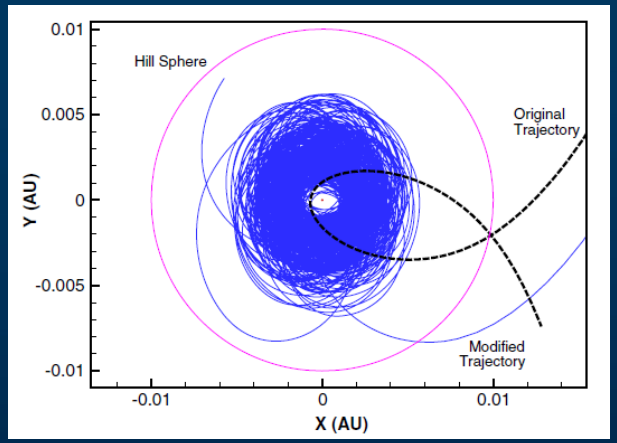

Figure 4: Synthetic MiniMoon stay duration increased by many years with only a few tens of m/s of delta-V.

[4] H. Urrutxua, D. J. Scheeres, C. Bombardelli, J. L. Gonzalo, J. Pelaez, ”Temporarily captured asteroids as a. pathway to affordable asteroid retrieval missions,” *Journal of Guidance, Control, and Dynamics,* vol. 38, no. 11, pp. 2132-2145.

THANKS & QUESTIONS?

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