Jet Propulsion Laboratory
California Institute of Technology

Navigation

Getting Where You Want to Go

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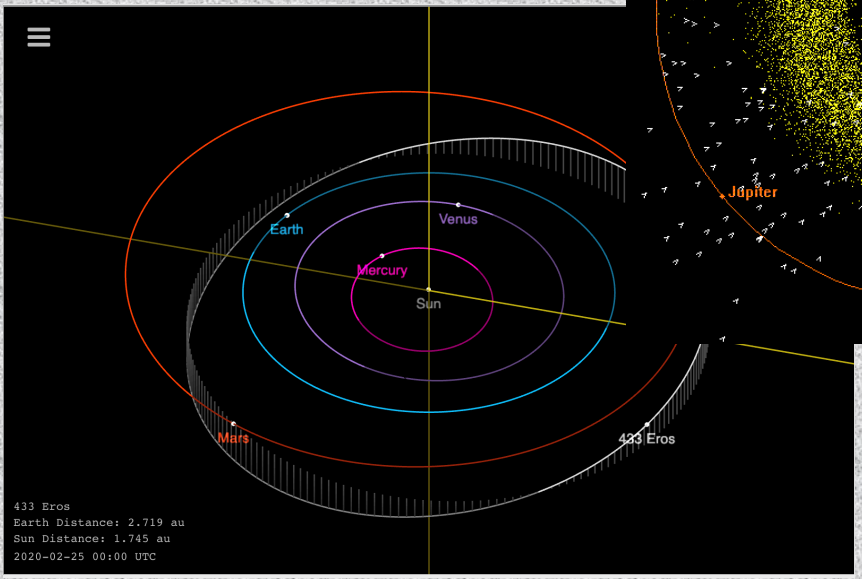
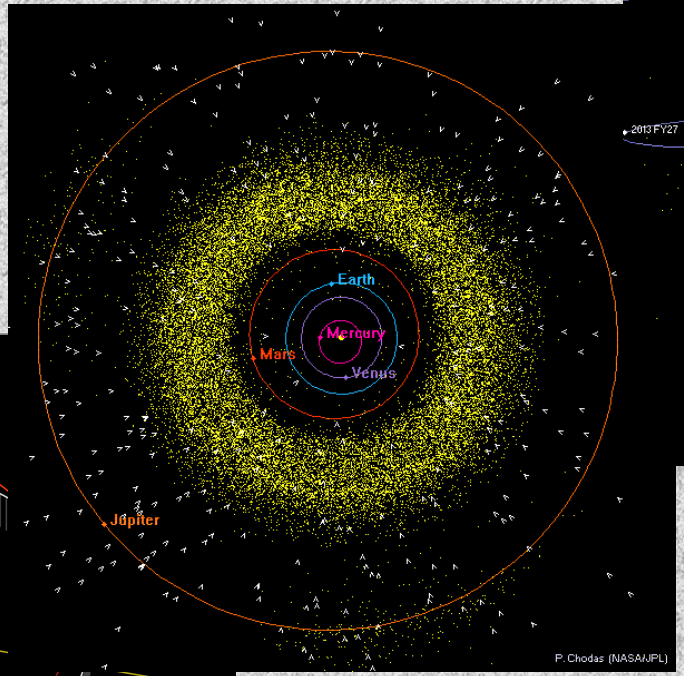
Navigation is Fundamental

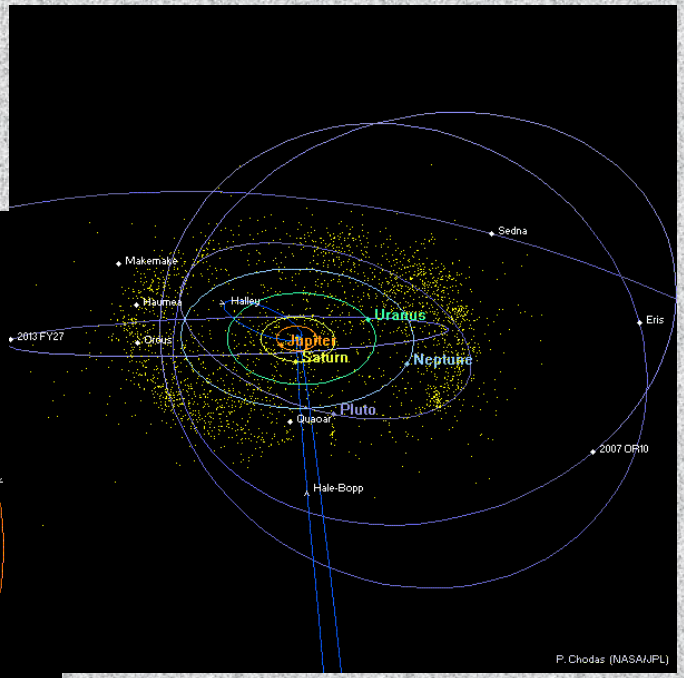
"If you don't get where you want to go,
you don't get the data you want to exploit..."

Ephemeris & Gravity

JPL's HORIZONS online solar system data and ephemeris computation service provides access to key solar system data and flexible production of highly accurate ephemerides for solar system objects







943317 asteroids, 3610 comets, 209 planetary satellites, 8 planets, the Sun, L1, L2, select spacecraft, system barycenters. HORIZONS is provided by JPL's Solar System Dynamics Group and funded by NASA's AMMOS Program.

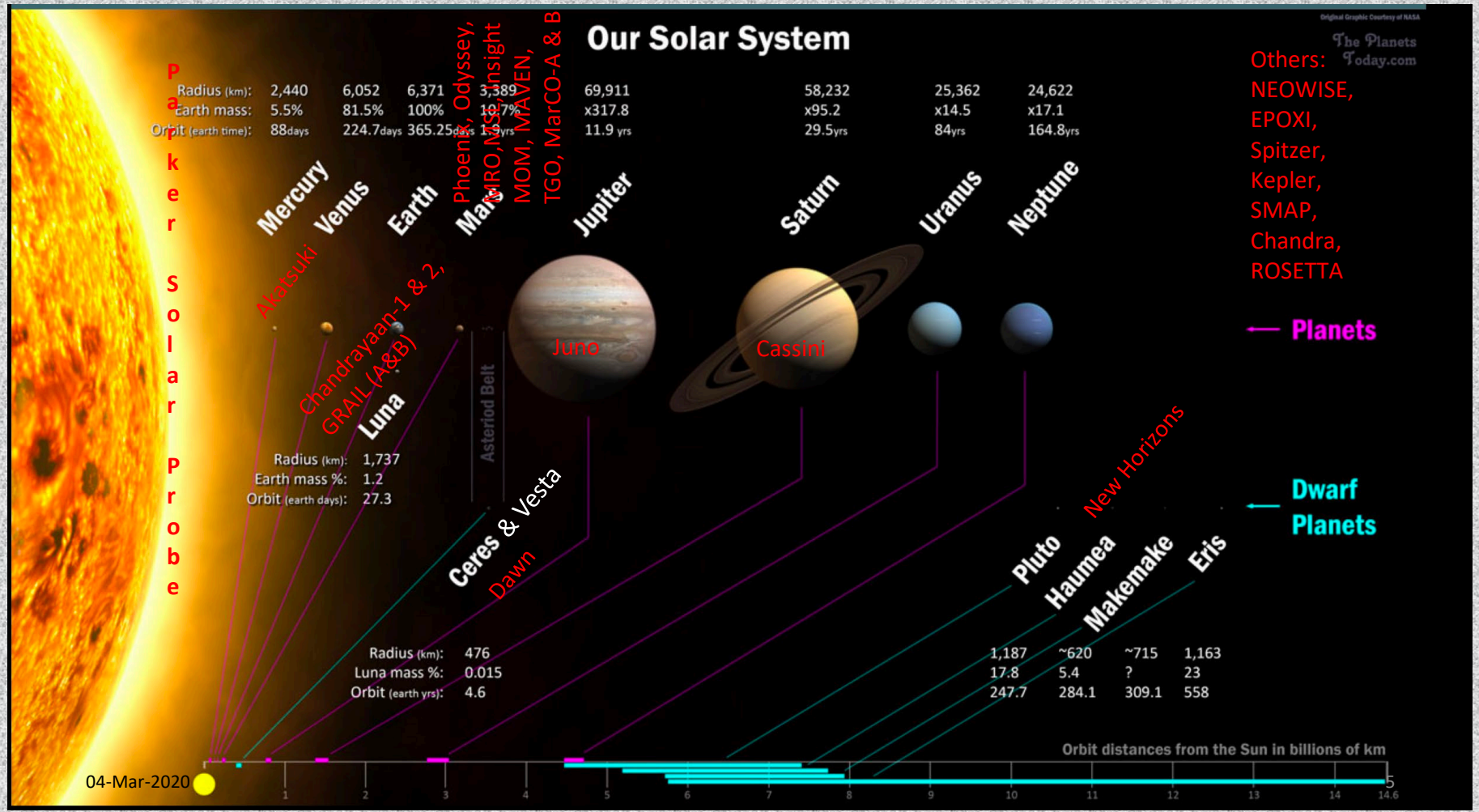
https://ssd.jpl.nasa.gov/

Monte – JPL's Signature Astrodynamics Software

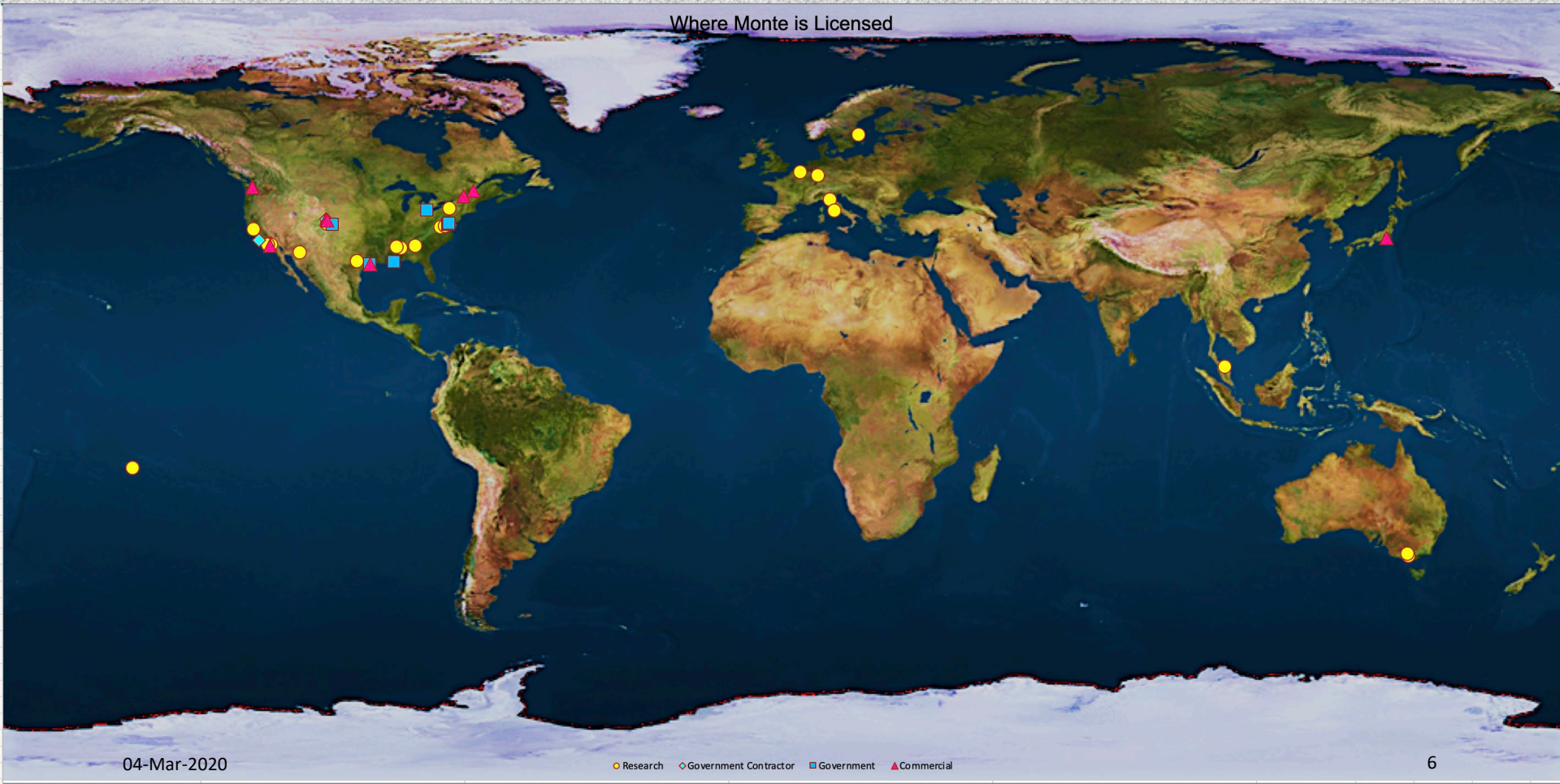
- JPL has a long history of navigating to the planets...
- Since 2008, JPL Navigators have used Monte, the "Mission-analysis, Operations & Navigation Toolkit Environment", funded by NASA's AMMOS program, to traverse the solar system
- Monte supports all phases of space mission development from early stage design and analysis through flight navigation services
- There is a rapidly expanding set of tools to support Space Mission Design, including trajectory design and optimization, etc.
- Core functionality supports operational Orbit Determination and Spacecraft Flight Path Control
- Monte may be licensed to and acquired by government agencies, government contractors, research institutions, and commercial firms
- How to Get It? To start the process, email William.L.Taber@jpl.nasa.gov, or see https://montepy.jpl.nasa.gov/

- Background: Monte Real Time Residual Plot

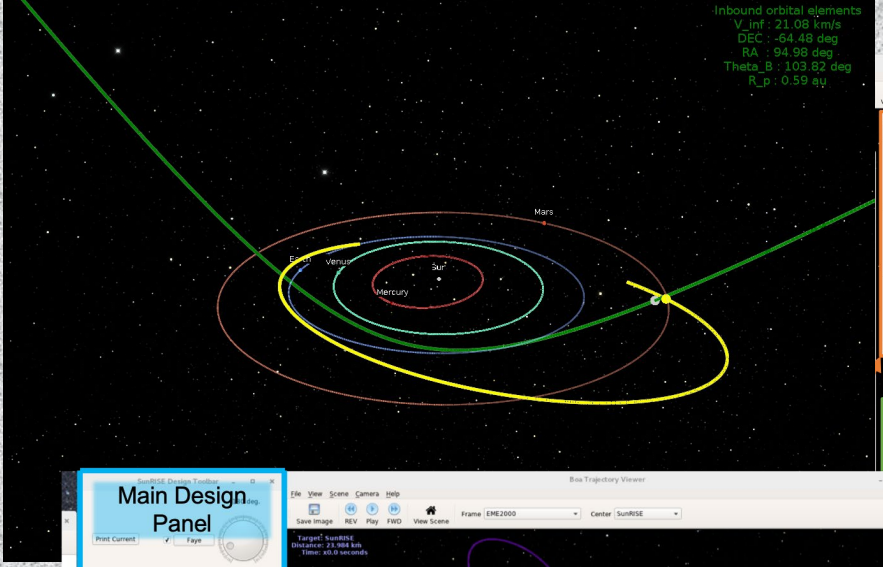
Monte – Where We Have Navigated With It

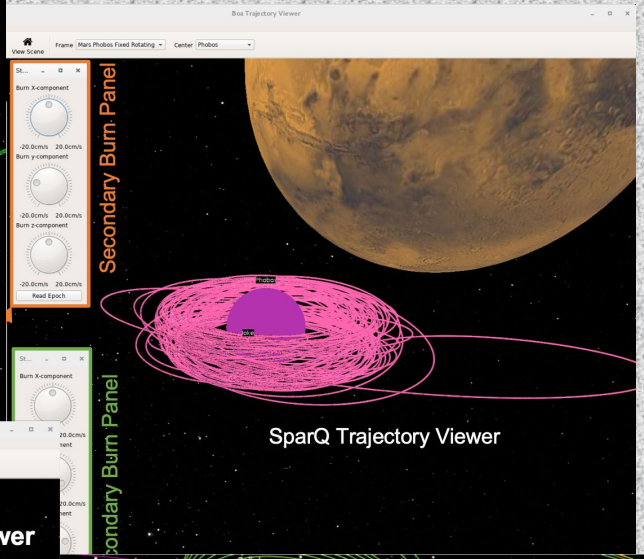


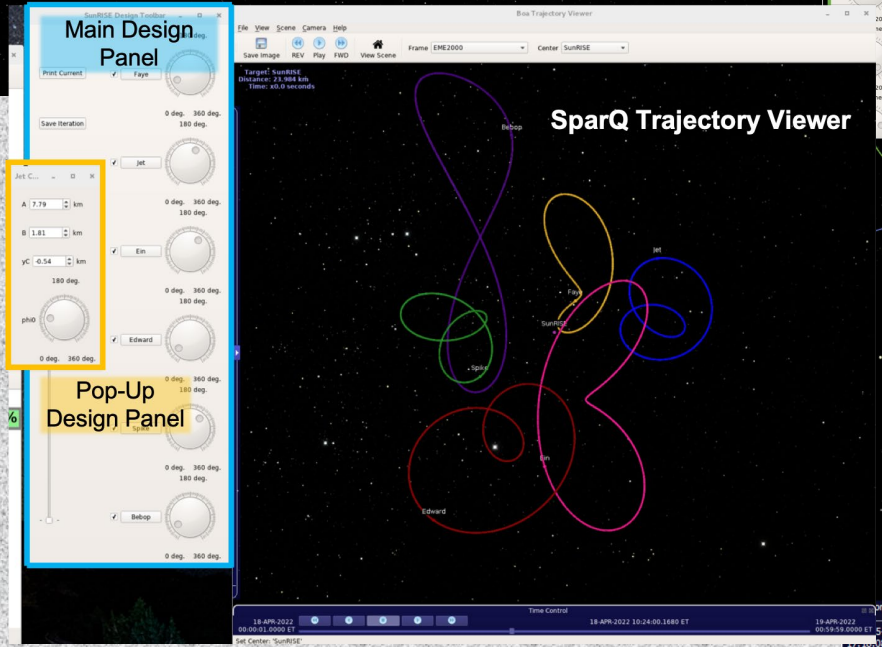
Monte – Where It Is Licensed



SparQ


Inbound orbital elements
V_inf : 21.08 km/s
DEC : -64.48 deg
RA : 94.98 deg
Theta_B : 103.82 deg
R_p : 0.59 au
Mars
Earth
Venus
Sun
Mercury

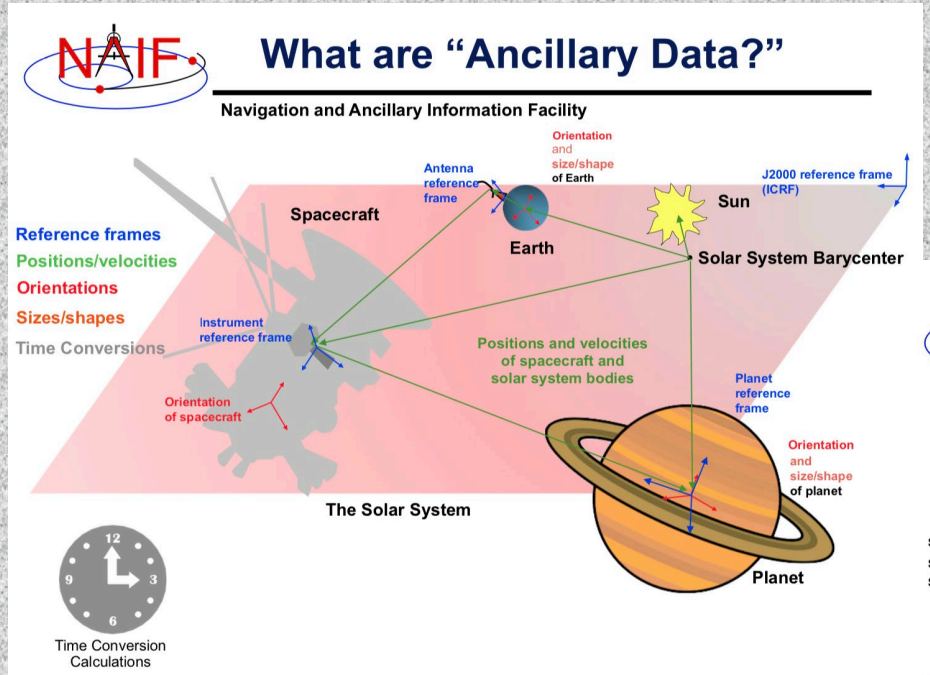

Secondary Burn Panel
SparQ Trajectory Viewer

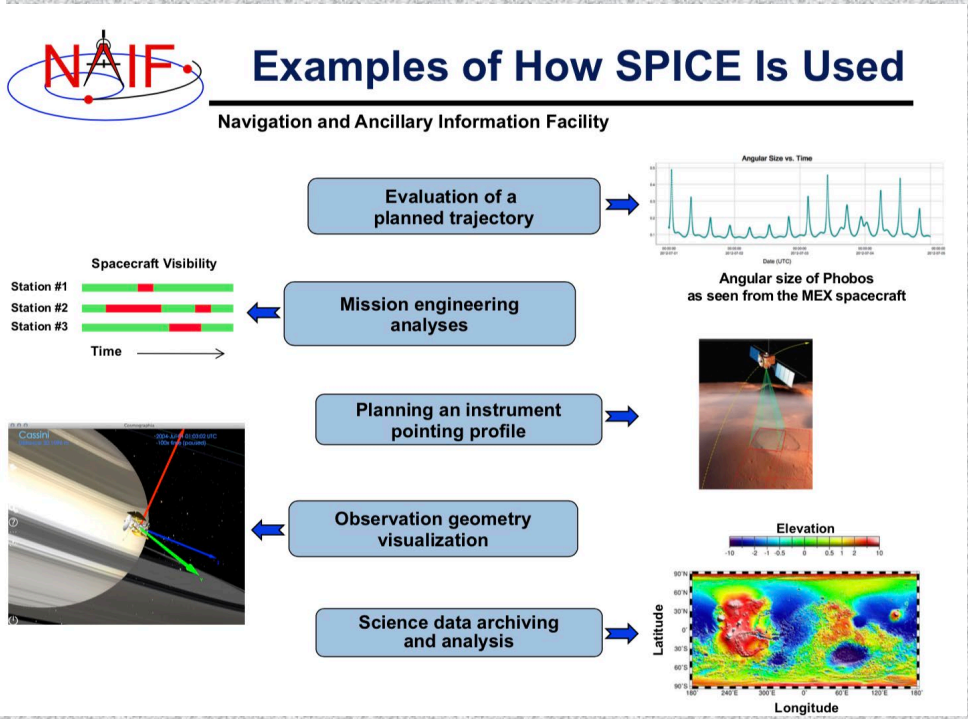

Main Design Panel
Pop-Up Design Panel
SparQ Trajectory Viewer


Callisto
Jupiter
Io
Thebe
Europa
Monte's 3D Trajectory Viewer

SPICE

https://naif.jpl.nasa.gov/naif/





S- Spacecraft ephemeris
P- Planet, satellite, comet, or asteroid ephemerides
I- Instrument information
C- Orientation information
E- Events information

Conclusion

In 15 short minutes, it is impossible to present all that has been accomplished and is yet to be accomplished by JPL Mission Design & Navigation