

Special Session

Breakthrough Initiatives project

Fast, frequent Solar System exploration with lightsails

In the past decade, two synergistic technologies have advanced to the point of enabling exciting, affordable possibilities for faster and more frequent access to the deep regions of our Solar System:

- Interplanetary CubeSats, e.g., Mars Cube One (MarCO) developed and flown by Jet Propulsion Laboratory for the Mars InSight mission
- Solar sailing, which utilizes Solar radiation propulsion.

Building on these developments, several new mission concepts have emerged enabling high-speed, low-cost missions throughout the Solar System. Today, we have the technology to cheaply fly a lightsail to low Solar perihelion (0.2-0.3 AU) and then, using photon pressure from the Sun, travel outward at speeds greater than 5 AU/year – exceeding that of any previous spacecraft. A mission to Jupiter would take less than two years and might cost only \$10-50m.

This special session examines how this new type of lightsail will enable fast, frequent missions to the outer Solar System at low cost, opening up deep space exploration to new scientists, organizations, and nations. It will consider the science possibilities of such a capability (including the search for life in the Solar System), the small-satellite technologies that will enable such missions (including electric propulsion and deep-space optical communications), and the future of this technology.

Agenda (3 hours)

Introduction (15m)

Lightning talks (9 x 10m = 1hr30)

Q&A (30 mins)

General discussion (30m)

Next steps and conclusions (15m)

Speakers:

Pete Worden, Breakthrough Initiatives	– Sails & the Search for Life in the Universe
Slava Turyshev, JPL	– Mission to the Solar Gravity Lens Point
James Schalkwyk, Breakthrough Initiatives	– The Breakthrough Starshot program
Lou Friedman, Planetary Society	– History of Solar Sails
Andrew Nutter, Gama Lightsails	– Gama’s space-based tech demonstration
Phil Maukopf, Arizona State University	– Deep space laser communications
Raycho Raychev – EnduroSat	– Building small satellites in the Balkans
Dillon O’Reilly – Inst. of Tech., Carlow	– Electric propulsion for interplanetary smallsats