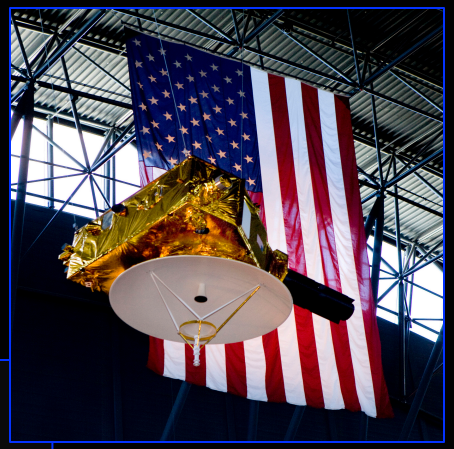
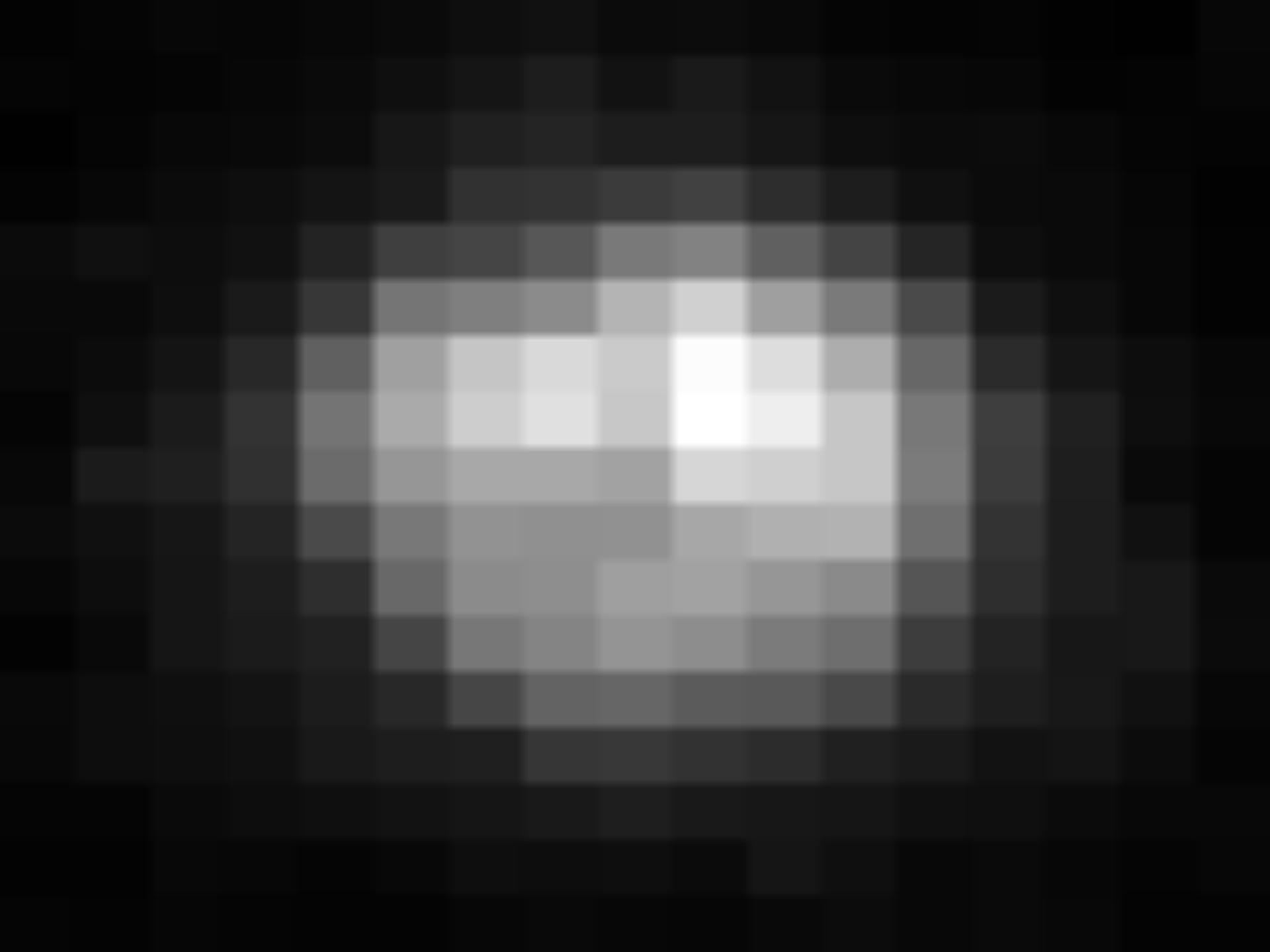
OPAG: We Did It!

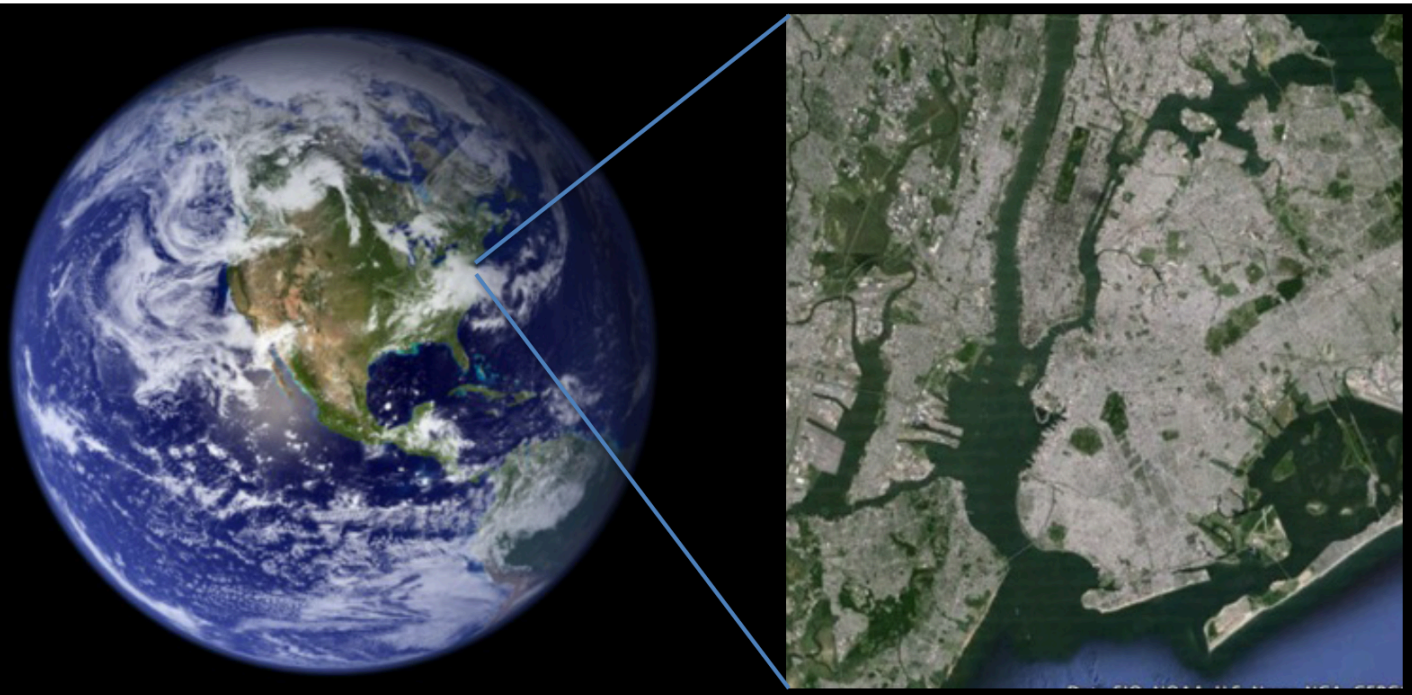




NEW HORIZONS:
MISSION OBJECTIVES

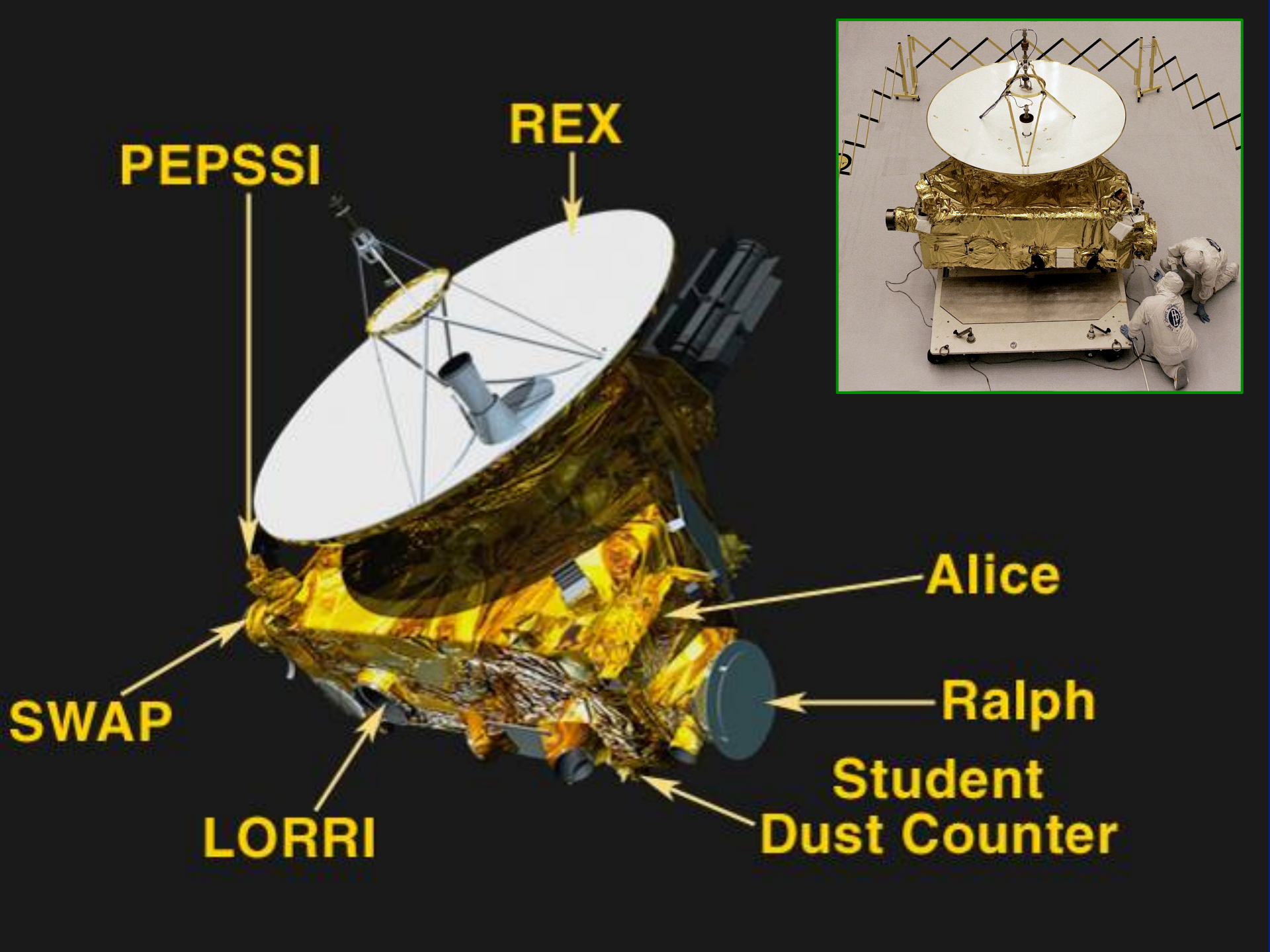
PRIMARY OBJECTIVES:

- CHARACTERIZE GLOBAL GEOLOGY AND MORPHOLOGY OF PLUTO AND CHARON
- MAP SURFACE COMPOSITION OF PLUTO AND CHARON
- CHARACTERIZE THE NEUTRAL ATMOSPHERE OF PLUTO AND ITS ESCAPE RATE

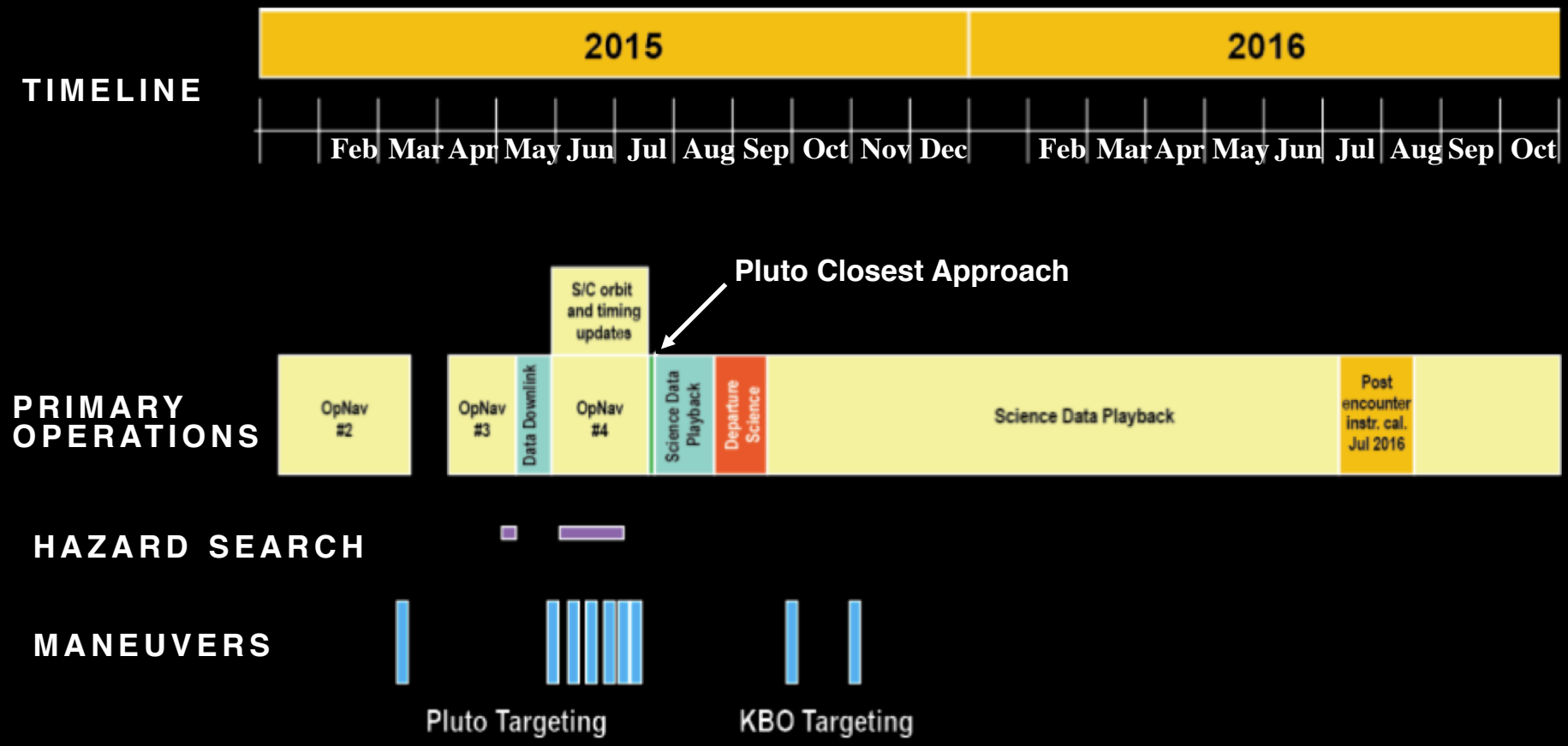


EARTH'S SURFACE (NEW YORK CITY) AT NEW HORIZONS' HIGHEST RESOLUTION (70 METERS / PIXEL)

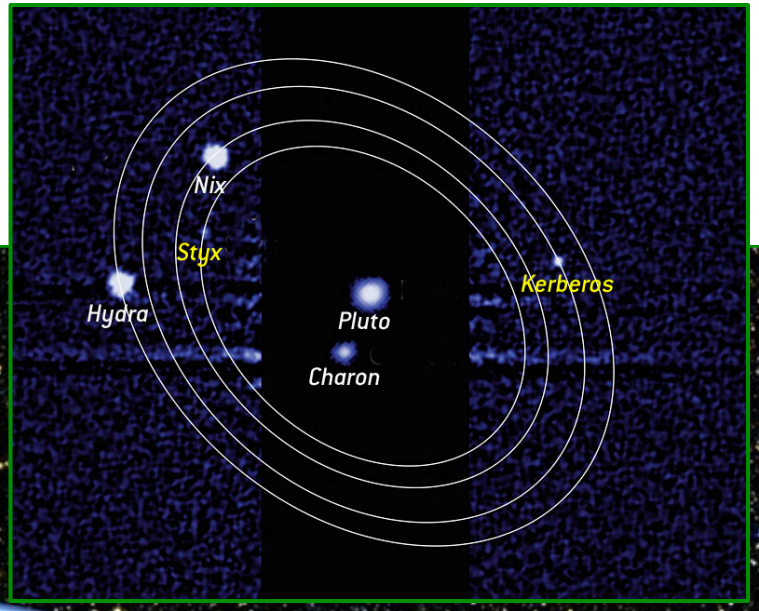
VIZ: DR. AMANDA ZANGARI


PEPSSI
REX
Alice
SWAP
Ralph
LORRI
Student
Dust Counter

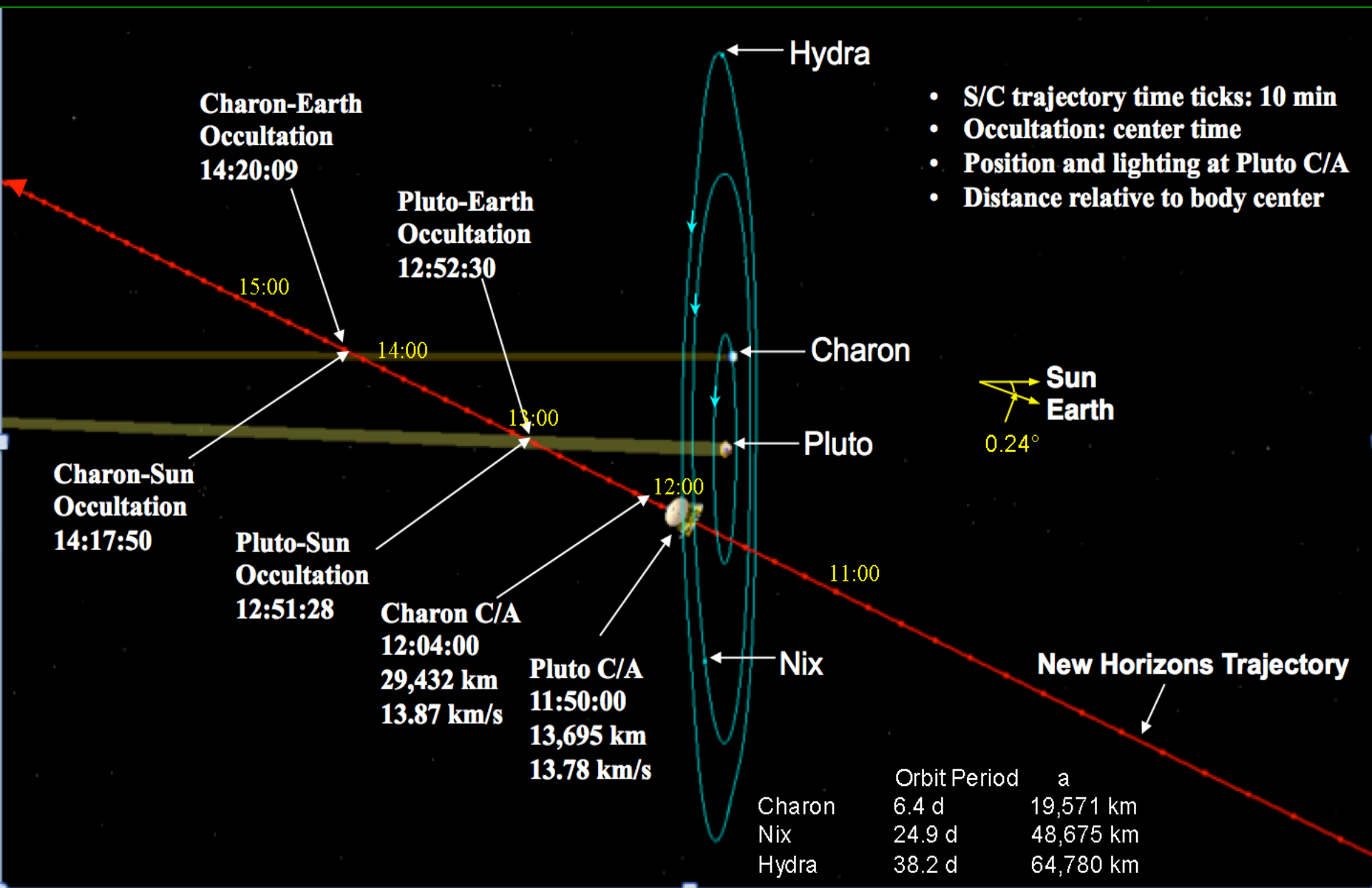
ENCOUNTER OVERVIEW



SIX OBJETCS TO STUDY

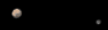


AND TWO NEEDLES TO THREAD



WE DID IT!

2015-05-28




Countdown
Countdown to Pluto
Closest Approach

I ♡ PLUTO

July 14, 2015: NASA's New Horizons #PlutoFlyby

The New York Times

"All the News That's Fit to Print"

Late Edition

NEW YORK, THURSDAY, JULY 16, 2015

Pluto's Portrait: Ice Mountains, No Craters and, for Scientists, a 'Toy Store'

YEARS OF TRADING AND COMPROMISE SEALED IRAN DEAL

ASSIST FROM A SULTAN

Concluding That Halting Bomb Development Eclipsed All Else

New York Times.

LATE CITY EDITION

NEW YORK, FRIDAY, JULY 16, 1965

TEN CENTS

FIRST MARS PHOTO IS TRANSMITTED; MARINER SIGNALS INDICATE PLANET LACKS A LIQUID CORE LIKE EARTH'S

SENATE APPROVES HOUSING MEASURE WITH RENT SUBSIDY

Administration Forces Beat a Republican-Led Effort to Kill 'Section'

OTHER DATA SENT

Sensors Find Scant Radiation Belt and Thin Atmosphere

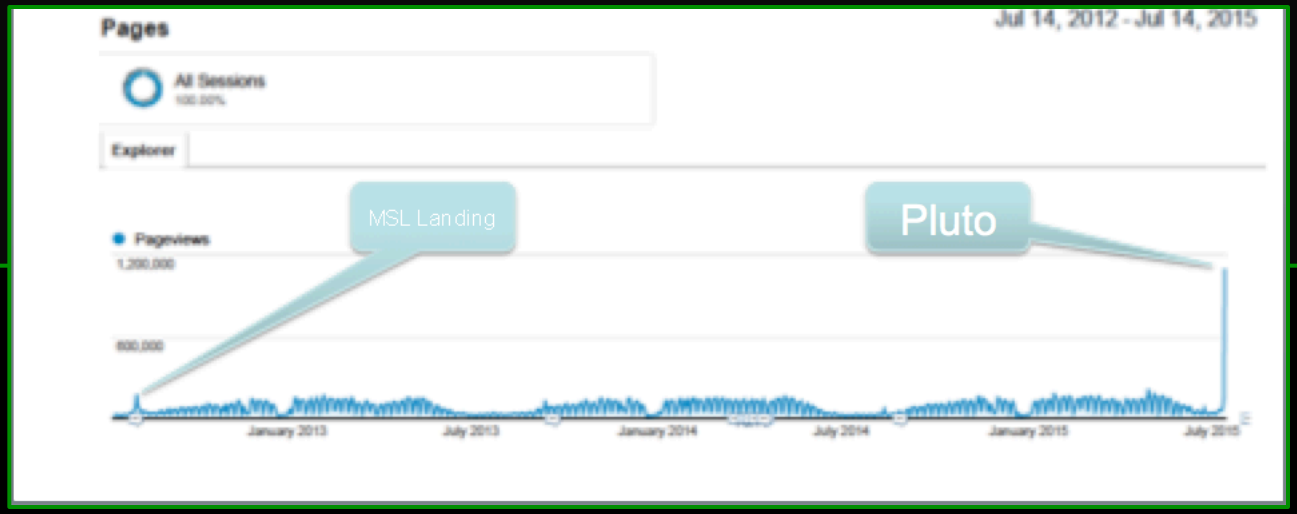
Spyder Webb @Spyder_Webb · 4h

Front page of The New York Times as it appeared on 16 July 2015 and 16 July 1965 #PlutoFlyBy #NewHorizons #Mariner

You, Pluto, NASA New Horizons and 7 others

3 3

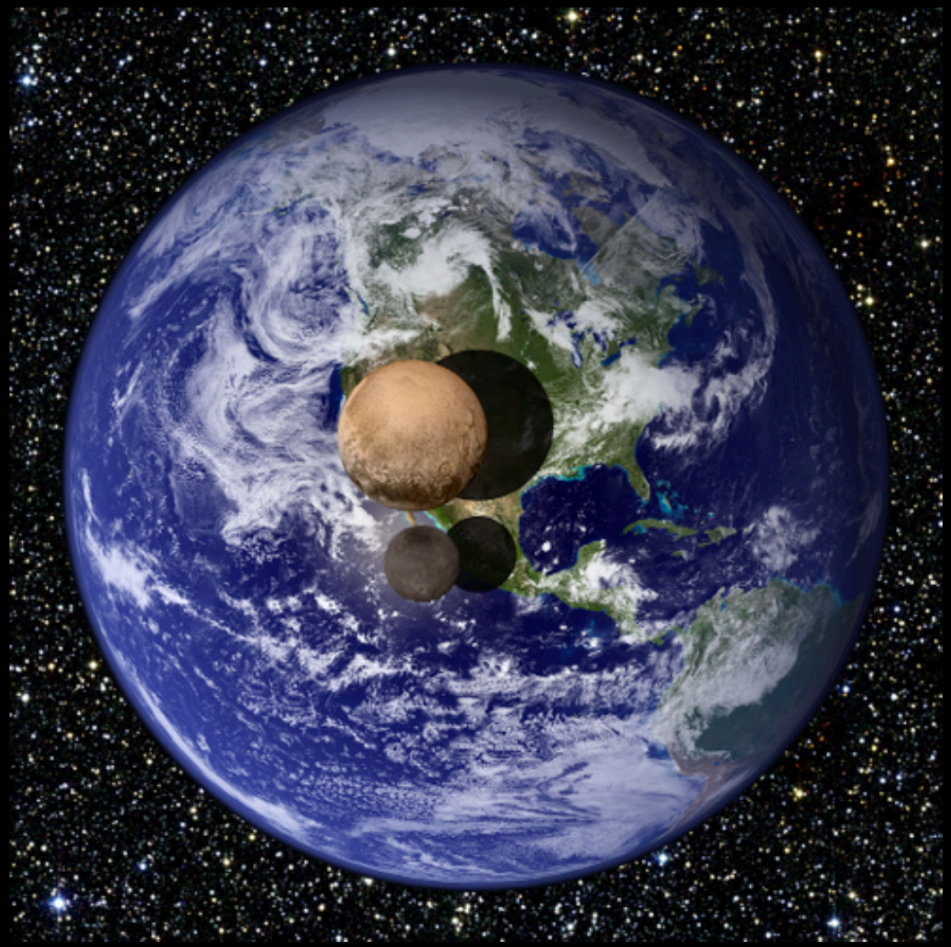
Arizona Daily Star
HERE COMES BEST LOOK YET AT PLUTO
Iran nuke deal: New chapter or mistake?
The Stuart News
PLUTO
LA VANG
RECORD EAGLE
Barcelona prorroga hasta el 2023 su idilio con el Mobile
Más irá cuarto en unitaria y Junqu
The Gazette
PLUTO'S FLYBY
AMERICAN LEAGUE WINS
TIMES COLONIST
Daily Herald
At last, a deal with Iran
Pluto's close-up
PRESS-TELEGRAM
Bridge costs
WHERE NO ONE HAS GONE BEFORE
The News-Gazette
The News & Advance
Journal Gazette
JOURNAL & COURIER
The Record
U.S. group, Iran reach historic nuclear accord
O TEMPO
The Detroit News
Kidnap suspect's career crumbled
Colorado DAILY
3 billion miles away
Wet for work
POLITICOS
THE BRUNSWICK NEWS
PANTAGRAPH
LEWISTON TRIBUNE
Clearwater County sees heavy crop loss
DAILY SUN
plan for housing
The Modesto Bee
Pool-chemical spill shuts part of Highway 99
BOOMERANG
Pluto's spotlight moment
HUMAN HISTORY
Sun Journal
STATE IN BIND ON BONDS
The Daily Progress
Weiner verdict vacated
Accordo "Sì al nucleare non avrà
Il Pericolo non viene più da Teheran
Così Obama s'è meritato il Nobel
EL PAÍS
El mundo da la bienvenida al nuevo Irán sin armas nucleares
el Nuevo Herald
Clarín
7% y afecta a once millones de personas
Newsday
THE IRAN NUCLEAR DEAL
Obama: Pact bars bu
2nd Arrest In Deadly Parkway Crash
THE SPOKESMAN-REVIEW
Nuclear deal opens door
Just flying by
Savannah Morning News
Daily News-Record
The Augusta Chronicle
las barbas de Plutón
YAKIMA HERALD-REPUBLIC
THE WALL STREET JOURNAL
SPRINGFIELD NEWS
Effort looks to grow in-demand workforce
Taunton family rallies behind girl battling genetic disease
O POVO
Estado dá desconto de até 100% para contribuinte quitar dívida
Iran Deal Ignites Fierce Fight
HOUSTON CHRONICLE
NAS PROFUNDEZAS DO SISTEMA SOLAR
metro
LIDOVÉ NOVINY
České kuřáky čeká šok
Lava Jato agora mira os políticos
On its last legs
Gonorrhea outbreak hits Wyo.
Wyoming Tribune
WE BUY GOLD
Passauer Neue Presse
THE OKLAHOMAN
Iran deal: 'New chapter' or 'historic mistake?'
CLOSE encounter
Atom-Einigung mit dem Iran
BEAUMONT ENTERPRISE
Iran, six world powers strike historic accord
NEW ORLEANS ADVOCATE
The Courier-Journal
FLOODS, OUTAGES, WATER RESCUES
LA NACION
Sigue creciendo la pobreza: ya afecta a 11 millones de personas
The Denver Post
Parking to eat up $180M
CHEGOU A VEZ DOS POLÍTICOS
Orlando Sentinel
A evolução DO ELBA
Chicago Tribune
THE DAILY SENTINEL
The Salt Lake Tribune
Nuke deal: Progress or blunder?
GOLDEN POND
Laurence Vincent-Lapointe wins gold in the Women's C1 Canoeing Flat 200m at the Pan Am Games in Welland.
Weston feiert Abkommen mit Iran

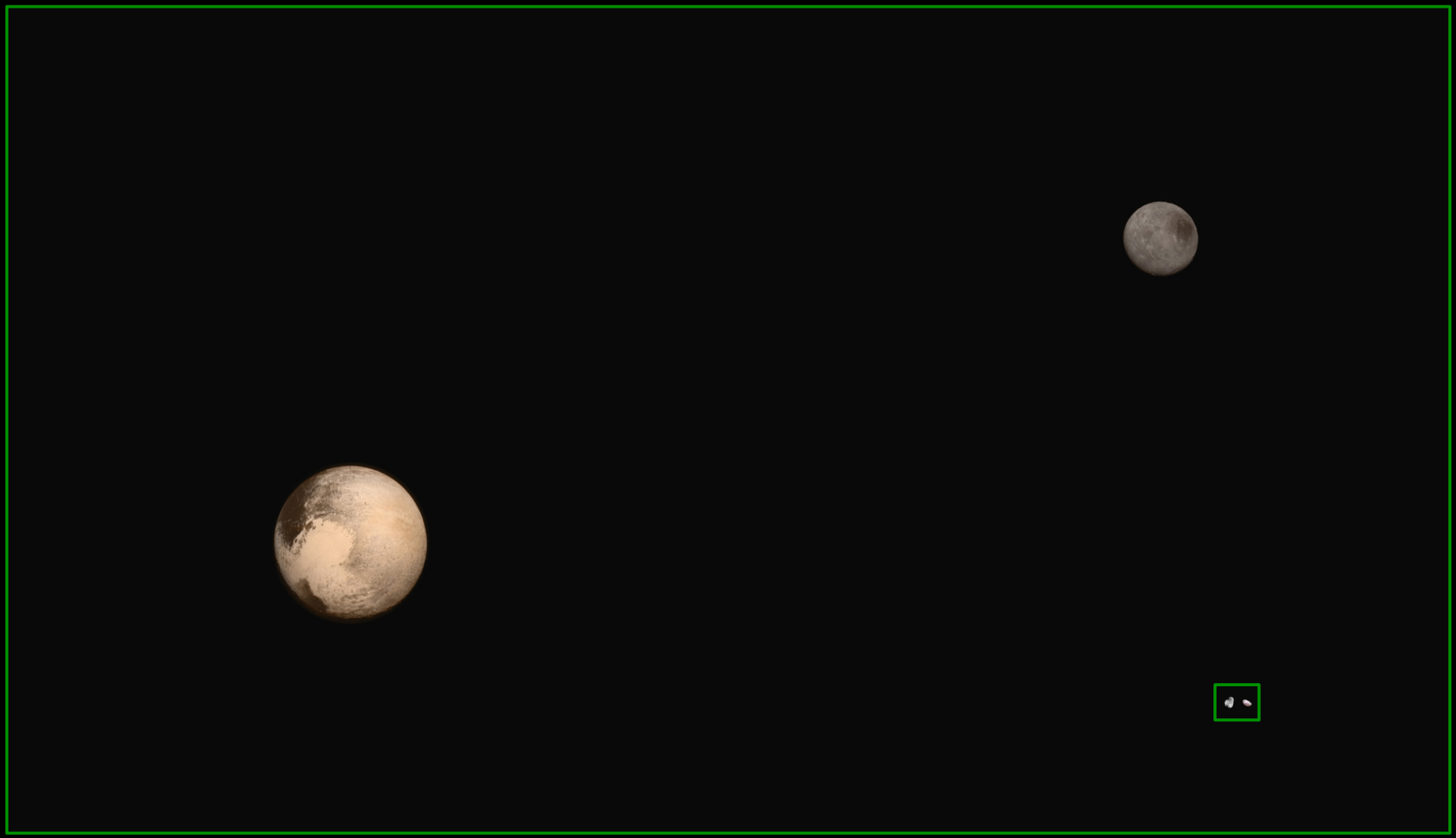

Pages
Jul 14, 2012 - Jul 14, 2015
All Sessions
100.00%
Explorer
MSL Landing
Pluto
Pageviews
1,200,000
600,000
January 2013
July 2013
January 2014
July 2014
January 2015
July 2015

NEW HORIZONS:
THE SIZE OF PLUTO

- Largest object known beyond the orbit of Neptune
  - Pluto exceeds the diameter of Eris by XX km.
- 9th largest object known in solar orbit

Pluto Radius: 1186 km (±1 km)





NEW HORIZONS:
CHARON'S POLAR SPOT

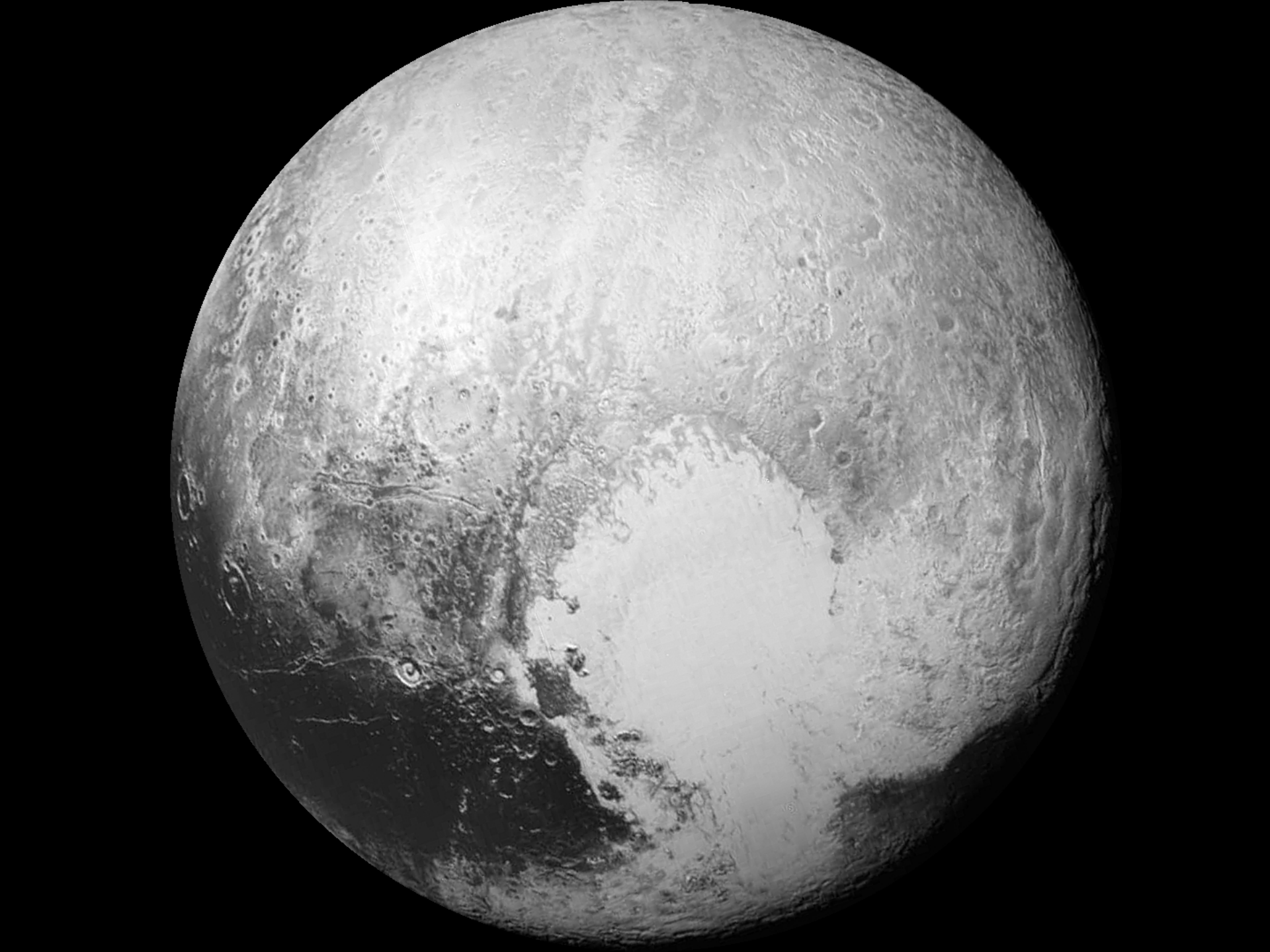
NATURAL COLOR
(RALPH + LORRI)

ENHANCED COLOR
(RALPH)

DARK POLAR SPOT IS REDDER THAN CHARON AVERAGE

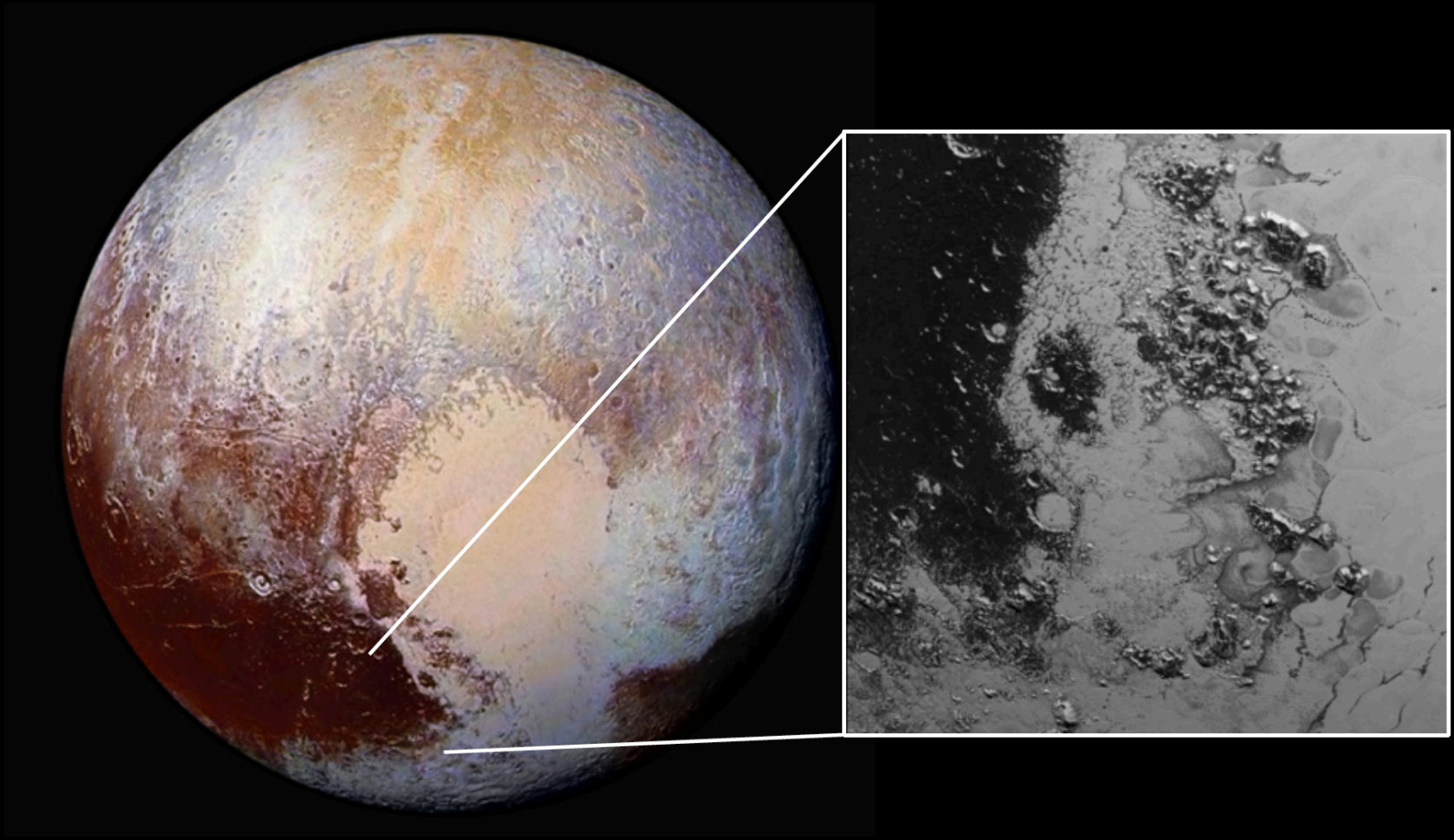
RED TERRAIN EXTENDS BEYOND DARK CORE OF SPOT

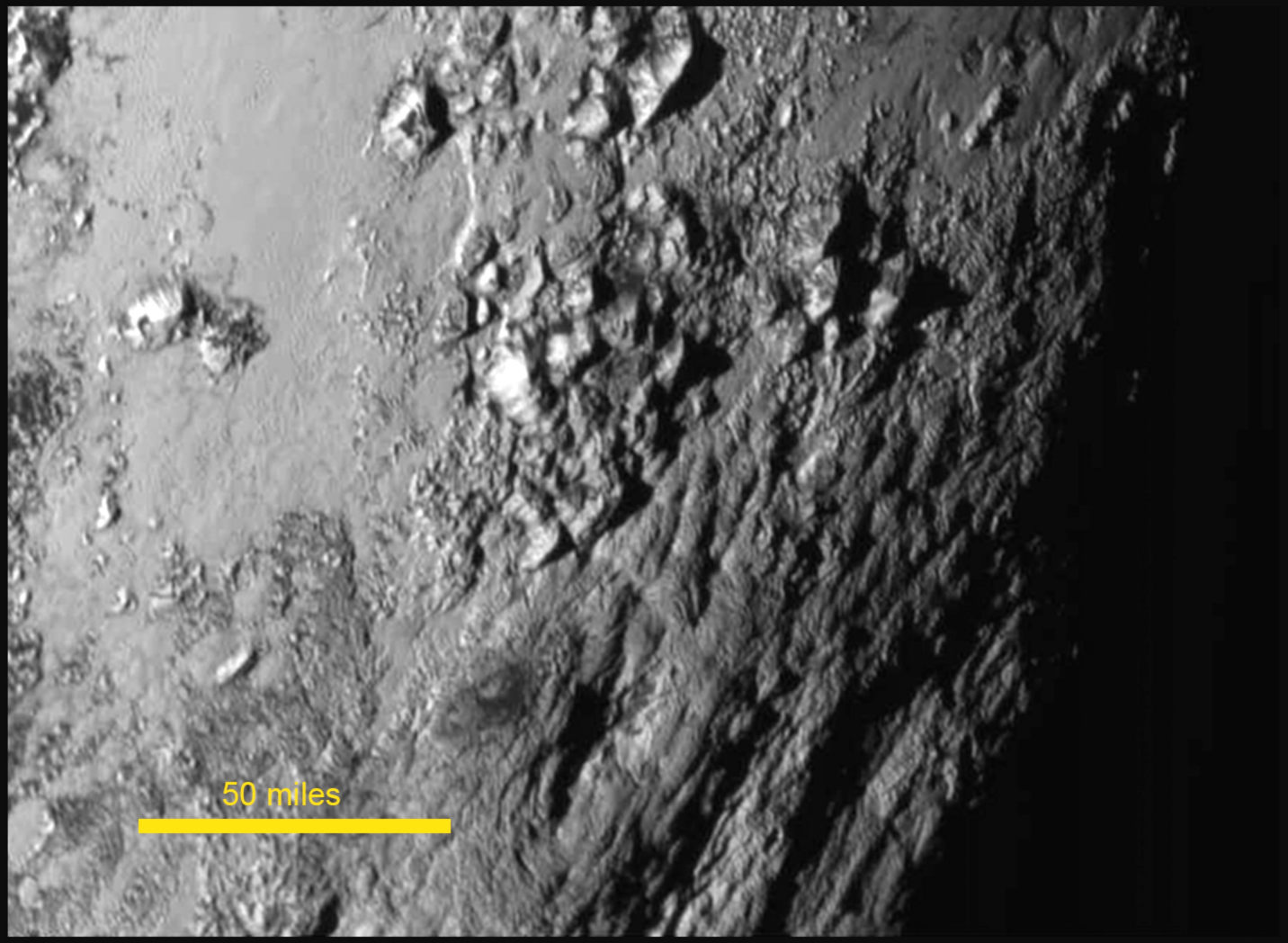
DARK CORE MAY BE CORRELATED WITH GEOLOGIC STRUCTURES



False Color

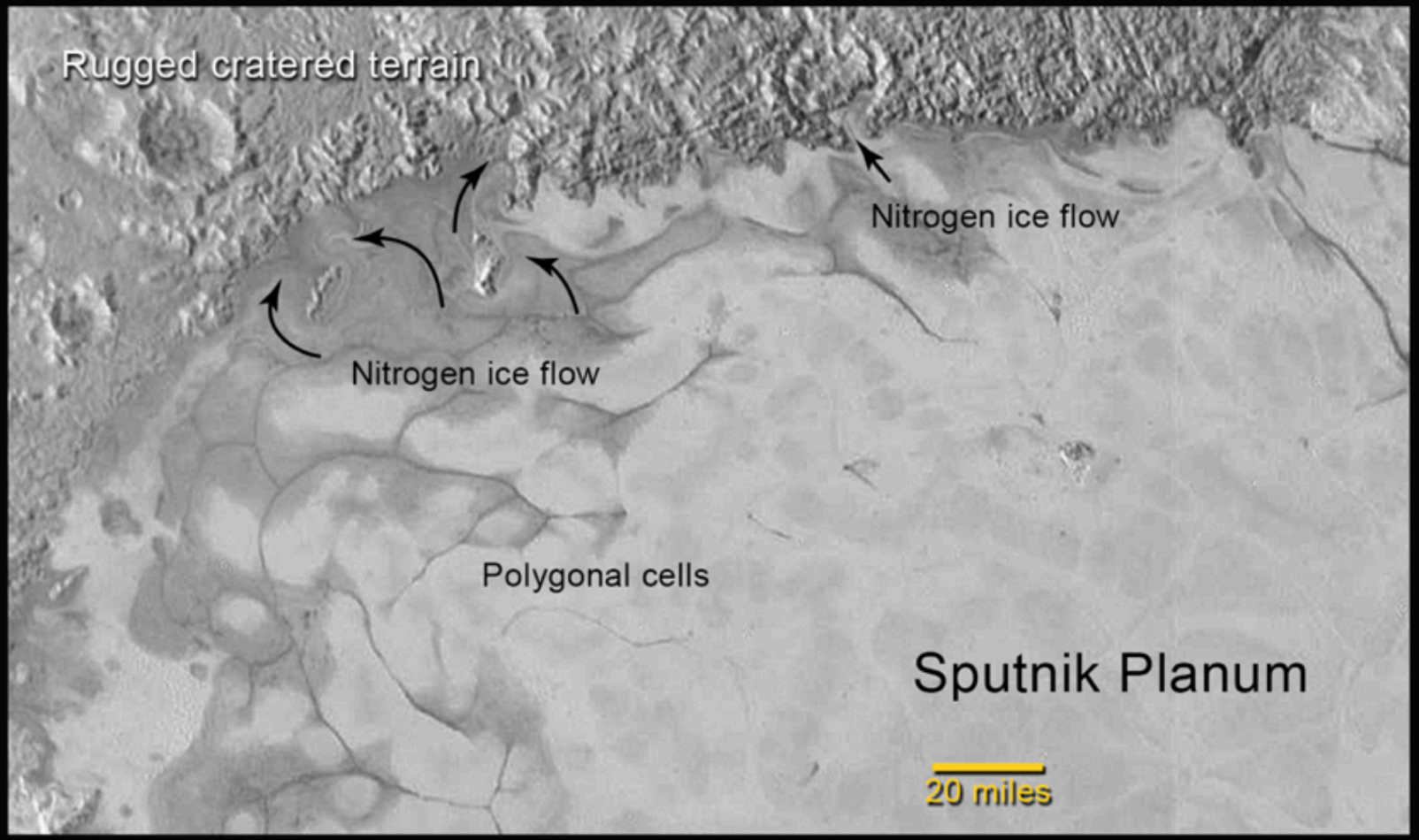
NEW HORIZONS: COMPLEX TERRAINS ON PLUTO



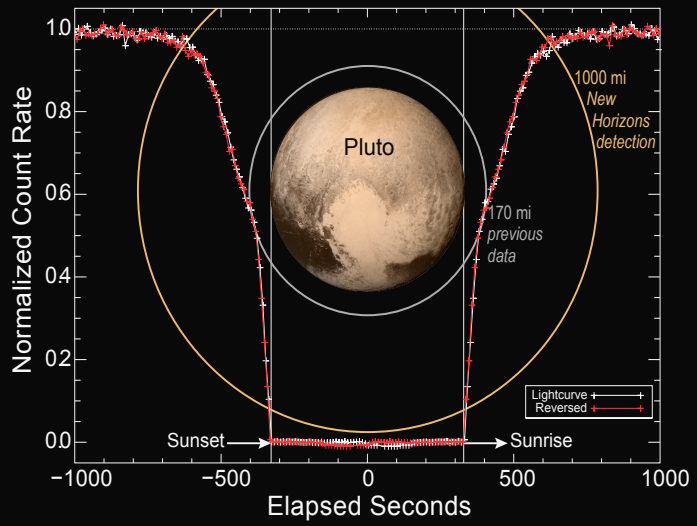

50 miles


20 miles

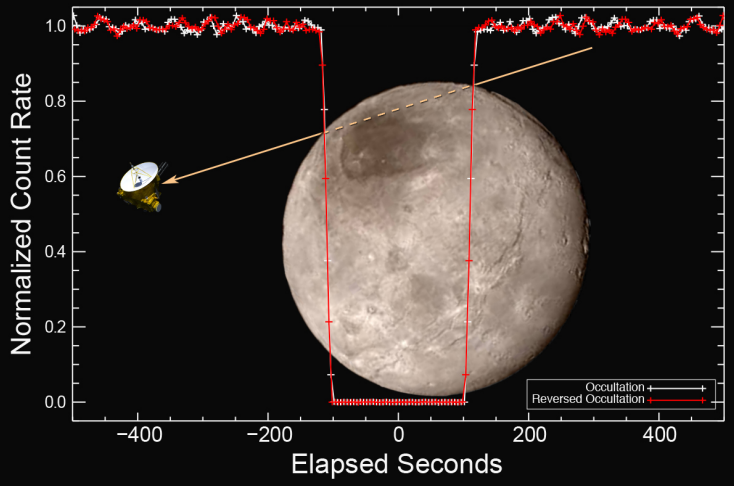
NEW HORIZONS:
GLACIAL FLOW ON PLUTO



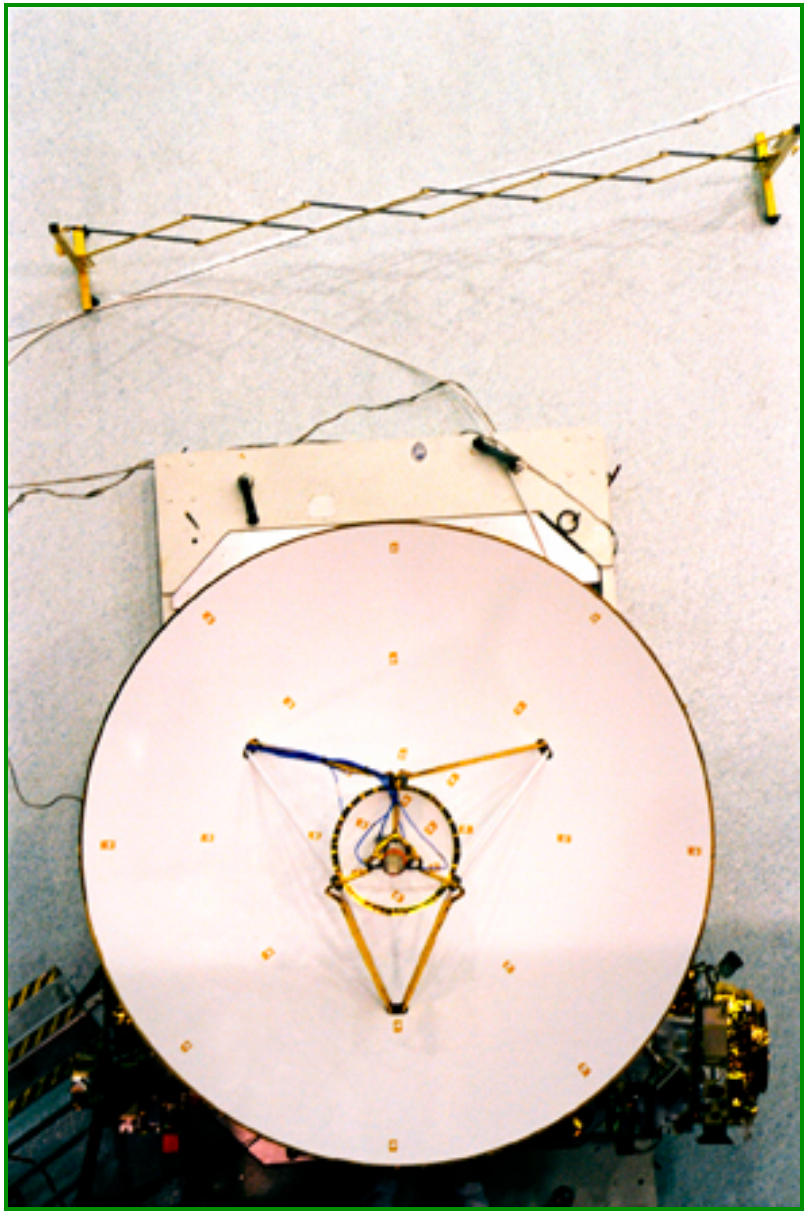
Alice Solar Occultation



Alice Solar Occultation of Charon



PROPOSAL: KBO FLYBY 2019



KBO EXTENDED MISSION PROPOSAL IN CONTEX

- The Planetary Decadal Survey that enabled New Horizons called for a Kuiper Belt-Pluto Mission to explore both the Pluto System and small KBOs.

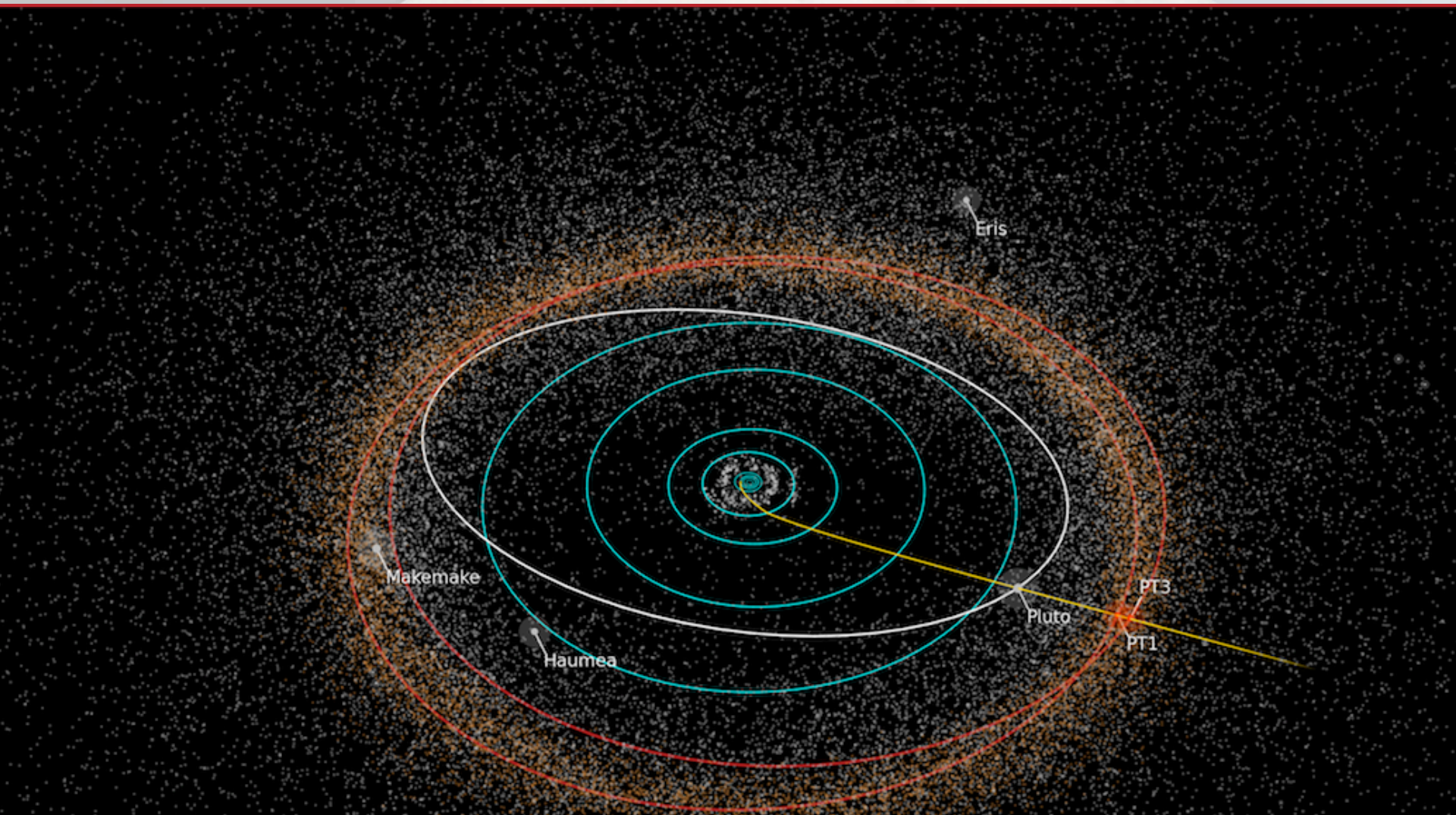
- New Horizons and its payload were explicitly designed to carry out this KBO mission in response to the NASA PKB AO.

- In 2014 the New Horizons project identified 2 potential KBOs targets using HST; they are called Potential Targets (PTs) 1 and 3.

- New Horizons is healthy and has more fuel and ΔV capability aboard (~130 m/sec) than originally after Pluto.

- A KBO extended mission is viable.

PT1 AND PT3 IN CONTEXT



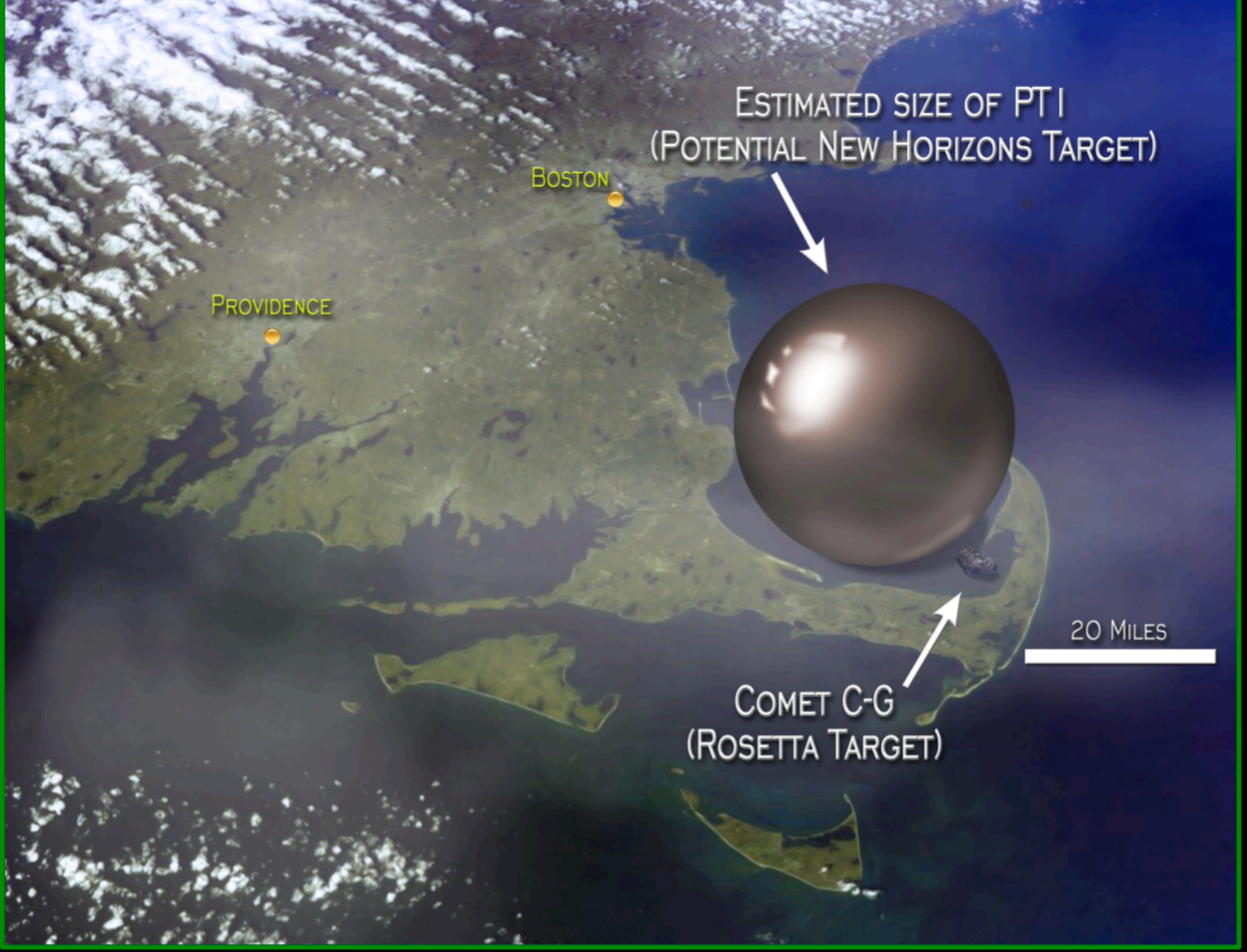
slide courtesy A. Parker

KBO Extended Mission Science Objectives

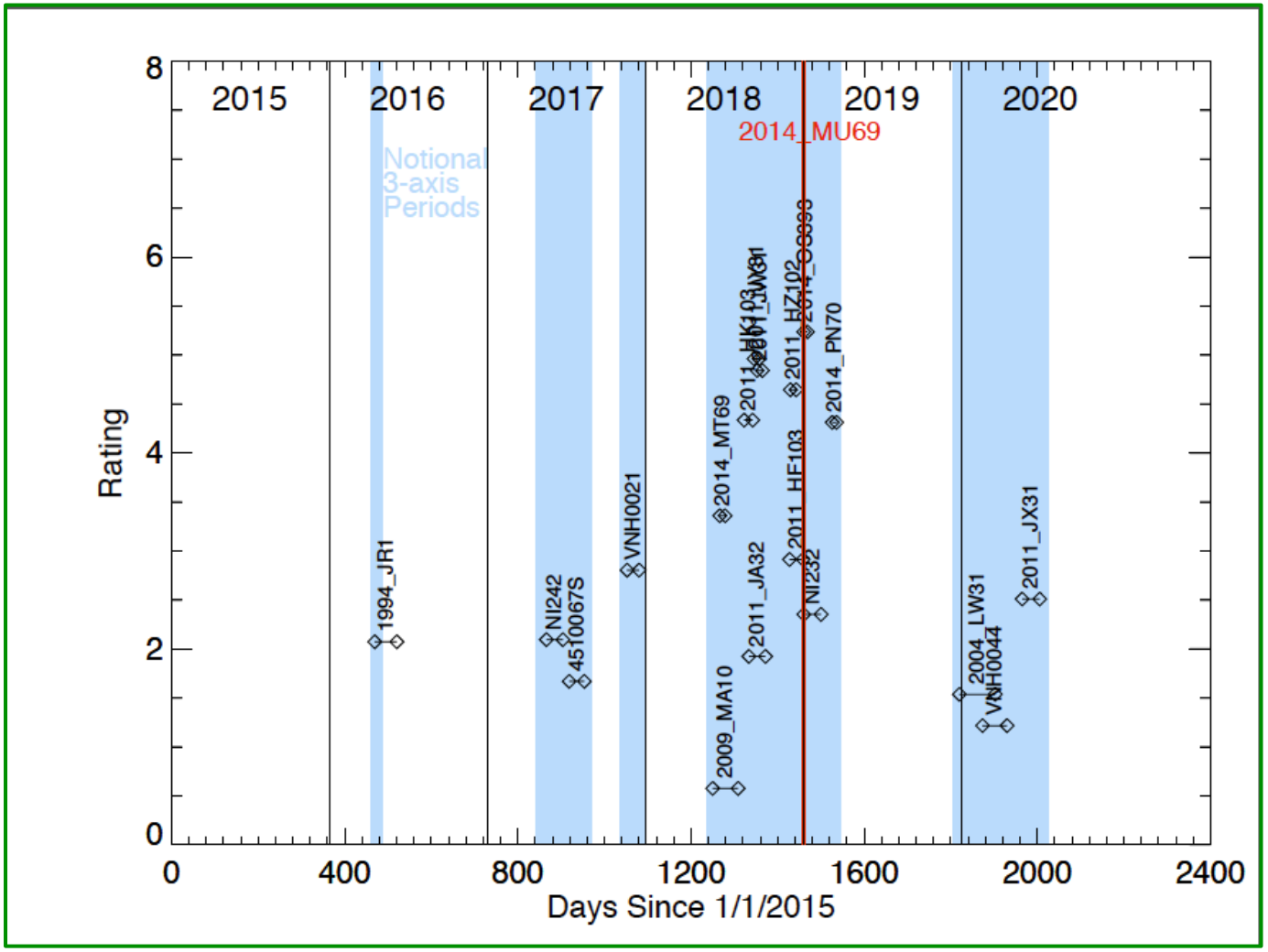
- Conduct a close flyby of a primordial KBO planetesimal.
- Conduct distant science flyby observations of 10-20 other KBOs.
- Conduct heliospheric cruise science in the Kuiper Belt; specifically heliospheric plasma, dust, and neutral H/He observations.
- Potentially conduct astrophysical cruise science.

PT1/PT3 OVERVIEW

	PT1	PT3
MPC Designator	2014 MU69	2014 PN70
Diameter (p=0.04, smaller if higher albedo)	**45 km**	**55 km**
Orbital Semi-major Axis	44.2 AU	44.3 AU
Orbital Eccentricity	0.036	0.068
Orbital Inclination	1.9 deg	2.8 deg
Cold Classical	**Yes (96.5%)**	Yes (95.4%)
ΔV to Target	**56.5 m/s**	116.9 m/s
Encounter Date	**2018 Dec 31**	2019 March 18
Encounter During Solar Conjunction	No	No
Encounter OpNav Field	Go	Go
Encounter OpNav Acquisition	Meets Requirement	Meets Requirement


ESTIMATED SIZE OF PT1
(POTENTIAL NEW HORIZONS TARGET)
BOSTON
PROVIDENCE
20 MILES
COMET C-G
(ROSETTA TARGET)

Distant KBO Flybys (PT1)



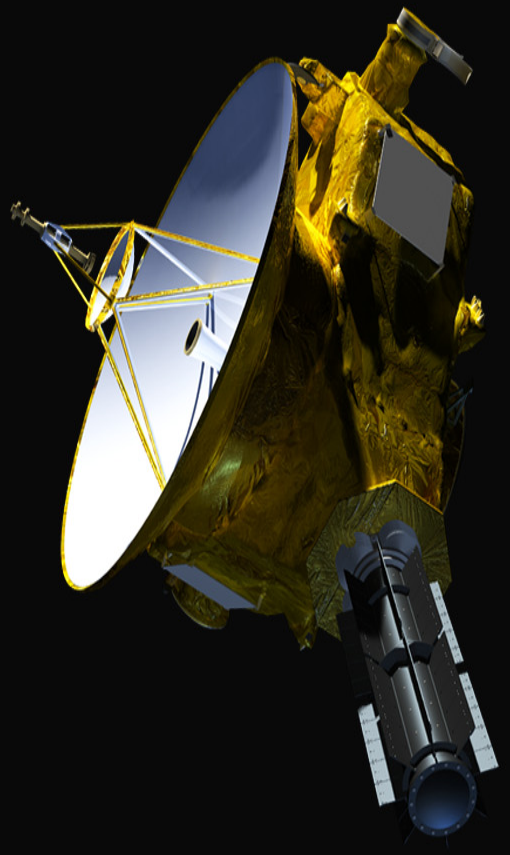
Science:
Phase Curves
Lightcurves
Colors
Inner Satellite Searches

Exploring Pluto: We Did It!

BACKUPS

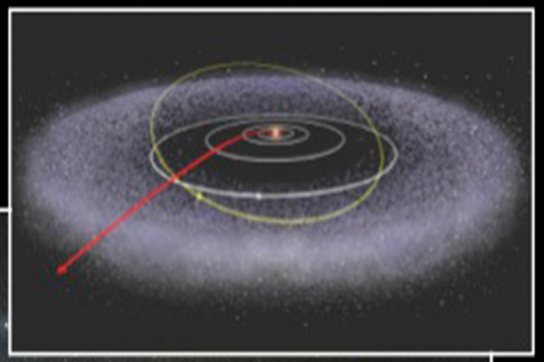
Mission History

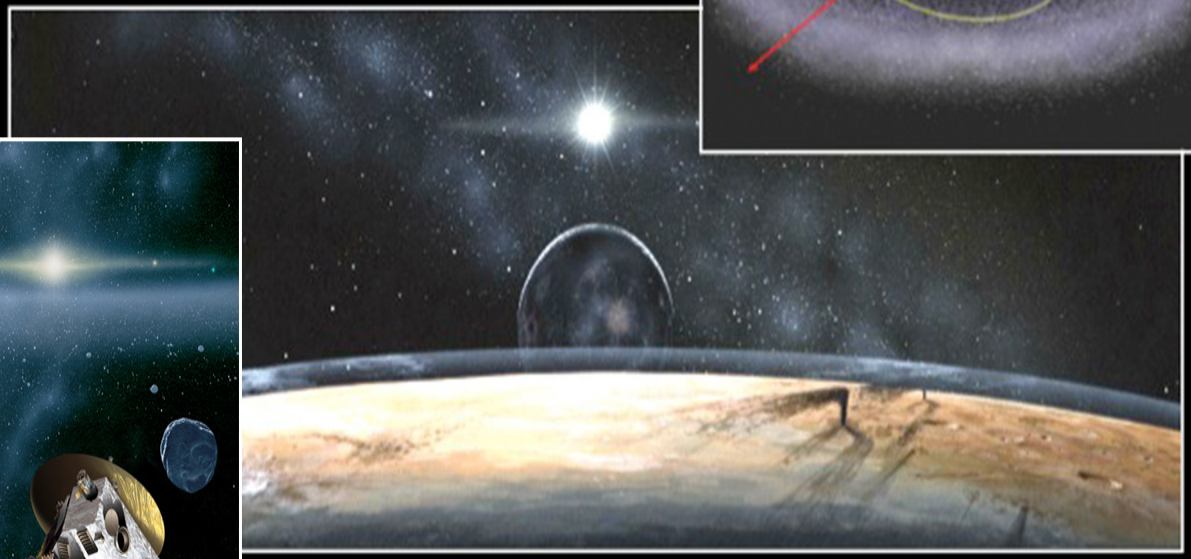
- 1990: Pluto 350
- 1991: Pluto Mariner Mark II
- 1992: Pluto Fast Flyby
- 1994: Pluto Express
- 1997: Pluto Kuiper Express
- 2001: New Horizons



Highest Funding Priority Medium-Scale Mission
New Start of the 2003 Planetary Decadal Survey:

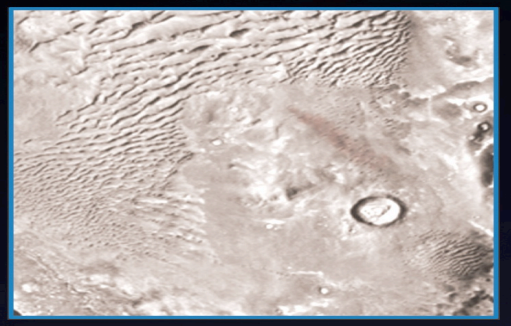
A Reconnaissance Expedition
to Pluto-Charon & the Kuiper Belt



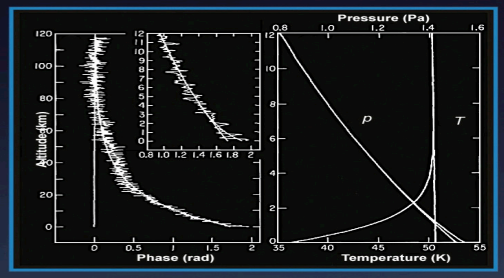


NEW HORIZONS:
Shedding Light on Frontier Worlds

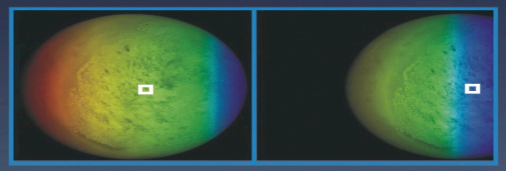
Global Mapping & High-Res Imagery



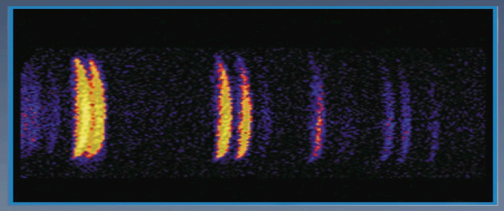
Radio Science Occultation, Gravity, & Radiometry



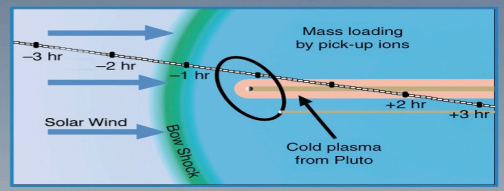
IR Surface Composition & Temperature Mapping



UV Airglow & Occultation Imaging Spectroscopy



In Situ Particles & Plasma Measurements



Concept Study Report for
the Pluto-Kuiper Belt Mission
NASA AO-OSS-01

Principal Investigator:
S. Alan Stern
Southwest Research Institute