

Titan Orbiter

Titan Orbiter globally characterizes Titan's dense N₂ atmosphere that harbors prebiotic molecules, its Earth-like methane hydrological cycle and seas, and its subsurface liquid water ocean, including how they evolve over time, in order to assess Titan's potential habitability. Cassini flybys revealed complex organic chemistry, methane-ethane lakes and seas, and meteorology on Titan, however these processes could not be thoroughly studied due to instrumentation and flyby coverage limitations. Titan Orbiter will investigate how the organic chemical factory on Titan works both in the atmosphere and on the surface, providing important context for data from Dragonfly and complementary global measurements.

Titan Orbiter Science Objectives:

- Determine Titan's internal structure, the depth and thickness of the ice shell and subsurface ocean, and whether the former is convecting; and determine rates of interior-surface solid or gas interchange
- Characterize Titan's global geology and its landscape-shaping processes
- Characterize Titan's global methane hydrological and sedimentological system, including surface transport/flow rates and cloud distributions
- Quantify the production, transport and fate of organic molecules in Titan's upper atmosphere and atmospheric and climate evolution in general

The mission shall address all four objectives.

The Titan Orbiter mission study report is available at:

<https://drive.google.com/file/d/1WYBrBXnTBN3cIipb-4GrIDzXiX2ztedG/view?usp=sharing>