

New Horizons Project Update



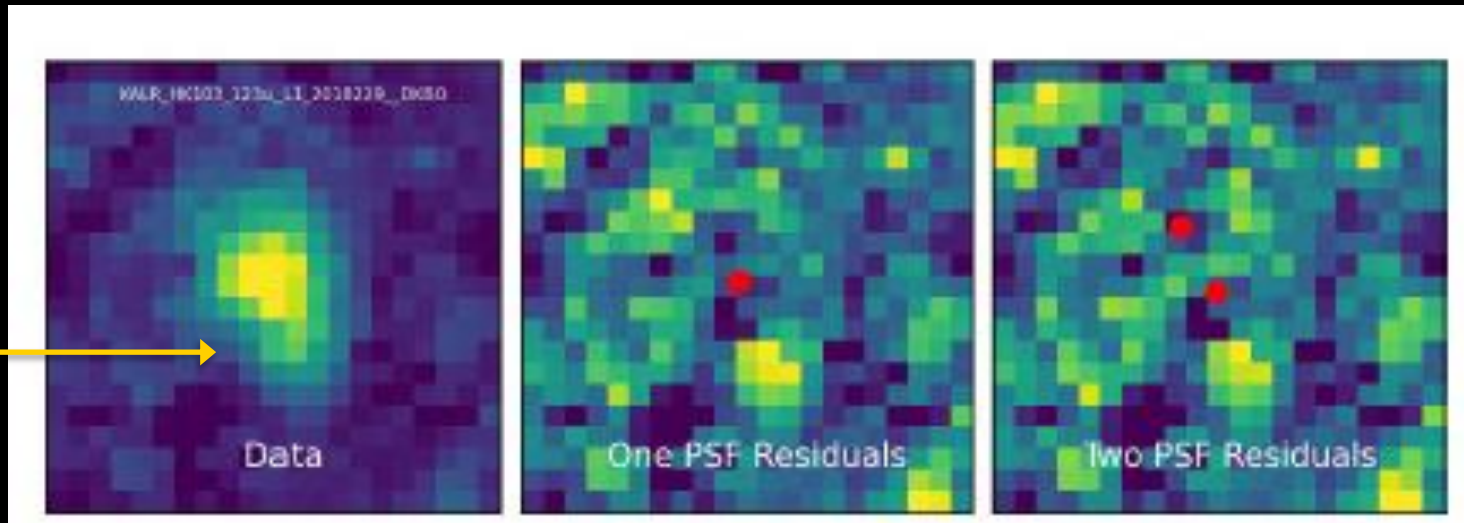
**Alan Stern/SwRI, Mission PI
for *the New Horizons Team***

2021 February 10

The Discovery of Tight KBO Binaries (Weaver, Porter, Spencer et al. 2021)

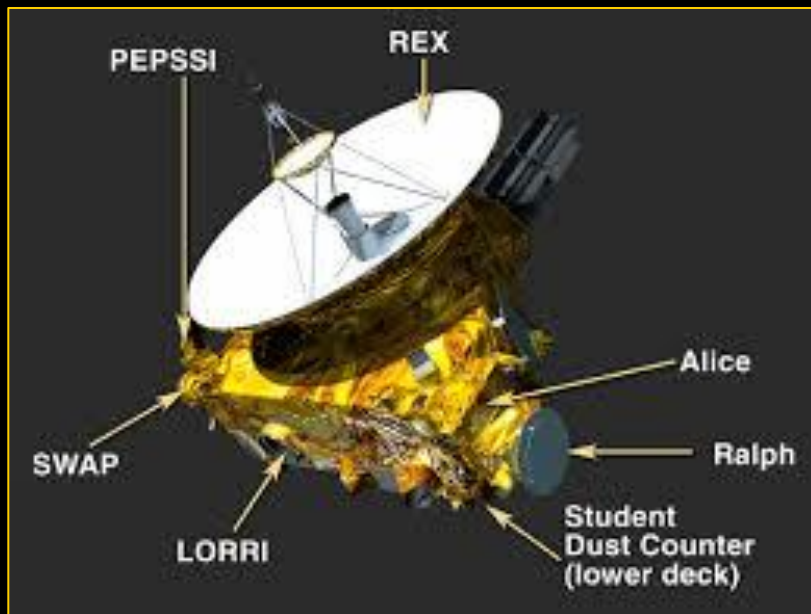


- **Example: KBO 2011 JY₃₁ (Cold Classical, D~50 km)**
 - **200 km (~4 diameters) separation, P=1.9 days**



- **Note: HST PSF for this KBO is ~3000 km.**

Overview



- **Healthy spacecraft**
- **Studying DKBOs**
- **Searching for New Targets**
- **Observing the Heliosphere**

- **Senior Review in 2022**

- **New flight software to enhance science in 2021:**
 - **SWAP** (Solar Wind)
 - **LORRI** (KBO Imaging)
 - **Ralph** (KBO Imaging)
 - **REX** (KB Dust)
 - **Alice** (Heliosphere H Mapping)

Major 2021 Activities

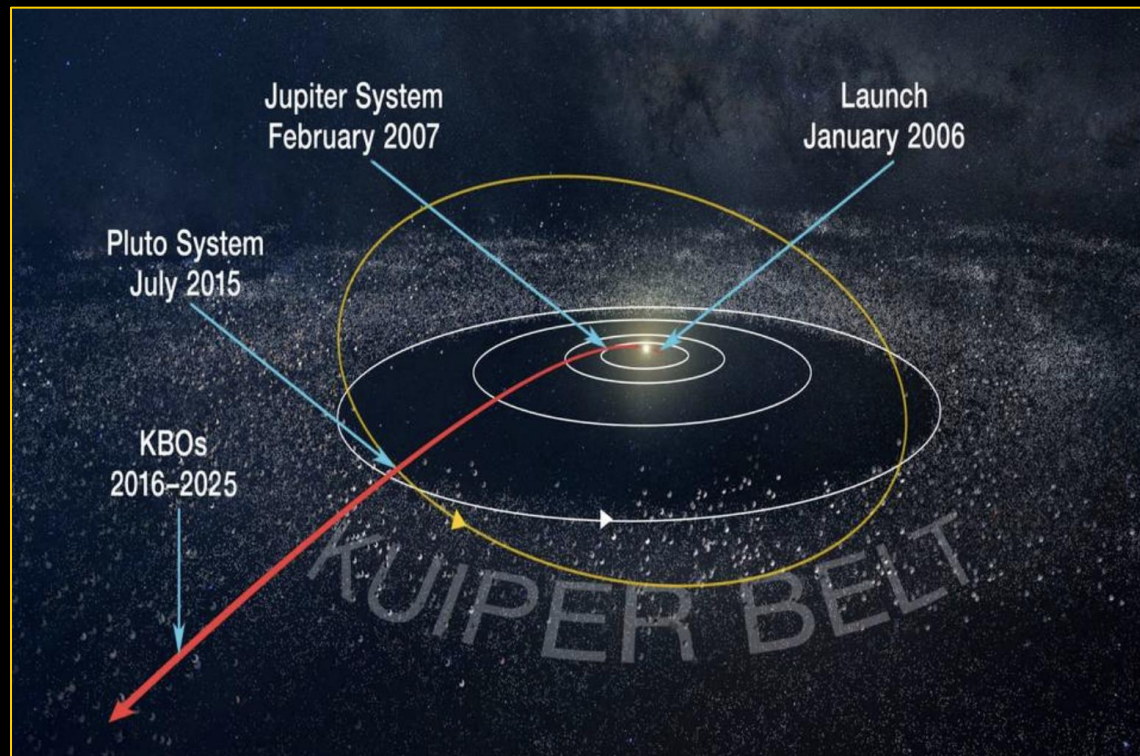
- **Flight Software (FSW) Uplinks (Feb, Jul, Sep)**
- **New FSW Capability Testing (Apr, Sep, Dec)**
- **Groundbased KBO Target Searches (Apr-Oct)**
- **KBO Observation Campaigns (May, Sep, Dec)**
- **Pluto System and Arrokoth Workshops (12-16 July)**
- **2021 PDS Delivery (Aug)**
- **PMSR Proposal Preparations (Fall-Winter)**

2021 PDS Delivery Highlights

➤ August:

➤ KBO Observations and Cruise Data 2020

➤ 6-10 Arrokoth and Pluto System Meta-products



The Pluto System After New Horizons

April 2021

THE PLUTO SYSTEM AFTER NEW HORIZONS

S. ALAN STERN, JEFFREY M. MOORE, WILLIAM M. GRUNDY,
LESLIE A. YOUNG, RICHARD P. BINZEL, EDITORS



The Pluto System After New Horizons

April 2021

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The Pluto System After New Horizons



April 2021



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March 2021 Icarus Special Issue



- Editorial**  **New access**
Introduction to *Encanto* special issues "Pluto System, Kuiper Belt, and Kuiper Belt Objects"
 Kelly N. Singer, William M. Grundy, Oliver L. White, Richard P. Binzel
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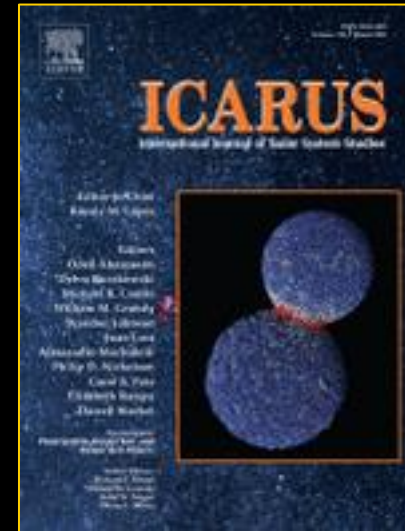
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Pluto System-Arrokoth Science Workshops (12-16 July at APL)

Topic	Leads	Days
The Varieties of Cryovolcanism in the Pluto System, and Implications for Elsewhere	Singer, White	1.0
<u>Thermodynamical</u> and Optical Microphysical Processes of Pluto's Ices	Grundy, Schmitt	0.5
Ammoniated Species in the Pluto System and Beyond	Cruikshank	0.5
Pluto's Escape Rate Over Time	Young	0.5
Formation of Pluto's Satellites	McKinnon	0.5
Arrokoth's Geologic Mysteries	Schenk	0.5
Arrokoth's Devolatilization	Lisse	0.5
TNO Observable Surface Characteristics: Nature v. Nurture	Grundy, Kavelaars	1.0

Open to the Community!

A Single Organic Compound Creates Pluto's Many Surface Colors

Protopapa et al. (2020)
The Astronomical Journal



Images from NASA's New Horizons mission show that Pluto's surface has many distinct regions with very different colors ranging from dark brown along the equator to light yellow in the north polar cap.

New models of the surface composition of these regions show that the range of colors can be reproduced by altering the abundance and particle size of a single coloring agent called tholin, which mostly is produced in the atmosphere and then settles to the surface.

Tholins are dark brown organic compounds produced when sunlight, cosmic rays, and energetic particles irradiate methane and nitrogen molecules in Pluto's atmosphere or surface.

The spectra above show that models (blue lines) obtained employing the same tholin-type material but with different abundances and particle sizes match the data of two regions with contrasting colors:

- The light yellow Lowell Regio near the pole is dominated by volatile ices that sublime and recondense and hide much of the deposits from the tholin haze.
- The dark brown Cthulhu Macula near the equator is enriched with tholin mostly unobscured on the surface.

Therefore, **Pluto's diverse surface colors do not require different chemical products formed in different environments; a single tholin material can account for all of Pluto's colors.**

