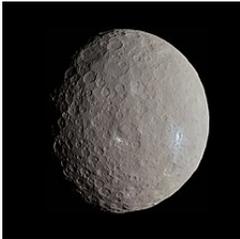




# NASA's James Webb Space Telescope:

## Solar System GTO and ERS Programs

There are 17 Guaranteed Time Observations (GTO) programs and one Early Release Science (ERS) program covering a large range of solar system science topics. **Future solar system General Observer (GO) proposers must follow target duplication guidelines (<https://jwst-docs.stsci.edu/observatory-functionality/jwst-duplication-checking>) when constructing their programs.** ERS programs are required not to have a proprietary period and can be used as the basis of a GO Cycle 1 Archival Research (AR) proposal; a majority of these GTO programs also have no proprietary period. Further information on the approved GTO and ERS programs can be found on the JWST website ([jwst.stsci.edu](http://jwst.stsci.edu)) under the "Observing Programs" heading and on the JWST documentation website ([jwst-docs.stsci.edu](http://jwst-docs.stsci.edu)) on the "JWST GTO Observation Specifications" page. APT files for these programs can be obtained by opening APT, selecting **File->Retrieve from STScI->Retrieve using Proposal ID, and entering the proposal ID number.**



NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/Justin Cowart

**Large Asteroids and Trojan Asteroids (GTO 1244):** The three main belt asteroids selected for this program are the largest, low-albedo asteroids known. Observations of Ceres will obtain information at longer wavelengths that complements those of the Dawn mission. JWST observations of Pallas and Hygiea will be unique and unobtainable from any other platform. Both Trojan asteroids, Hektor and Patroclus, are binary and have low albedos. Patroclus is a target for the Lucy mission in the early 2030s.

**Targets:** Ceres, Hektor, Hygiea, Pallas, Patroclus

**Observing modes:** MIRI/MRS, NIRCcam/Imaging, NIRSpec IFU

**Near-Earth Objects (GTO 1245):** Near-Earth Objects (NEOs) are of interest to the scientific, aerospace, and business communities because of their scientific significance, impact threat, human exploration, and private asteroid mining. Several spacecraft have visited NEOs but they had only limited spectral capabilities. This program will complement these "ground truth" observations while testing the tracking limits of JWST (nominally 30 mas/s).

**Targets:** Don Quixote, Phaethon

**Observing modes:** MIRI/LRS, MIRI/MRS, NIRCcam/Imaging, NIRSpec/FS



ESA/P. Carril



NASA/ESA/Hubble Heritage Team

**Mars (GTO 1415):** The brightness of Mars prevents observations with the full suite of JWST instruments, but the spatial distribution of the water D/H ratio, characterization of mesospheric emissions, spatial variability of dust and water ice clouds, and identification of trace species can be investigated with NIRSpec and NIRCcam. Mars will be observable in two separate windows closely spaced in time approximately every 2 years and can be effectively tracked at JWST's nominal tracking limit (30 mas/s).

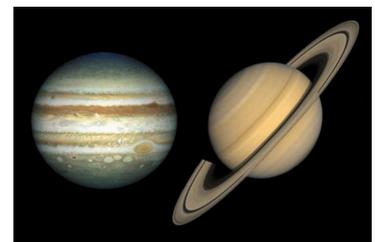
**Targets:** Mars

**Observing modes:** NIRCcam/Imaging, NIRSpec/FS

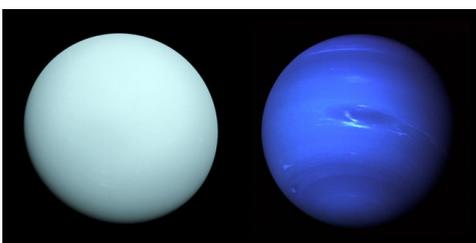
**Jupiter's Great Red Spot (GTO 1246) & Saturn (GTO 1247):** A MIRI/MRS mosaic of Jupiter's Great Red Spot and the surrounding region will help constrain 3D temperature, composition, and aerosol distributions. Saturn observations with JWST will complement Cassini and include a mosaic of the North Polar region, NIR spectra of small, faint satellites, and MIR observations of the rings.

**Targets:** Jupiter Great Red Spot (GTO 1246); Epimetheus, Pallene, Pandora, Rings, Saturn, Telesto (GTO 1247)

**Observing modes:** MIRI/MRS, NIRCcam/Imaging, NIRSpec/IFU



NASA/GSFCza



NASA/JPL-Caltech; NASA

**Uranus (GTO 1248) & Neptune (GTO 1249):** Uranus observations focus on the effects of the extreme seasonal tilt on circulation and chemistry, including the coupling between the upper, middle, and lower atmospheric levels. Neptune observations focus on middle atmospheric circulation, the south polar vortex, and a search for evidence of vertical coupling and tropical oscillation patterns.

**Targets:** Uranus (GTO 1248); Neptune (GTO 1249)

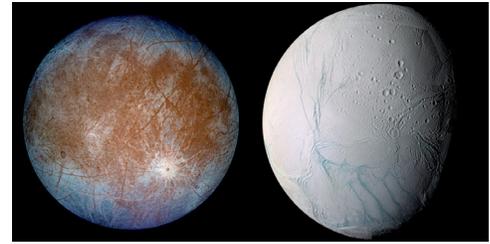
**Observing modes:** MIRI/MRS, NIRSpec/IFU



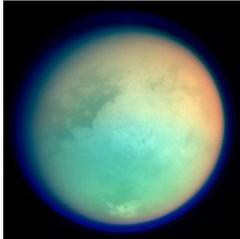
**Probing the Sub-surface Oceans of Europa and Enceladus with JWST (GTO 1250):** The presence of ongoing plume activity around the active moons Europa and Enceladus will be tested by probing specific wavelength regions for fluorescent emission features due to water, methane, and several organic species with NIRSpec and MIRI.

**Targets:** Enceladus, Europa

**Observing modes:** MIRI/Imaging, MIRI/MRS, NIRCcam/Imaging, NIRSpec/IFU



NASA



NASA/JPL/Space Science Institute

**Titan Climate, Composition and Clouds (GTO 1251):** Titan will be in southern winter/northern summer during JWST's lifetime. Imaging and high-resolution spectral observations in Cycle 1 will provide a baseline for Titan's surface composition and the gases, hazes, and clouds in the atmosphere. The NIRSpec/IFU will provide spatial information on all of these properties. The JWST observations in Cycle 1 could be useful for comparison to potential future observations later in the JWST mission.

**Targets:** Titan

**Observing modes:** MIRI/MRS, NIRCcam/Imaging, NIRSpec/IFU

**Spectral Mapping of a Comet's Inner Coma (GTO 1252) & ToO Comet (GTO 1253):** These programs aim to use the spectral mapping modes of JWST to characterize the composition of volatiles and dust in the inner 1000 km of the comae of a periodic comet and a newly discovered comet (ToO observations). Volatiles to be mapped are H<sub>2</sub>O, CO<sub>2</sub>, CO, CH<sub>4</sub>, CH<sub>3</sub>OH, and trace species, some of which are not observable from the ground. These programs will provide data previously only obtainable by in-situ spacecraft.

**Targets:** 19P/Borrelly, 238P/Read (GTO 1252); TBD (GTO 1253)

**Observing modes:** MIRI/MRS, NIRCcam/Imaging, NIRSpec/IFU



E. Kolmhofer/H. Raab



NASA/JHUAPL/SwRI

**Kuiper Belt Science with JWST (GTO 1191), Surface Composition of Mid-sized TNOs: Searching for Ammonia (GTO 1231), TNOs (GTO 1254) & Kuiper Belt Science with JWST (GTO 1272 & GTO 1273):** Together, these programs contain spectroscopic and imaging observations of dwarf planets, resonant TNOs, TNO binaries, Centaurs, and a test of Haumea family membership.

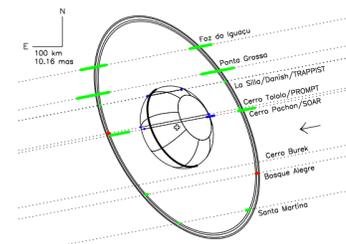
**Targets:** 1995 SM55, 1999 KR16, 2002 AW197, 2002 MS4, 2002 TX300, 2003 OP32, 2004 PT107, 2005 RR43, 2005 UQ513, 2007 OR10, Eris, Pluto/Charon, Salacia (GTO 1191); 2003 AZ84, Orcus (GTO 1231); Makemake, Varuna (GTO 1254); 2013 XZ8, Chariklo, Sedna, Triton (GTO 1272); 2008 FC76, Amycus, Chiron, Haumea, Quaoar (GTO 1273)

**Observing modes:** MIRI/Imaging, MIRI/LRS, MIRI/MRS, NIRSpec/FS, NIRSpec/IFU

**ToO TNOs: 'Unveiling the Kuiper Belt by Stellar Occultations' (GTO 1271):** Stellar occultations are valuable for measuring the occulting body's size, shape, geometric albedo, binarity, presence of rings, thermal surface properties, and bulk density. Determining a target for this proof-of-concept program requires knowledge of JWST's location in space and thus must wait until after launch. There is a 50% chance that an occultation of a star brighter than K=19 will occur in Cycle 1.

**Targets:** TBD

**Observing modes:** NIRCcam/Time Series



Braga-Ribas et al., 2014



NASA/JPL

**ERS Observations of the Jovian System as a Demonstration of JWST's Capabilities for Solar System Science (ERS 1373):** This program aims to characterize Jupiter's cloud layers, winds, atmospheric composition, and temperature structure in the South Polar region; the structure and evolution of the gossamer rings; and the atmospheres and surfaces of Io and Ganymede. NIRISS/AMI interferometric observations of Io are planned to obtain high-spatial resolution images of potentially active regions.

**Targets:** Ganymede, Io, Jupiter, Rings

**Observing modes:** MIRI/MRS, NIRCcam/Imaging, NIRISS/AMI, NIRSpec/IFU

See more at [jwst.stsci.edu](http://jwst.stsci.edu) and [jwst-docs.stsci.edu](http://jwst-docs.stsci.edu)

