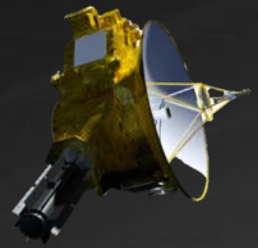


New Horizons Mission Update

NASA SBAG: June 2018

Hal Weaver

New Horizons Project Scientist

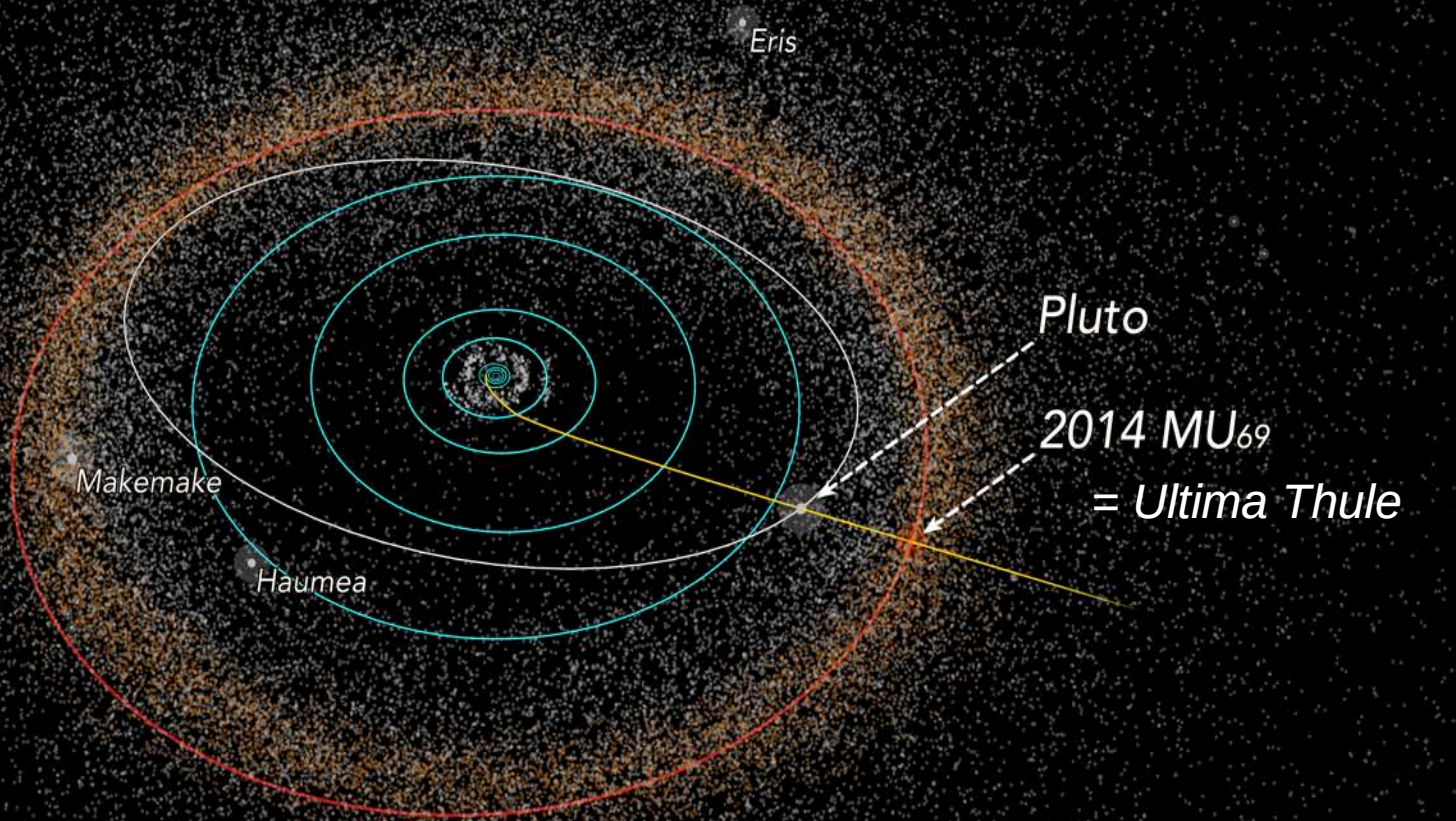
JHU-APL

NASA

APL JOHNS HOPKINS APPLIED PHYSICS LABORATORY

SwRI

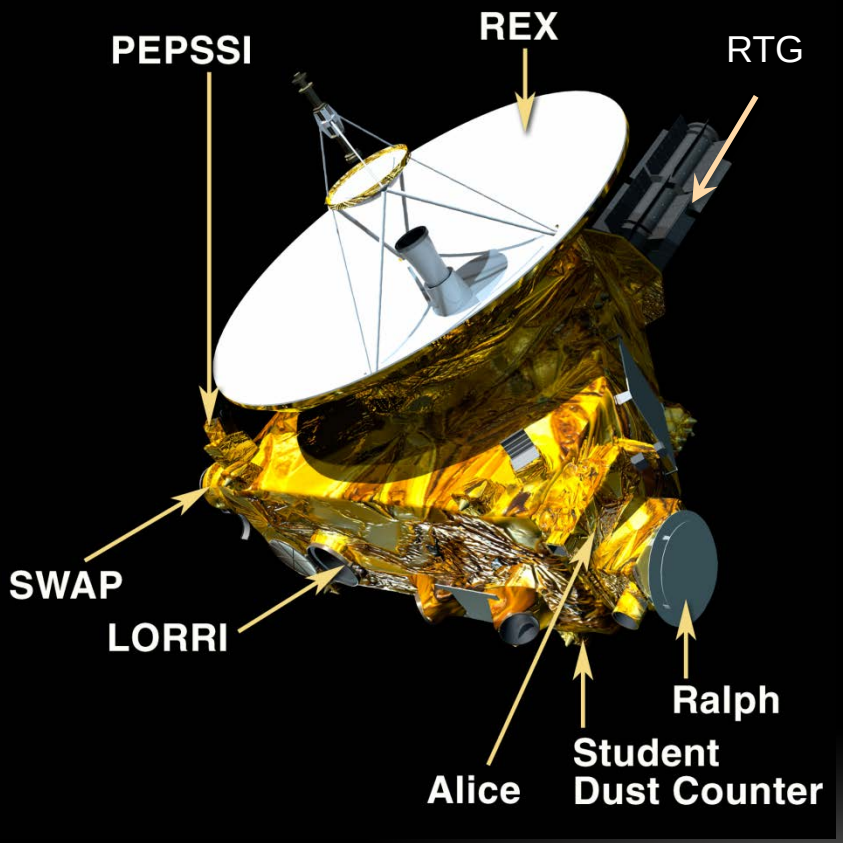
First Mission to Explore the Kuiper Belt



PI = Alan Stern (SwRI)

PM = Helene Winters (JHU-APL)

New Horizons: Science Instruments



Ralph:	**Color Camera and IR Spectral Imager: Composition**
Alice:	**Ultraviolet Spectral Imager: Atmospheric studies**
LORRI:	**HiRes Panchromatic Camera: Geology, OpNav, Deep Searches for Moons and Rings**
REX:	**Radio Science Experiment: Atmospheric [T,P] profile and Surface Temperature**
SWAP:	**Solar Wind At Pluto**
PEPSSI:	**Energetic Particles: Atmospheric Escape**
SDC:	**Student Dust Counter**
RTG:	**Radioisotope Thermoelectric Generator**

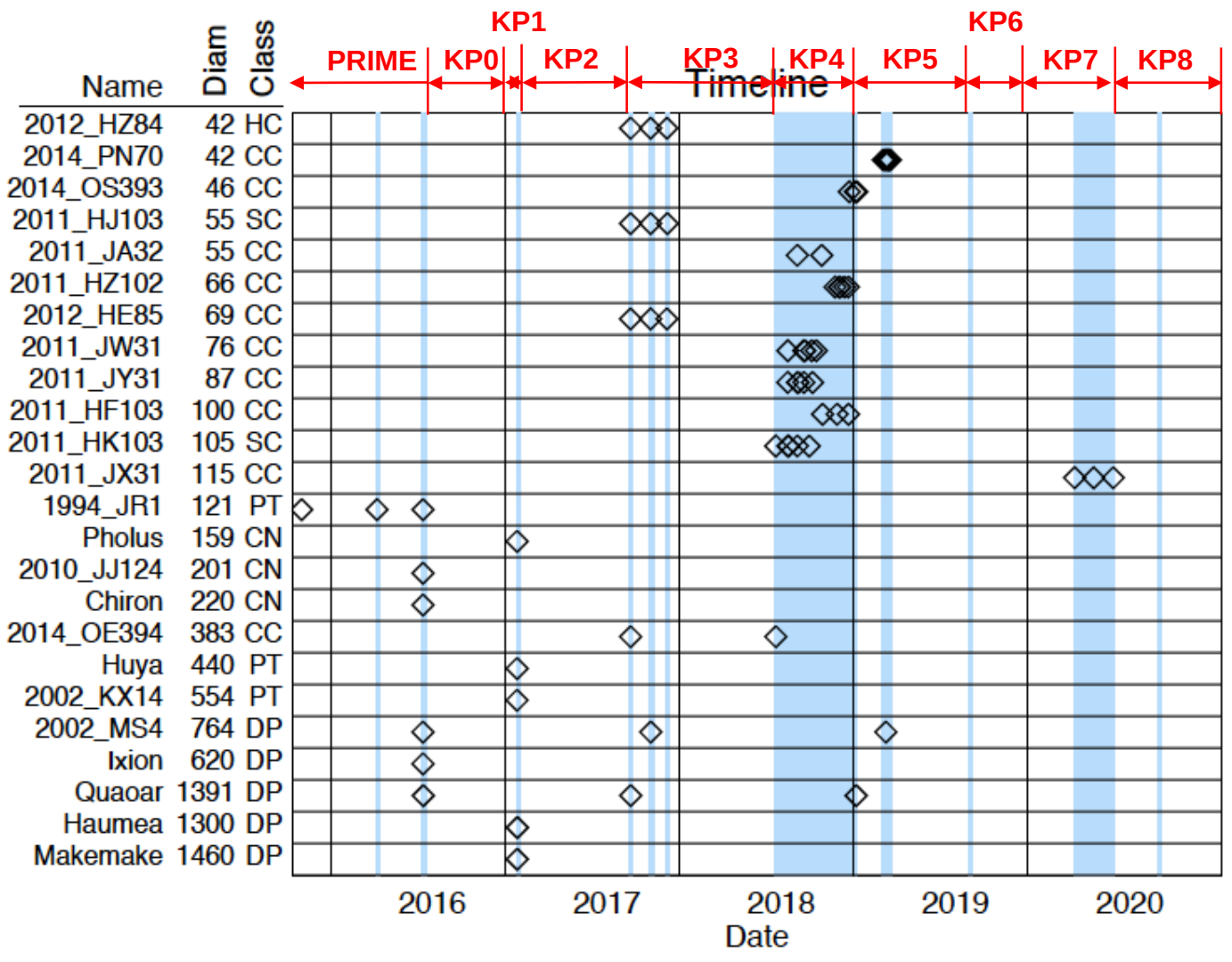
Kuiper belt Extended Mission (KEM)

- From 2016-2021, New Horizons will study the Kuiper Belt to 50 AU, meeting a Decadal Survey priority
- Centerpiece: Close flyby of an ancient object, Ultima Thule (2014 MU69), on January 1, 2019
  - Flyby data downlink through Fall 2020
- New Horizons is observing ~30 other KBOs in unique ways, while also studying the Kuiper Belt environment

NH KEM DKBOs

Planning has already commenced for over two dozen DKBOs, and we are searching for more opportunities

Observations have already been made of ~15 DKBOs



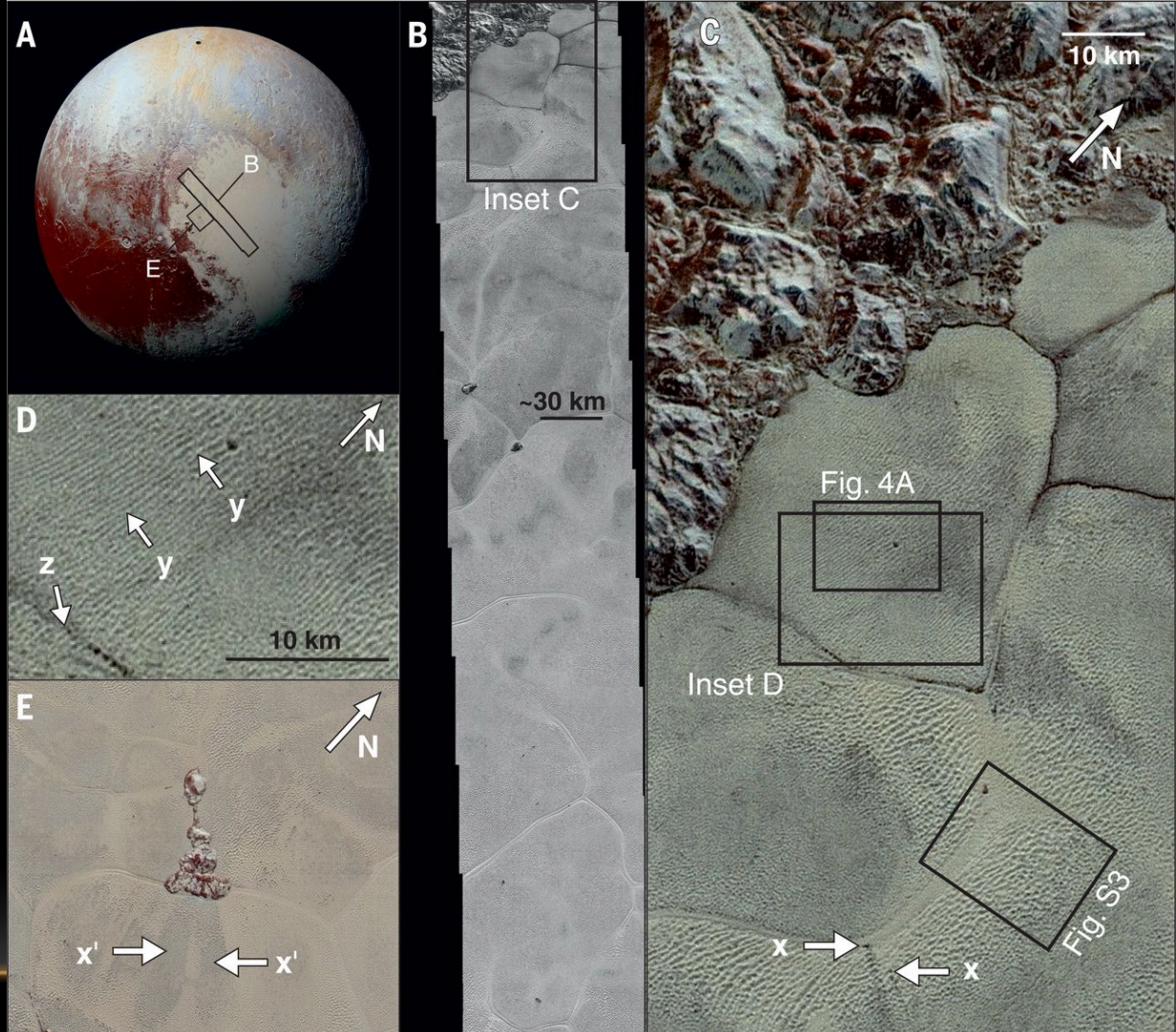
New Horizons: Still in Great Shape

- Spacecraft exited hibernation on Jun 4, not to return to hibernation until Oct 2020
- All instruments and S/C subsystems are *nominal*
  - Essentially no degradation since launch in Jan 2006
- NH Project currently focused on the upcoming flyby of KBO *Ultima Thule*
- NH Science Team still cranking out papers
  - From both the Pluto flyby and from the KEM
- NH Project continues to deliver data to the PDS
  - “High level” products (P4) already delivered and first KEM data to be delivered this summer

Dunes on Pluto

Small methane ice particles are ejected by sublimation and are blown across the surface forming regular dune-like patterns

X’ point to Wind Streaks



Telfer et al. 2018

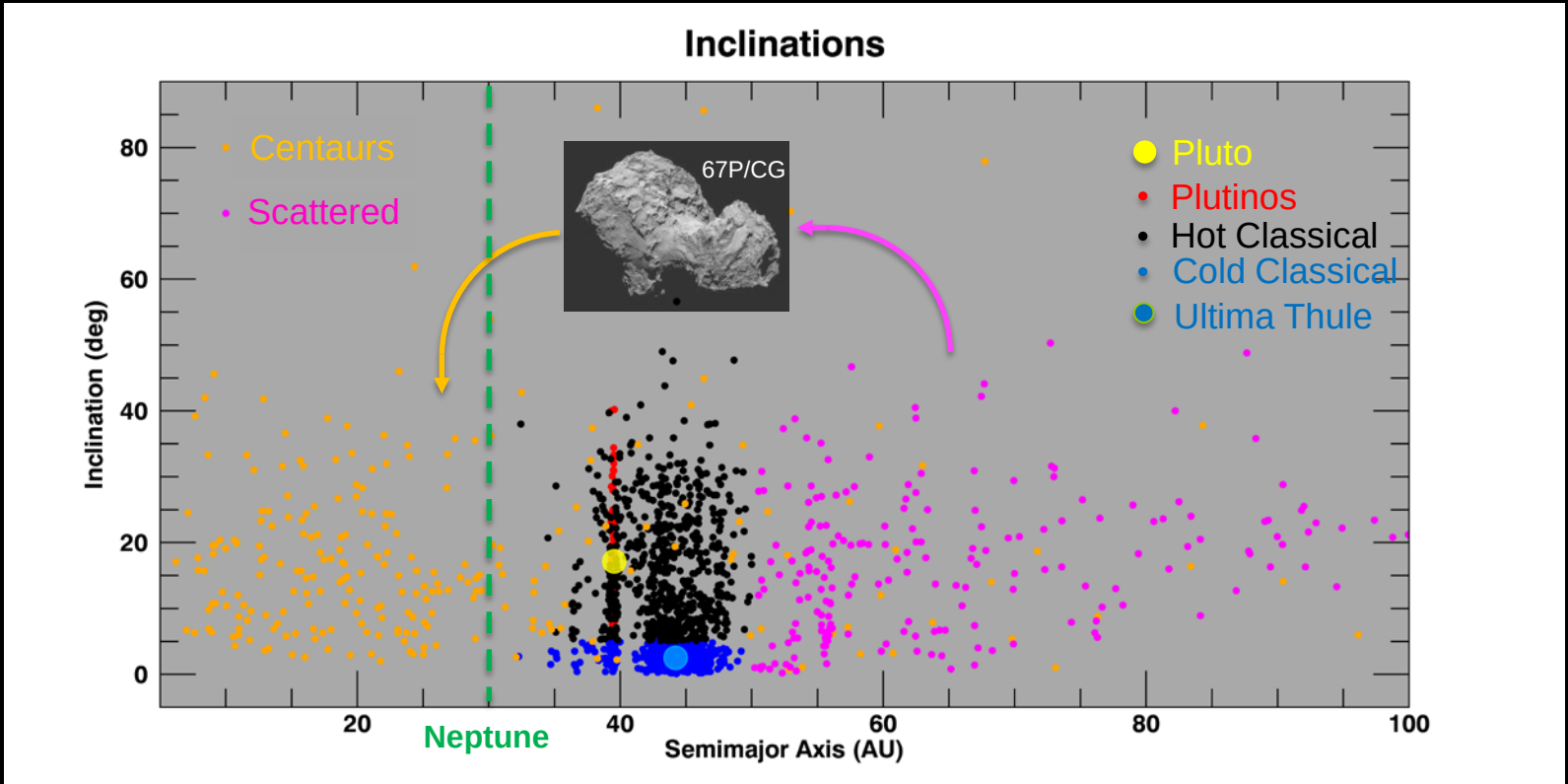
New Horizons PDS Delivery Status

- **Pluto P4 Delivery** - Upper level, science team generated products of data from the Pluto mission phase
  - Official review held on 5/15
  - 2 datasets certified, 3 more need delta reviews
  - Updates to critical liens to be submitted by 6/22
    - Only a few critical liens, updates in-work
  - We have a commitment from PDS to have re-review before mid-July
    - Datasets to be certified and posted before NFDAP
- **KEM Cruise 1 (KC1) Delivery** - Data from first phase of KEM Cruise
  - Includes all data after Pluto that has been downlinked by 12/31/2017
    - Note not all SWAP and PEPSSI data made it down before hibernation
  - Rewriting code base to make deliveries simpler, KC1 on new code base
  - Sent to instruments for internal review, most have returned reviews
  - To be delivered to PDS within next couple of weeks, no later than end of June

Ultima Thule

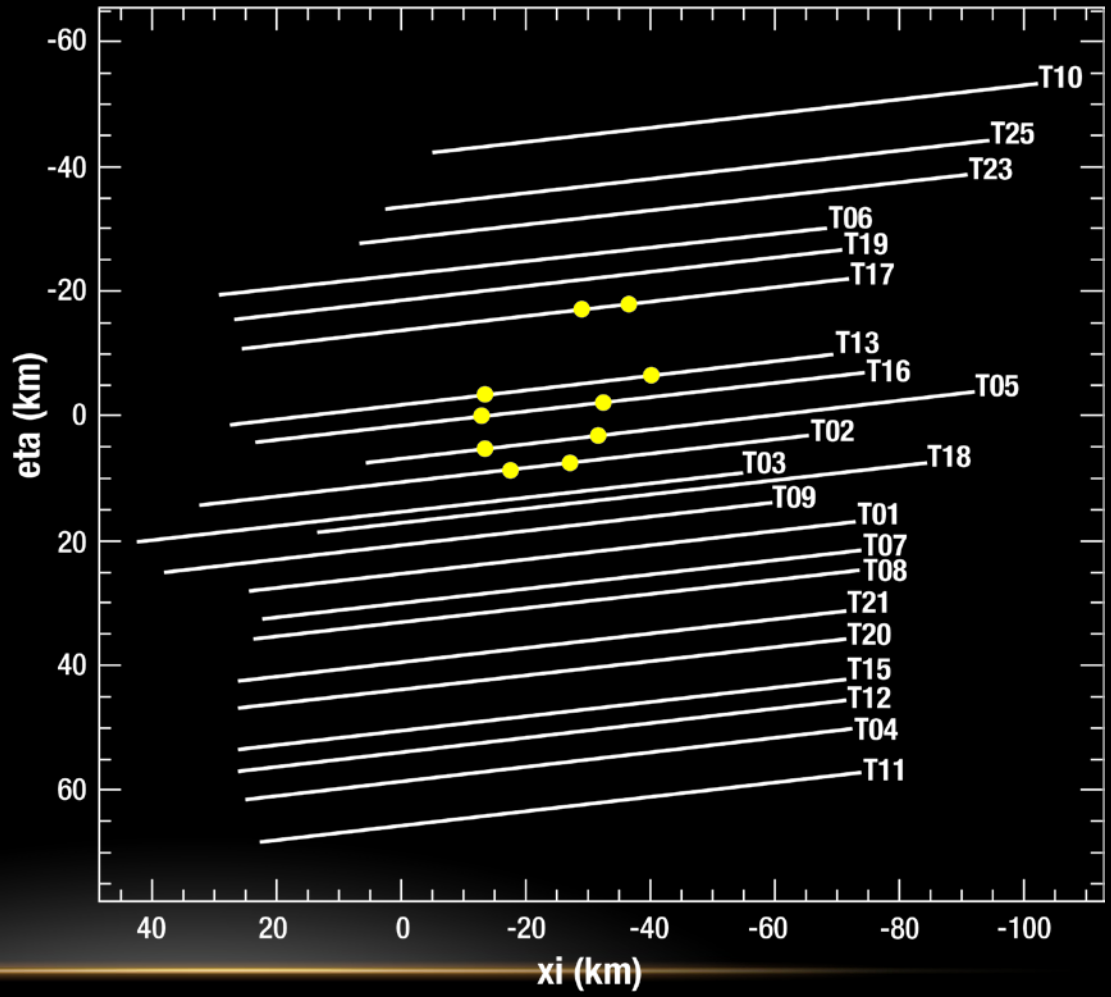
The most
distant
and most
primitive object
ever explored

KBO Families: Classical, Resonant, Scattered

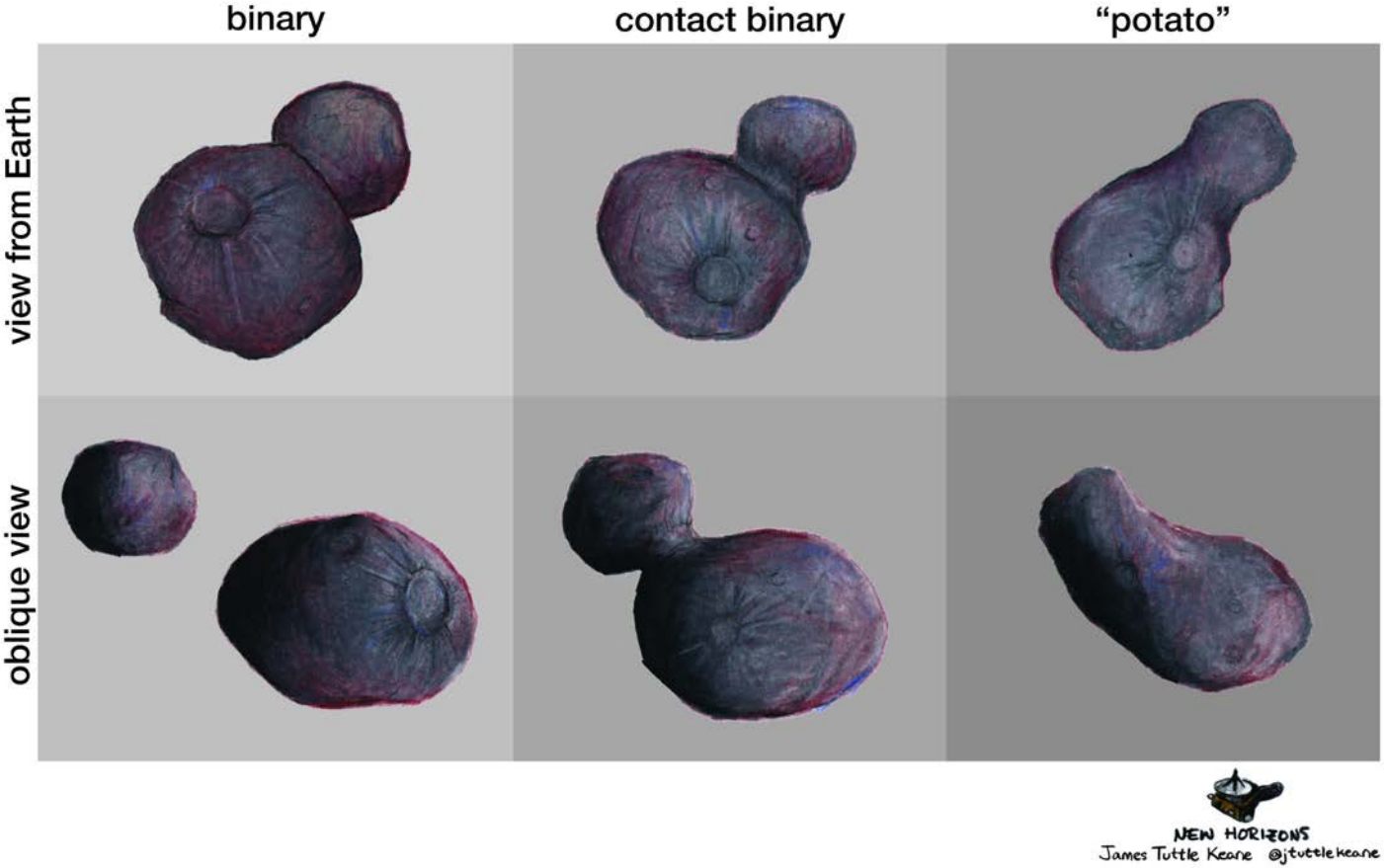


Cold Classicals: Low inclination, Low eccentricity → *Primitive*

Five chords detected during occulation campaign on July 17, 2017, revealing critical shape information



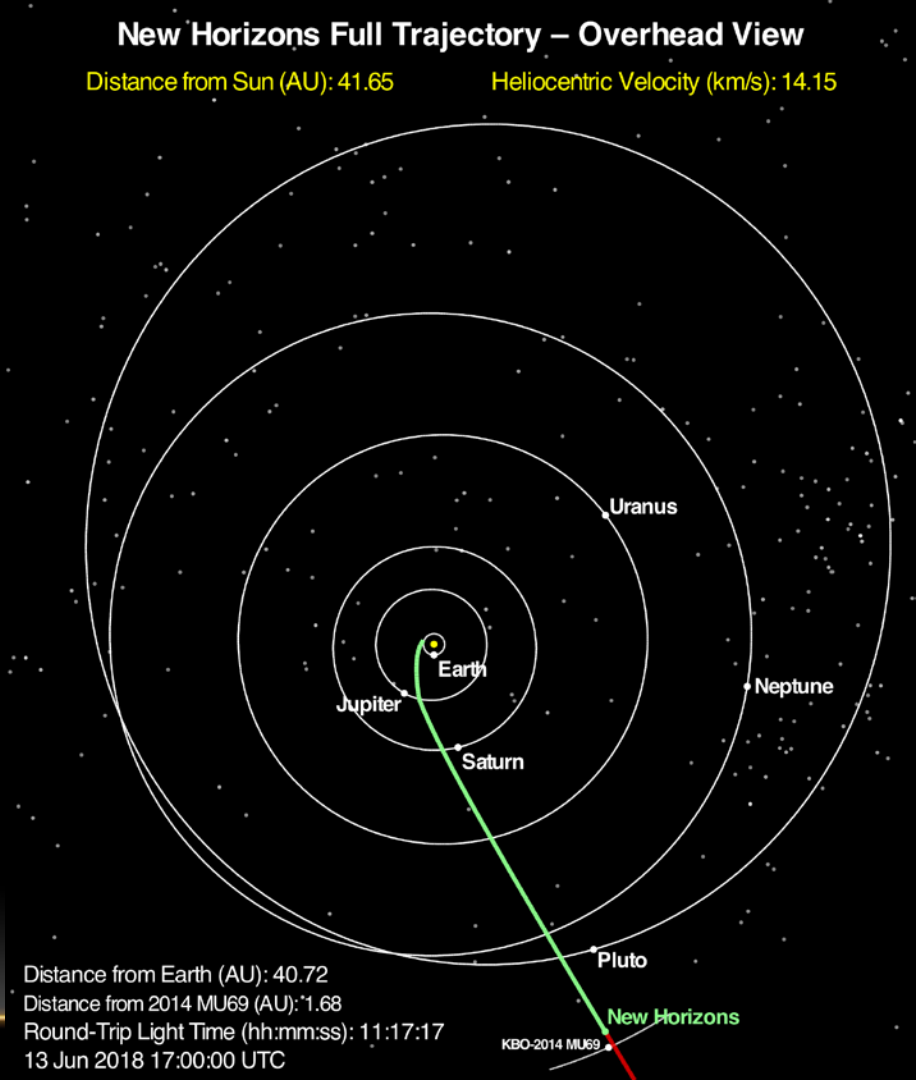
What does Ultima Thule Look Like?



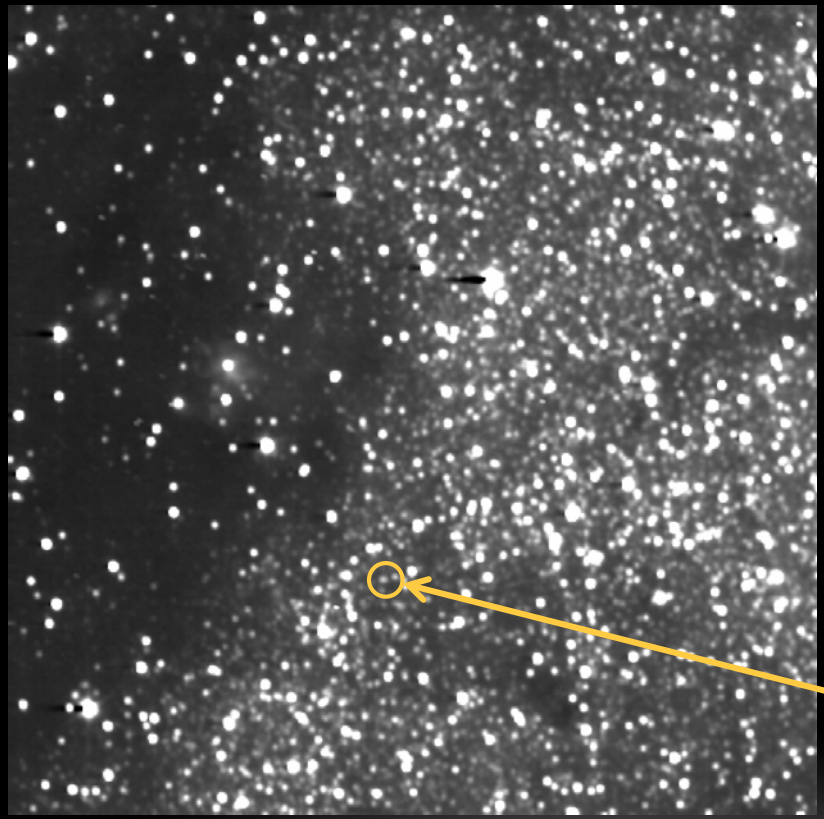
The New Horizons spacecraft is well past Pluto and is bearing down on Ultima Thule.

First Ultima Thule observations scheduled for August 16, but UT may be too faint for detection then.

Systematic observations of Ultima Thule begin in mid-September.



Ultima Thule Background Field

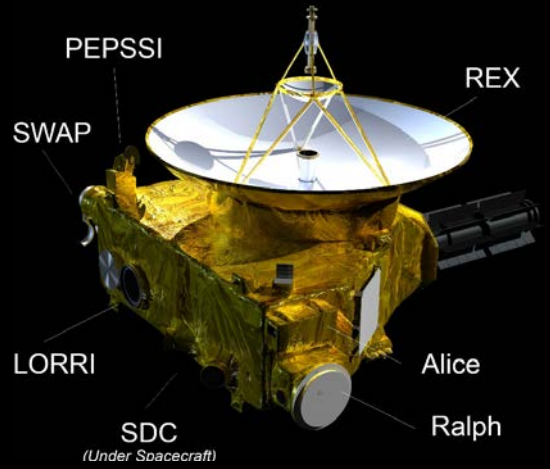


September 2017
New Horizons LORRI image of Ultima Thule approach area

Ultima Thule should appear here by September 2018

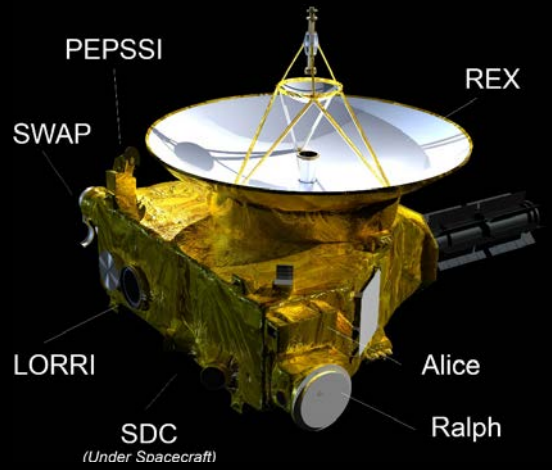
Ultima Thule Science Objectives (1)

- Characterize geology and morphology
  - Craters, grooves, topography
- Map surface composition
  - Search for ices: ammonia, carbon monoxide, methane, water ice
  - What makes Ultima Thule dark and red?

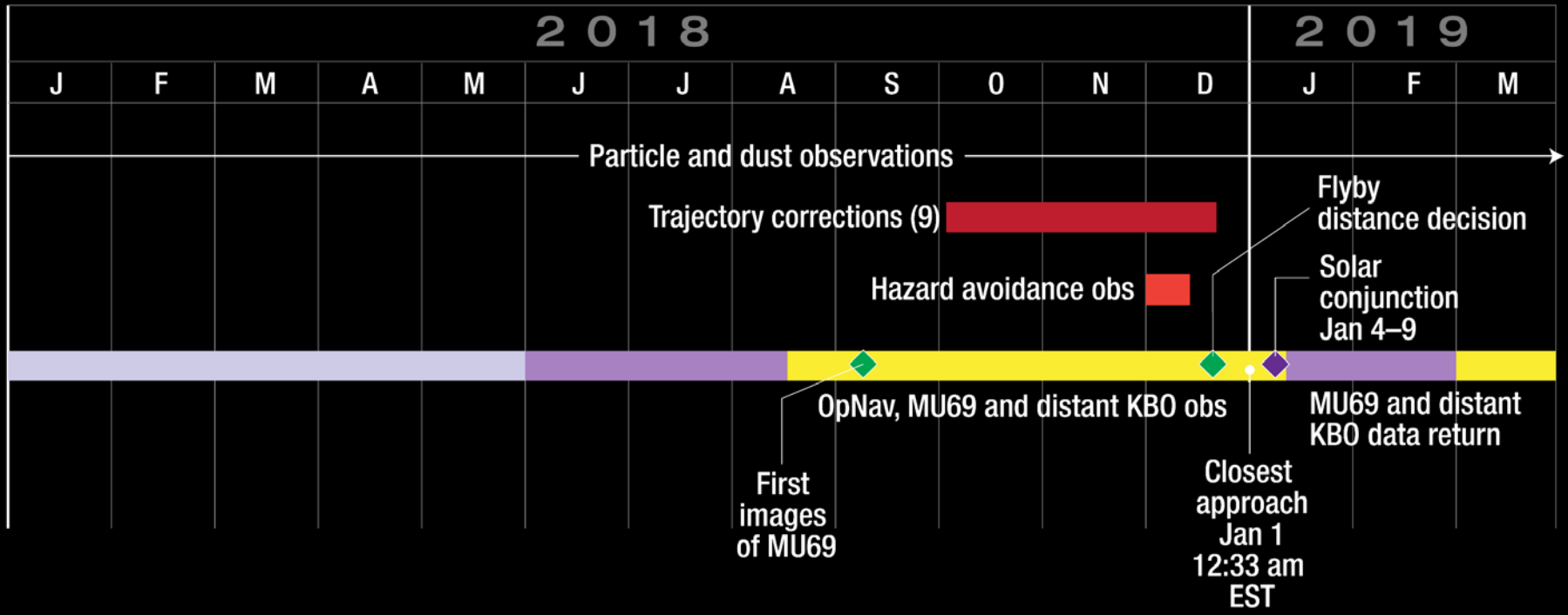


Ultima THule Science Objectives (2)

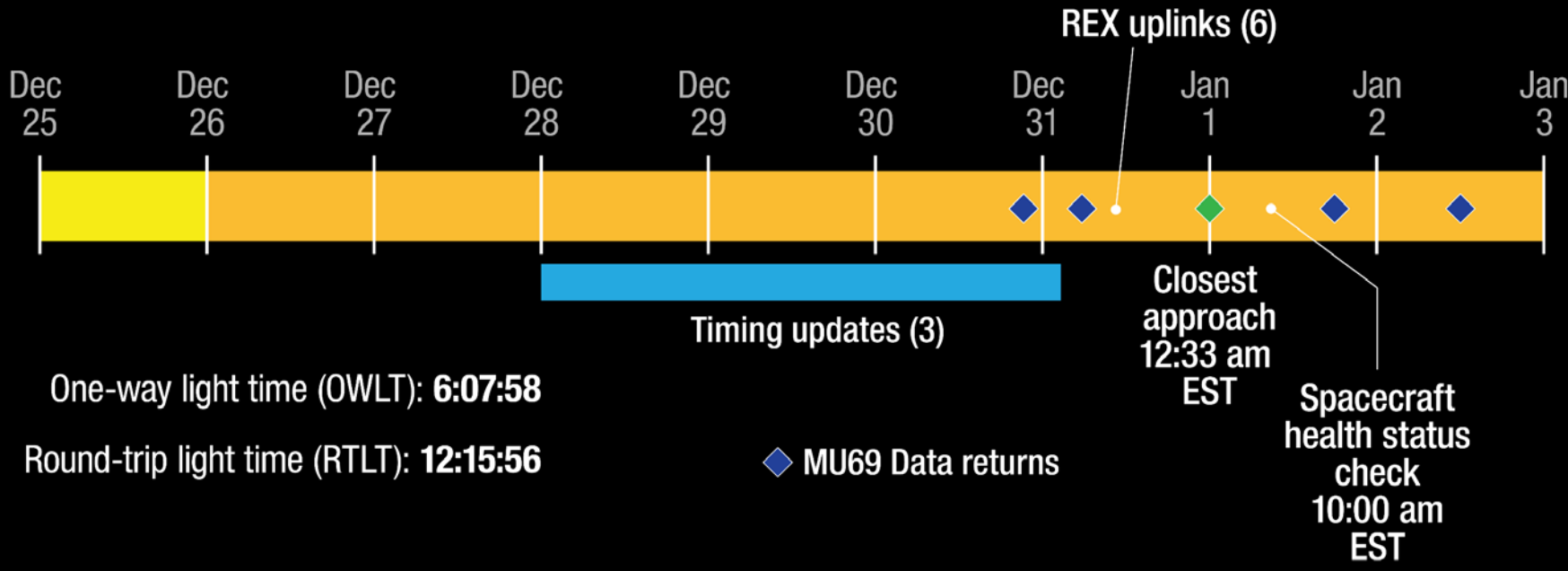
- Structure: Single body? Binary?
- Search for and study satellites and rings
  - Is the moon real? Is there more than one?
- Search for a coma (atmosphere and gases)



Ultima Thule Ops Timeline Overview



Ultima Thule Flyby Detail



BACKUP