



Propagation of Acoustic Waves from the OSIRIS-REx Sample Return Capsule during Re-entry

Sarah Popenhagen

PhD student, University of Hawai'i at Mānoa

Milton Garcés¹, Daniel Bowman², Elizabeth A. Silber², Philip Blom³, Jeremy Webster³

¹University of Hawai'i at Mānoa, ²Sandia National Laboratories, ³Los Alamos National Laboratories



Introduction

- On 24 Sep 2023, the OSIRIS-REx sample capsule entered Earth's atmosphere at hypersonic speed
- Capsule slowed to subsonic before landing at UTTR

Relevance

- Ability to detect and track objects travelling at high speeds in the atmosphere would be valuable for monitoring and non-proliferation
- Few opportunities to collect data

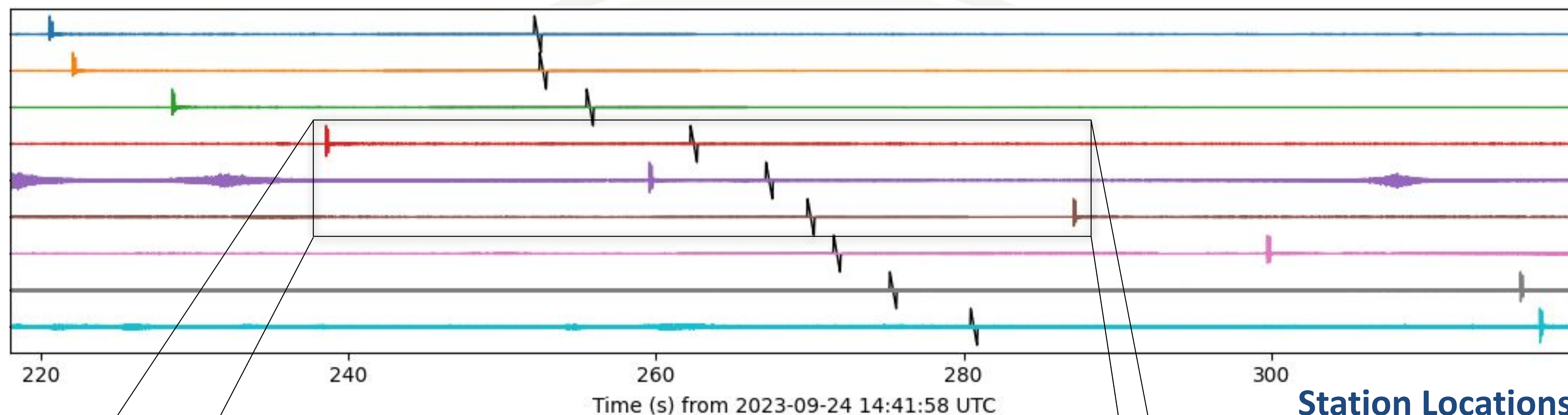
Approach

- Collaborative collection campaign with SNL & AFRL
- Modeling performed using infraGA

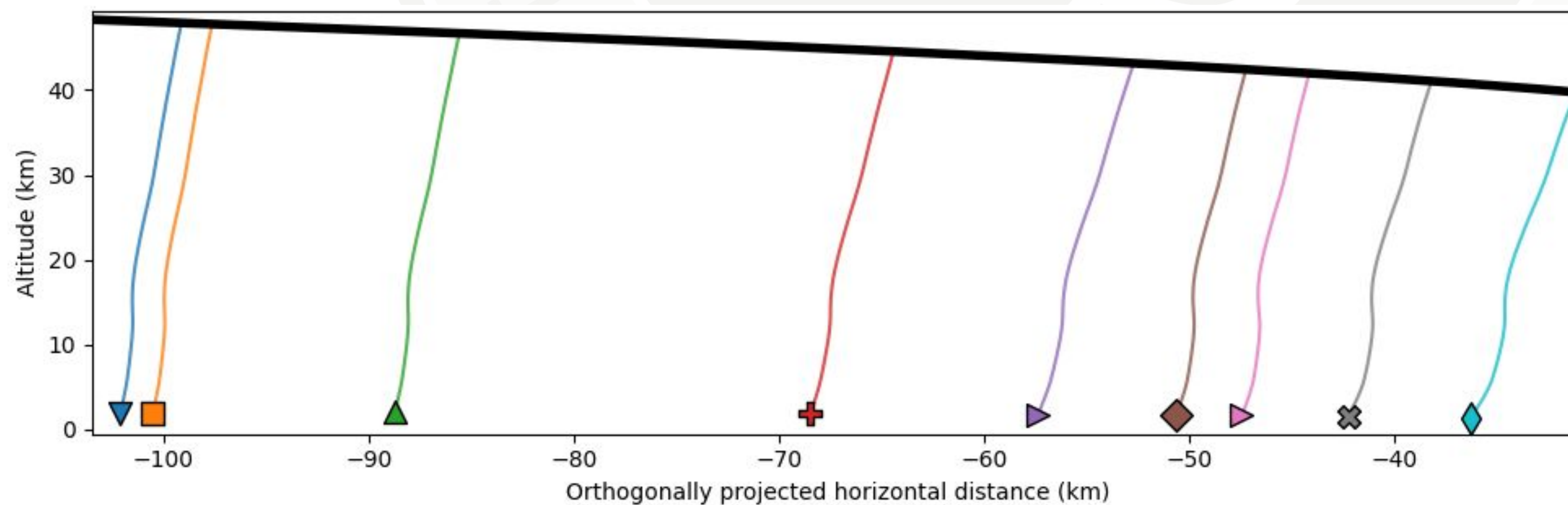


Results

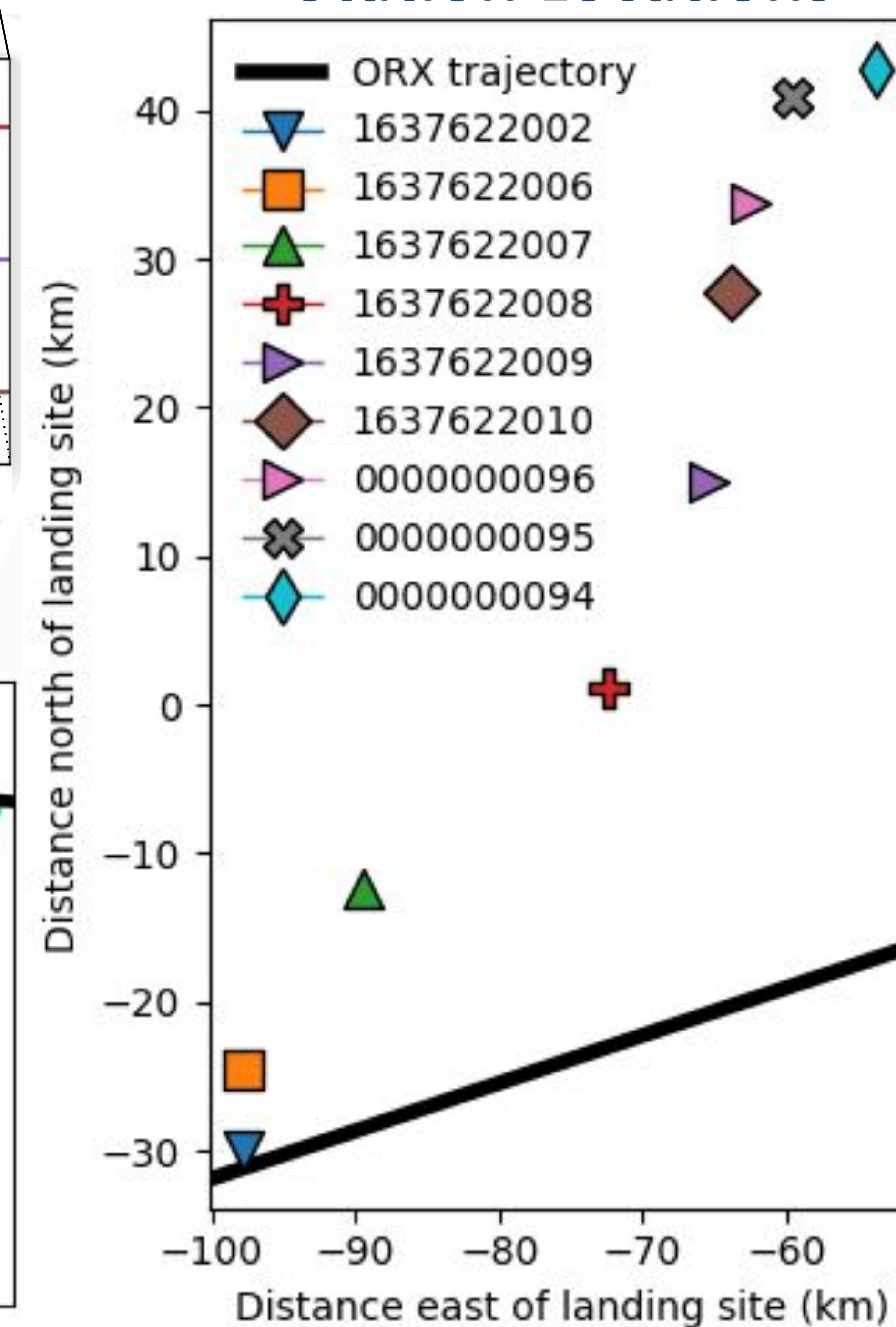
Observed and Modeled Waveforms & Arrival Times



Modeled First-Arrival Raypaths



Station Locations



Impact

- Collaboration with SNL & NNSS to publish paper in GRL last year on airborne collection platforms
- Collaboration with LANL on propagation modeling

Conclusion

- Propagation of signals from re-entry show clear pattern
- Small differences in trajectory potentially have significant effect on arrival times

Next Steps

- Further analysis of OSIRIS-REx data is ongoing
- Final trajectory information expected to clarify results