Optimast-SCI Science: New Discovery Frontiers with Sensitive, Millarcsecond Resolution

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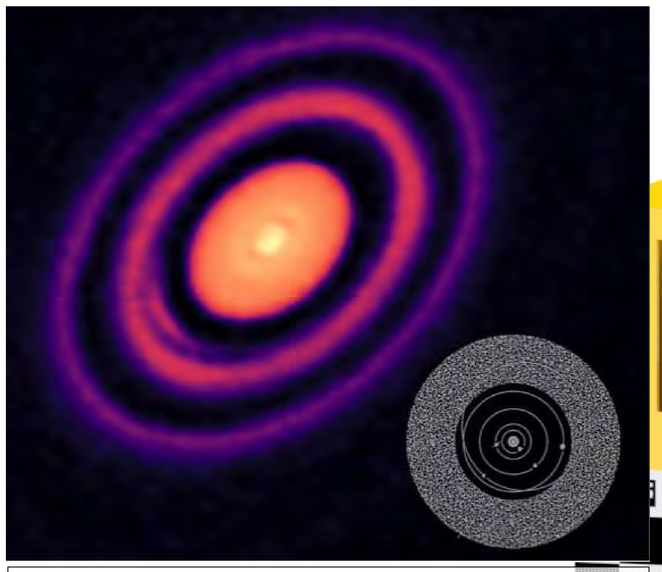
Optical interferometry from a space-based platform is freed from the limitations of the Earth's atmosphere.

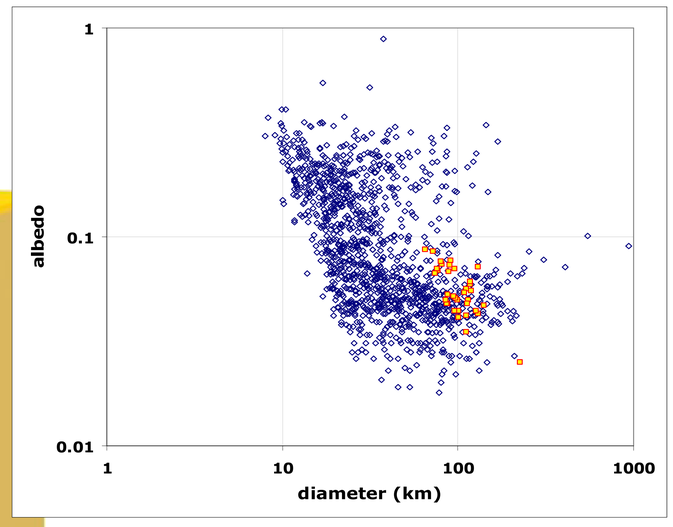
One fundamental benefit is **sensitivity**.

Gains of 100-1000× or more are possible, compared to ground-based optical interferometry.

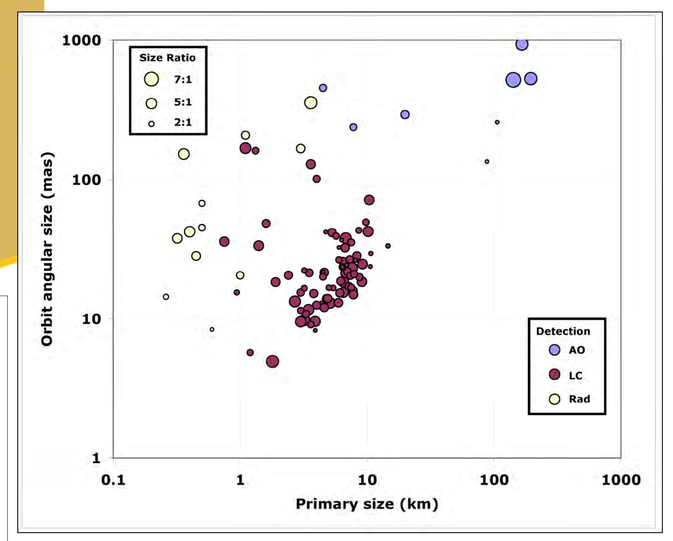


Imaging the Terrestrial Planet Forming Regions of Nearby YSOs

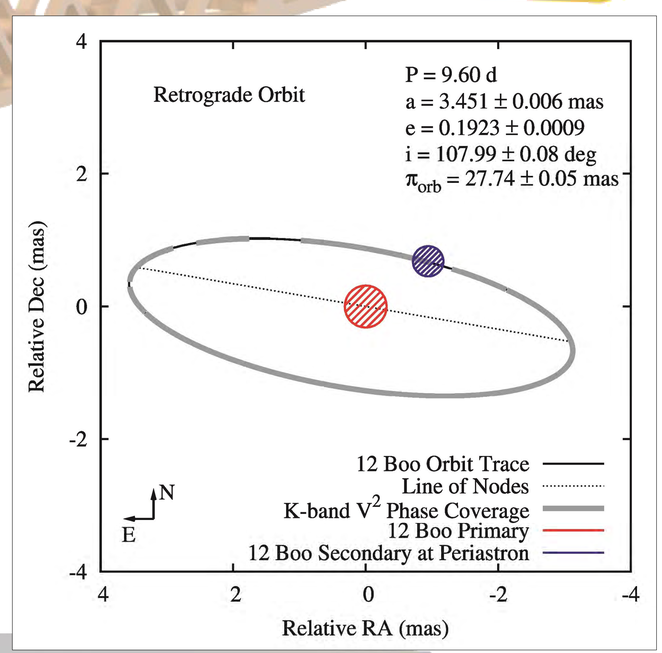
- ALMA observations are mapping out regions outside the water snow line; e.g. Isella+ 2018, HD163296 above, with 40mas resolution (inset on lower right is our own solar system)
- Optimast will have > 5× greater resolution
- Spanning 0.4-1.0μm, Optimast will image both scattered and thermal light



Single Object Targets Resolvable by Optimast (N>1,000)



Known Binary Targets for Orbit Mapping (N>100)



Fundamental Parameters of Low Mass Stellar Binaries

Follows ground-based work of bright stars.
- The orbit of 12 Boo (Boden et al. 2005) measured by the Palomar Testbed Interferometer, which determined component masses to 0.3%.
- Despite having a shorter base-line, with a shorter operational wavelength, Optimast will have similar angular resolution but for far fainter targets (e.g. low-mass stars).

Asteroid exploration: Flyby quality data without the flyby

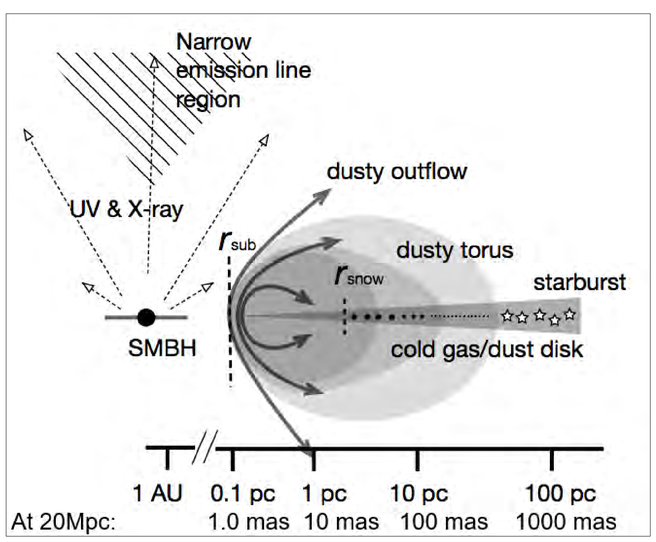
Extreme optical resolution (~2mas) from a two-element optical space interferometer:
- Shapes, sizes of ~10^3 asteroids
- Orbit and mass determination for all known V<16 binaries
- Spatially resolved spectra-photometry in >10 wavelength bands
- Space-based operation enables **high sensitivity** for reflected light objects
- Application of ground-based interferometry techniques (well developed but limited to emitted light objects, i.e. stars)

Main Belt Asteroids
- Sizes, shapes for any object > 10km (H<12.3)
- Resolved surface mapping for > 30 km
- Rotation > 6 hours (<5° 'smear' in 300sec)
- Detection of binaries, Keplerian solutions for binary orbits
- Hundreds of possible targets

Near-Earth Asteroids
- Direct size determination for >10m objects (H<26)
- Mapping of binary orbits

Jupiter Trojans
- H<9.2 (~36 known targets)
- Orbits / shapes for targets, binary detection

Additional targets: gas giant moons, ice dwarfs



Probing the Inner Core Architecture of Active Galactic Nuclei

- At 20 Mpc, 1mas resolution probes the inner edge of the AGN disk
- The feedback process between the dusty wind and host galaxy
- What fraction of supermassive black holes are binary?

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ONLINE RESOURCES

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