

Probing Psyche: Mission Overview and Operations Concept

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June 14, 2018



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What do we know about (16) Psyche?

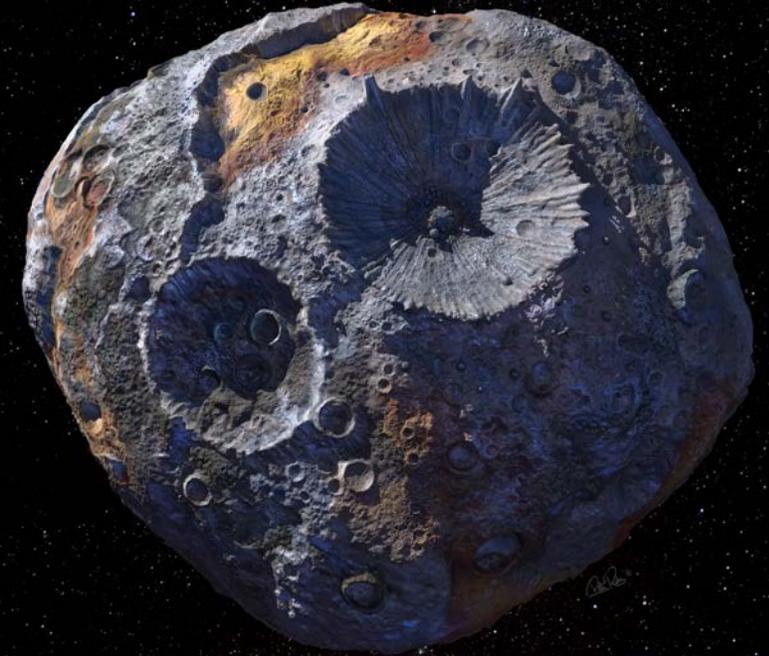
Tenth largest asteroid in the Main Belt

Largest M-type asteroid with diameter of 226 km

High radar albedo of 0.37 consistent with iron-nickel

High thermal inertia of $\sim 120 \text{ J m}^{-2} \text{ S}^{-0.5} \text{ K}^{-1}$

High density – estimates between $4,500 \text{ kg/m}^3$ to $6,980 \text{ kg/m}^3$



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Psyche is likely the stripped core of an early planetesimal



Science Objectives



Objective A: Determine whether Psyche is a core, or if it is unmelted material.

Objective B: Determine the relative ages of Psyche's surface regions.

Objective C: Determine the global abundances, in portions of Psyche's surface that appear to be a metal phase, of light elements S, K, and Si.

Objective D: Determine whether Psyche was formed under more oxidizing or more reducing conditions than Earth's core.

Objective E: Characterize Psyche's topography.





Psyche is a massive body with unknown gravity



NEAR

OSIRIS-REx

Psyche

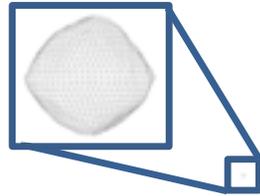
Dawn



Eros

R = 16 km

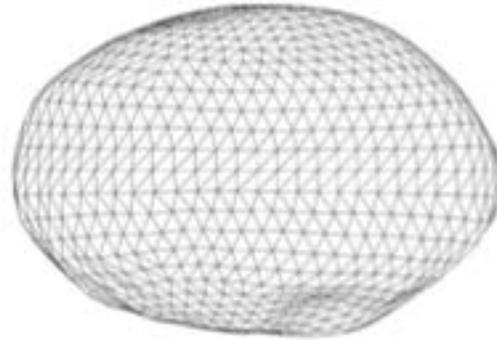
M = (0.00024)M_{Psyche}



Bennu

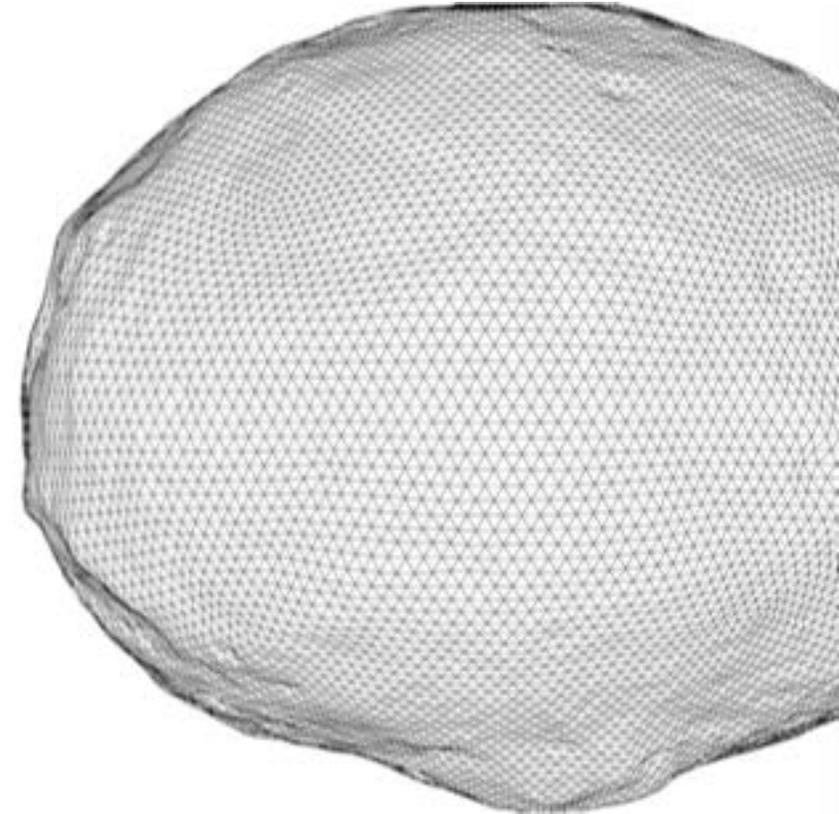
R = ~0.25 km

M = (0.000000003)M_{Psyche}



Psyche

R = 113 km



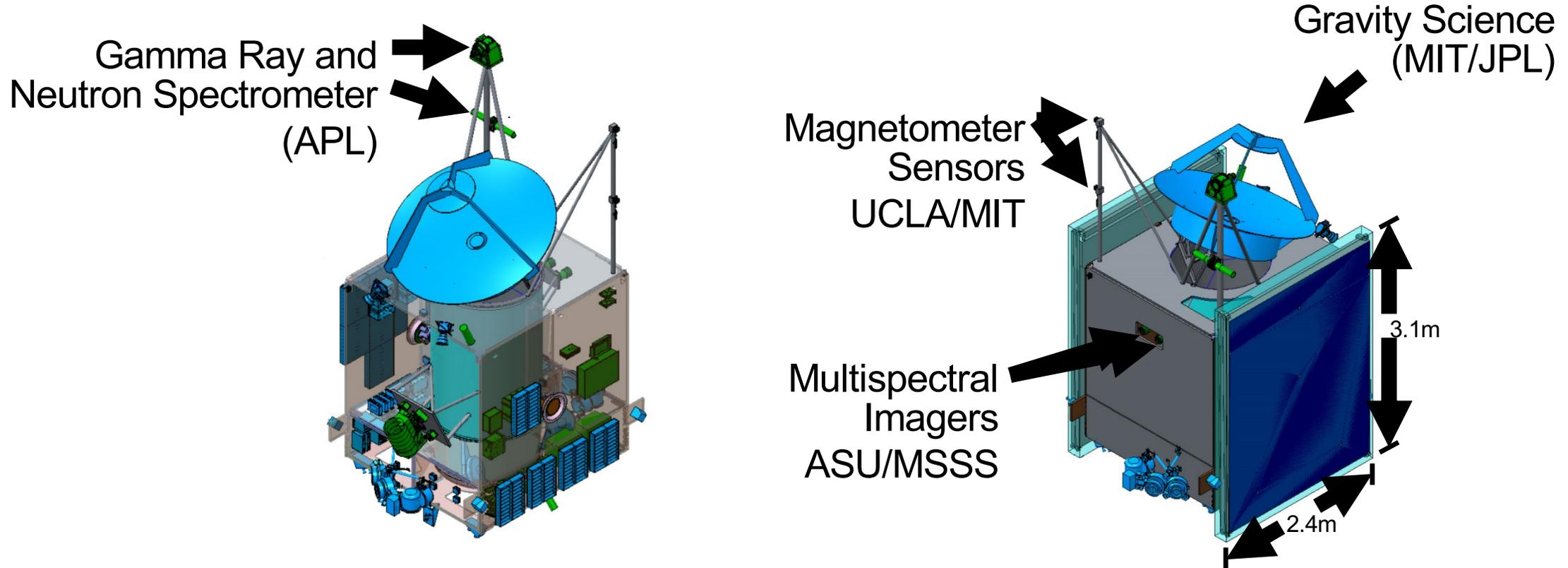
Vesta

R = 265 km

M = 9M_{Psyche}



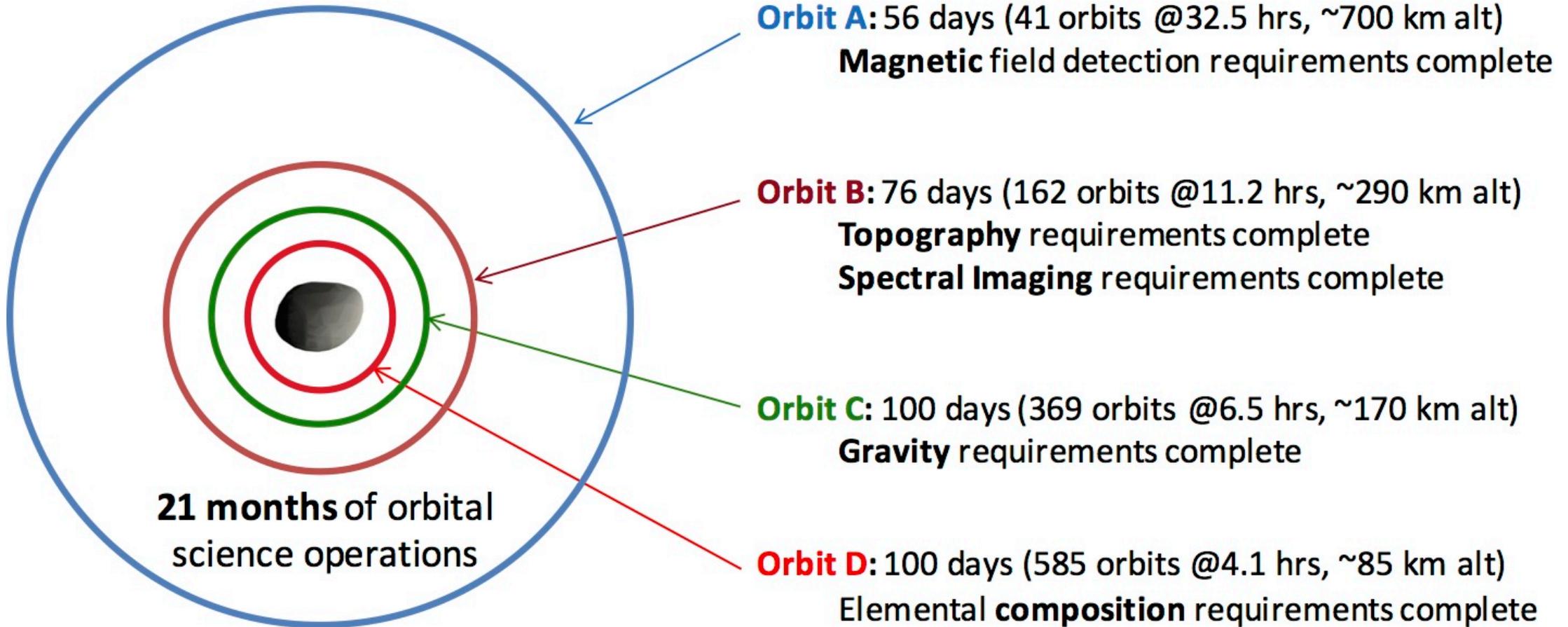
Psyche's Payload: Three simple science instruments



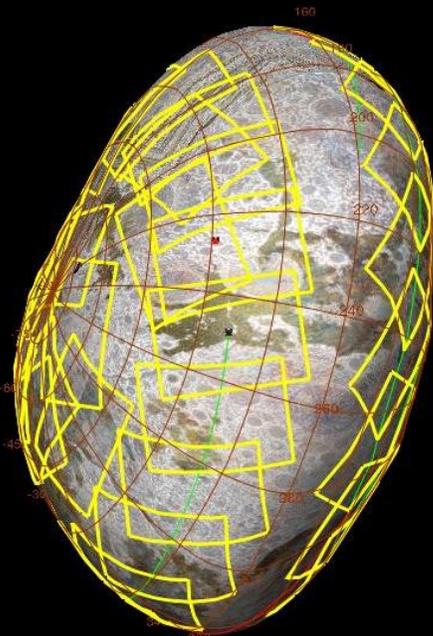
Spacecraft chassis built by SSL
Avionics, flight software, communications, and fault protection by JPL



Psyche mission planned science orbits

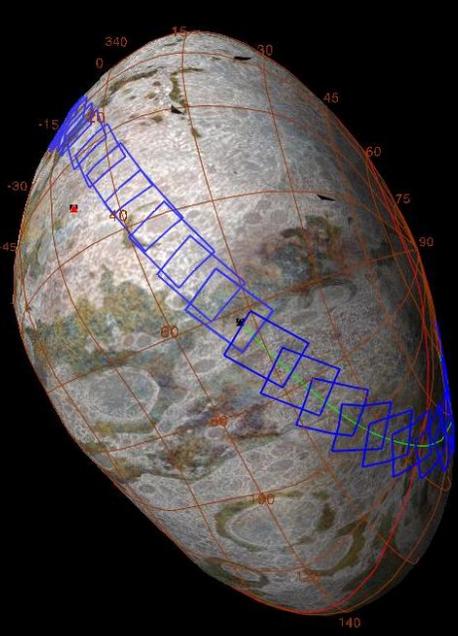


Orbit A



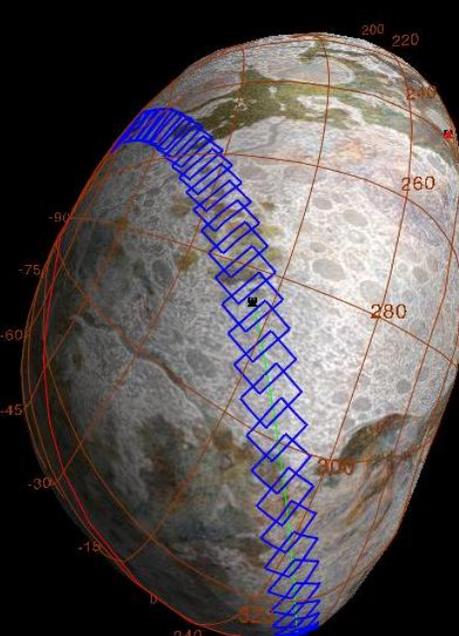
35 m/pixel

Orbit B



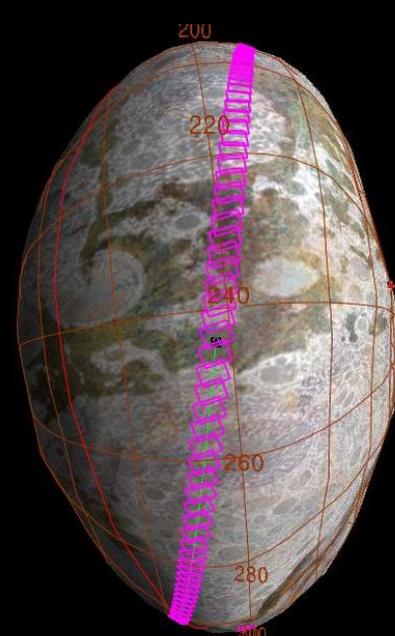
15 m/pixel

Orbit C

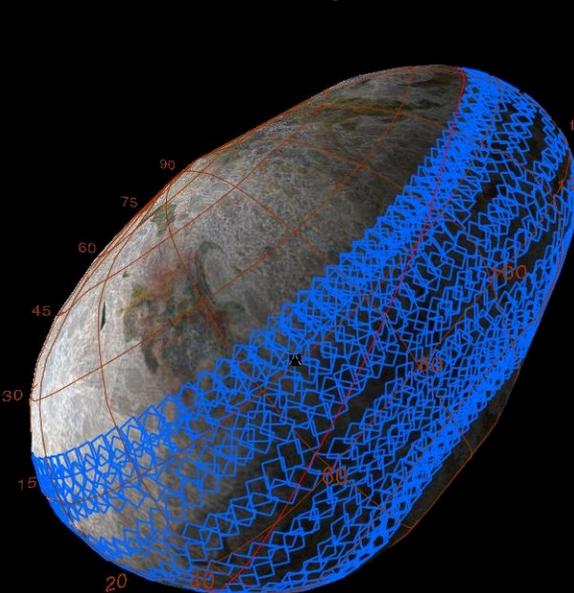
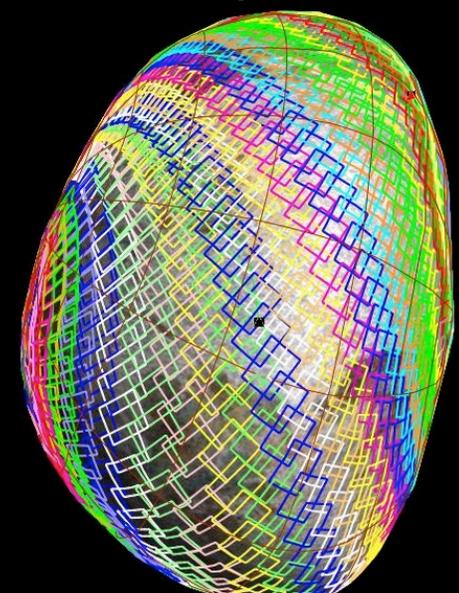
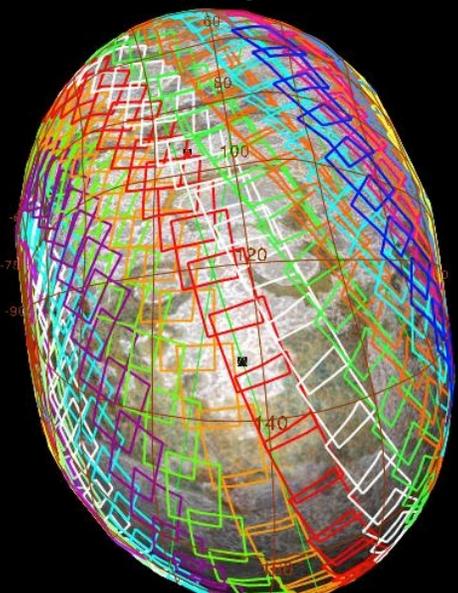
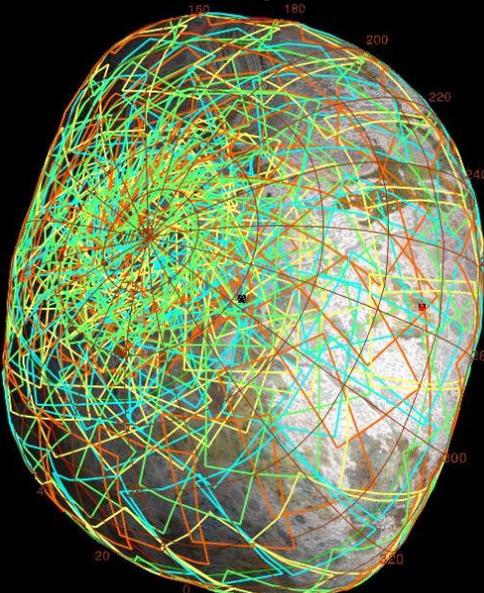


9 m/pixel

Orbit D

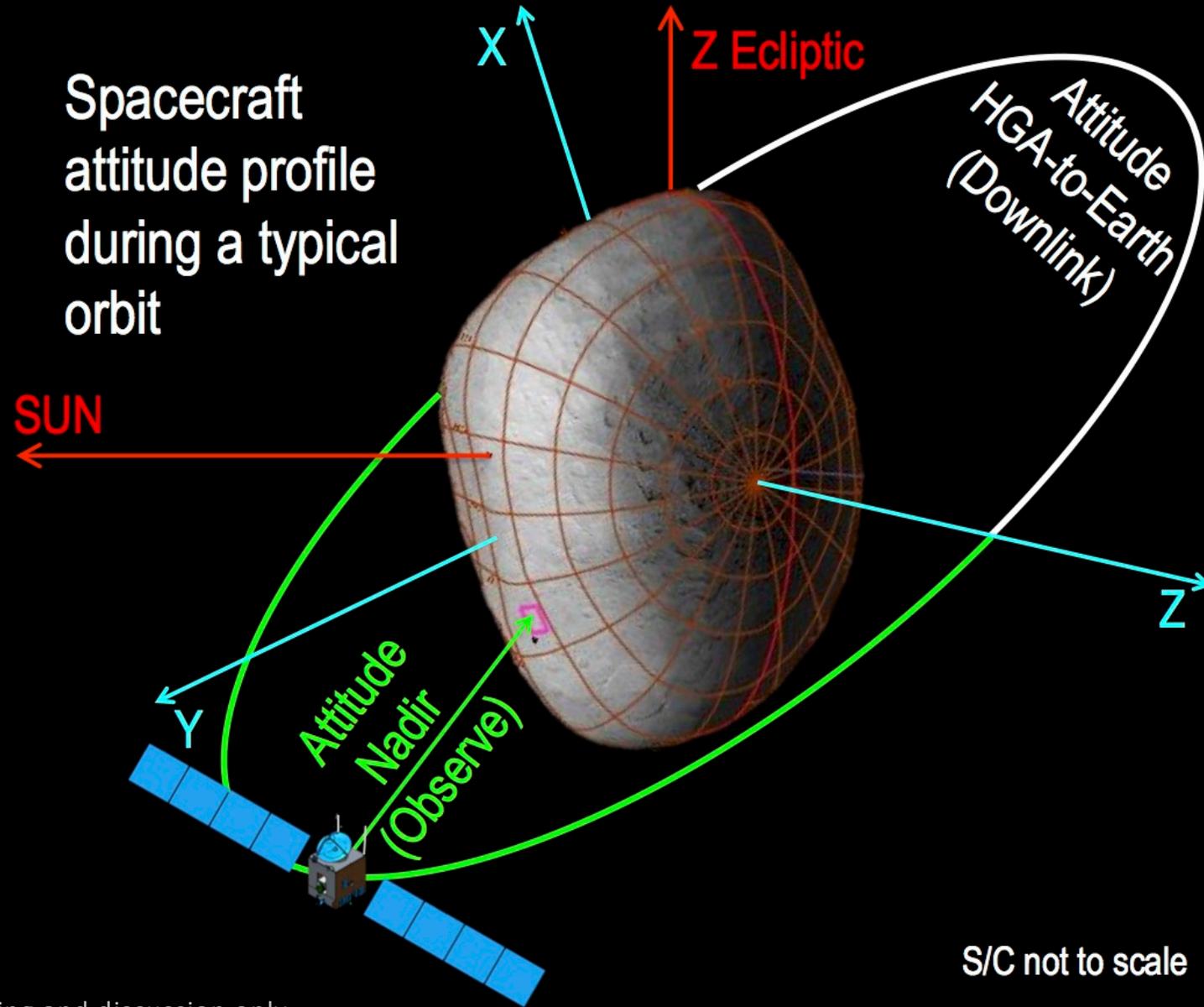


4 m/pixel





Typical orbit scenario



Psyche: Journey to a Metal World



Unique target body

High heritage instrument suite

Heritage operations concept

=> To observe for the first time, a planetary core

Peter Rubin '16