

A dedicated space observatory for time-domain solar system science

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Time-domain science

- **Spectral domain:**
covered by ground-based and space-based facilities
- **Spatial domain:**
covered by flybys and orbiters, adaptive optics
- **Time domain:**
exploration has been limited

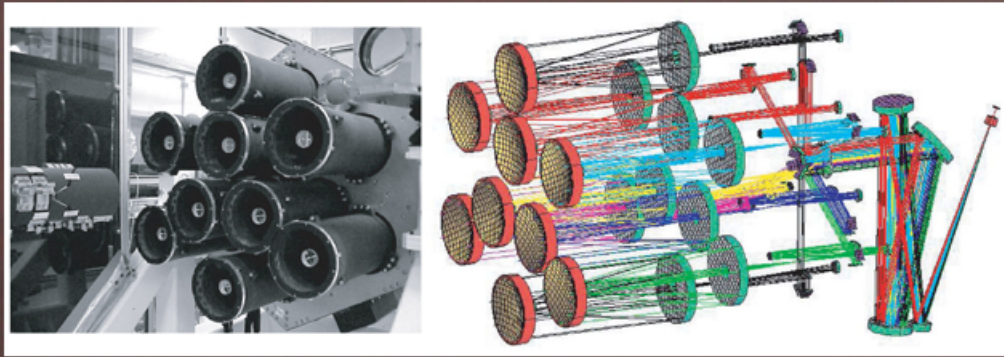
Time-domain science requirements are unique

- **Sampling interval**
 - ranges from milliseconds to days
 - intervals depend on program science goals
 - limited from the ground by “night”
 - limited at existing facilities by oversubscription
- **Campaign duration**
 - ranges from single visit to entire observatory lifetime
 - limited at existing facilities by oversubscription, scheduling cycles
- **Other**
 - wavelength range, angular resolution, etc.

Science programs

Investigation	Category	Data type (λ s)	Sampling scales	Campaign duration
Giant planet zonal winds and vortices	Atmospheres	Imaging (0)	Hours, single target rotation period	Years
Cloud/storm evolution and variability	Atmospheres	Imaging, spectroscopy (0, IR)	Hours, days	Days, years
Occultations	Atmospheres	Photometry, spectroscopy (UV, 0, IR)	Milliseconds	Hours
Aurorae	Atmospheres/space science	Imaging, spectroscopy (UV)	Minutes, hours	Years, hours
Volcanic trace gases	Atmospheres/geology/astrobiology	Spectroscopy, imaging (IR)	Days	Years
Volcanism, cryovolcanism	Geology/astrobiology	Imaging, spectroscopy (UV, 0, IR)	Days, hours	Years
Small body mutual events	Small bodies	Photometry (0)	Milliseconds	Hours
Cometary evolution	Small bodies	Imaging, spectroscopy (UV, 0, IR)	Hours	Days

Saving money with a distributed aperture



- Developed and tested at Lockheed-Martin
- May or may not be a mature, flight-tested technology

- Trades against filled aperture:
 - lower mass for same total aperture
 - lower volume for same total aperture
 - equal angular resolution
 - lower sensitivity

The last decadal survey:

“The close coincidence between the instrumentation used by planetary and other astronomers makes it unnecessary for the SSE Survey to recommend a major Earth-orbiting telescope devoted exclusively to solar system studies. The survey prefers to rely on the Discovery and, where appropriate, the Explorer lines to generate appropriate candidates.”