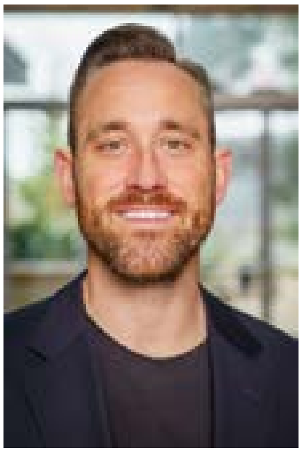
# AAE SPECIAL SEMINAR

# Toward a Spatiography of Circumterrestrial Space

**TUESDAY, APRIL 28TH, 2026**
**RHPH 172 1:30PM-2:20PM**

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**Abstract**

Satellites, debris, and natural material in the Earth- Moon environment occupy a dynamical regime that departs sharply from the classical terrestrial picture. Beyond the Laplace radius, lunisolar torques over- take Earth's oblateness, and long-term evolution is organized by an intertwined secular-resonant skeleton: von Zeipel-Lidov-Kozai-like coupling (with higher-order modications) and commensurabilities involving lunar precession frequencies shape the orientation and eccentricity evolution of high-altitude orbits. Super-posed on this secular architecture, lunar mean-motion resonances- most notably the 3:1 and 2:1 interior commensurabilities -partition cislunar phase space into stable islands bounded by separatrices, surrounded by chaotic layers that mediate transport and resonance switching. In this talk, I connect two complementary viewpoints. The first is local, perturbed-Hamiltonian intuition: analytical averaging and resonance half-width estimates that explain where long-lived structures can exist and why neighboring regimes become chaotic. The second is global and geometric: in the restricted three-body problem, resonance zones and transport corridors are defined by unstable resonant periodic orbits and their stable/unstable manifolds, with Earth-Moon L1 and L2 gateways regulating connectivity between the cislunar and translunar realms. A key outcome is a physically interpretable spatiography of circumterrestrial space built from boundaries that are both operational and dynamical: an inner, topology-based cislunar demarcation tied to the L1/L2 gateways; a translunar transition defined by lunisolar tidal parity, marking when geocentric motion becomes increasingly organized by Sun-Earth phase-space structure; and an outer boundary at the Sun-Earth Hill sphere, beyond which trajectories are no longer meaningfully Earth-bound and are instead governed by heliocentric dynamics. I will close by illustrating how this combined geometric-and-tidal partition clarifies long-term predictability, stable graveyard behavior, chaotic transport corridors, and disposal pathways that preferentially target bounded evolution versus conditional escape.


**Biography**

Aaron J. Rosengren is an Assistant Professor in the Jacobs School of Engineering and the Center for Astrophysics & Space Studies at the University of California San Diego. He previously served from 2017- 2020 as an Assistant Professor in the College of Engineering and of the Interdisciplinary Graduate Program in Applied Mathematics at the University of Arizona. He completed his postdocs at the Aristotle University of Thessaloniki in Greece in the Department of Physics (2016 - 2017), as a member of the EU H2020 Project, REDSHIFT, and at the Institute of Applied Physics Nello Carrara of the Italian National Research Council (2014 - 2016), as a Marie Curie Fellow in the FP7 Stardust Network. He has held visiting researcher positions at UNSW Canberra in Australia, the Asher Space Research Institute at Technion in Israel, the University of Rome Tor Vergata in Italy, and the Belgrade Astronomical Observatory in Serbia. Dr. Rosengren is Fellow of the Outer Space Institute (OSI) for the sustainable development of space at the University of British Columbia and currently serves on the External Advisory Board of the Ann and H.J. Smead Department of Aerospace Engineering Sciences at the University of Colorado Boulder.