Recurrent Activity from Active Asteroid (248370) 2005 QN_{173}: A Main Belt Comet

Colin Orion Chandler†, Henry H. Hsieh‡, Chadwick A. Trujillo†

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Submitted to The Astrophysical Journal Letters

Active Asteroids

Active asteroids have comet-like features such as a tail.

Colin Orion Chandler

AAS DPS 53 – October 2021

Image Credit: NASA

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Where is water now?

- Space exploration
- Asteroid mining

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Where did Earth's water come from?

- Some came after birth of Earth
- Active asteroids: a viable reservoir?

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Active Asteroids

Active asteroids have comet-like features such as a tail.

Problem: fewer than 30 known

Where is water now?

- Space exploration
- Asteroid mining

Where did Earth's water come from?

- Some came after birth of Earth
- Active asteroids: a viable reservoir?

Colin Orion Chandler

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Image Credit: NASA

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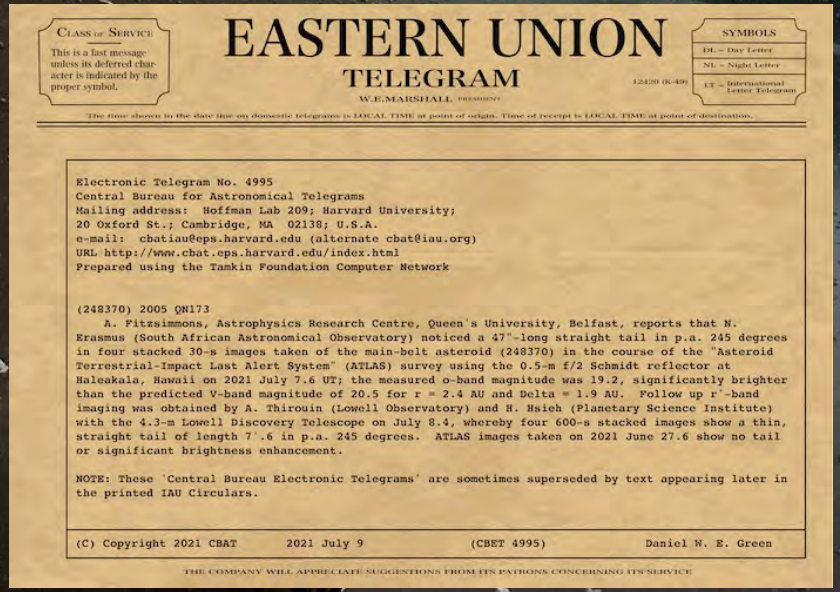
New Active Asteroid Notice



CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

EASTERN UNION
TELEGRAM
W. E. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination.

Electronic Telegram No. 4995
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Mailing address: Hoffman Lab 209; Harvard University;
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(248370) 2005 QN173
A. Fitzsimmons, Astrophysics Research Centre, Queen's University, Belfast, reports that N. Erasmus (South African Astronomical Observatory) noticed a 47"-long straight tail in p.a. 245 degrees in four stacked 30-s images taken of the main-belt asteroid (248370) in the course of the "Asteroid Terrestrial-Impact Last Alert System" (ATLAS) survey using the 0.5-m f/2 Schmidt reflector at Haleakala, Hawaii on 2021 July 7.6 UT; the measured o-band magnitude was 19.2, significantly brighter than the predicted V-band magnitude of 20.5 for r = 2.4 AU and Delta = 1.9 AU. Follow up r'-band imaging was obtained by A. Thirouin (Lowell Observatory) and H. Hsieh (Planetary Science Institute) with the 4.3-m Lowell Discovery Telescope on July 8.4, whereby four 600-s stacked images show a thin, straight tail of length 7'.6 in p.a. 245 degrees. ATLAS images taken on 2021 June 27.6 show no tail or significant brightness enhancement.

NOTE: These 'Central Bureau Electronic Telegrams' are sometimes superseded by text appearing later in the printed IAU Circulars.

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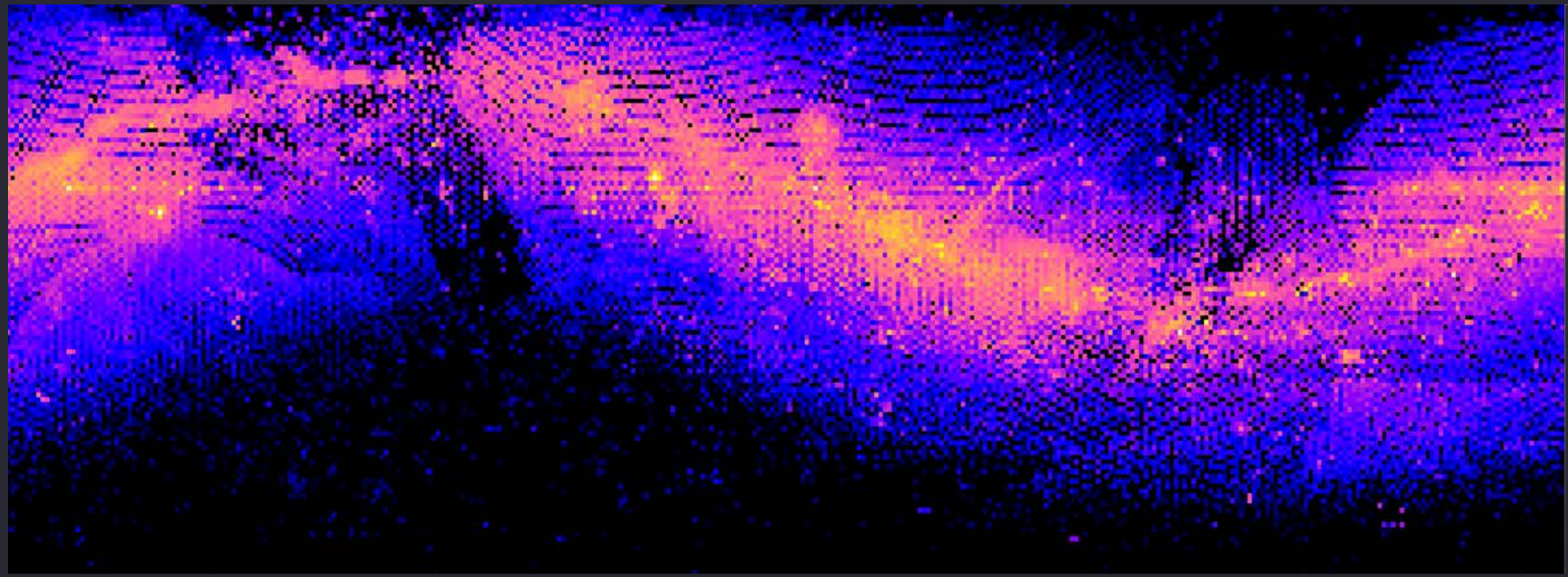
THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

- Object: Newfound “active asteroid”
- Location: Main Asteroid Belt
- Diameter: 4 km
- Activity discovery: July 2021
- Orbital period: 5 years

High Performance Computing

NAU HPC MONSOON

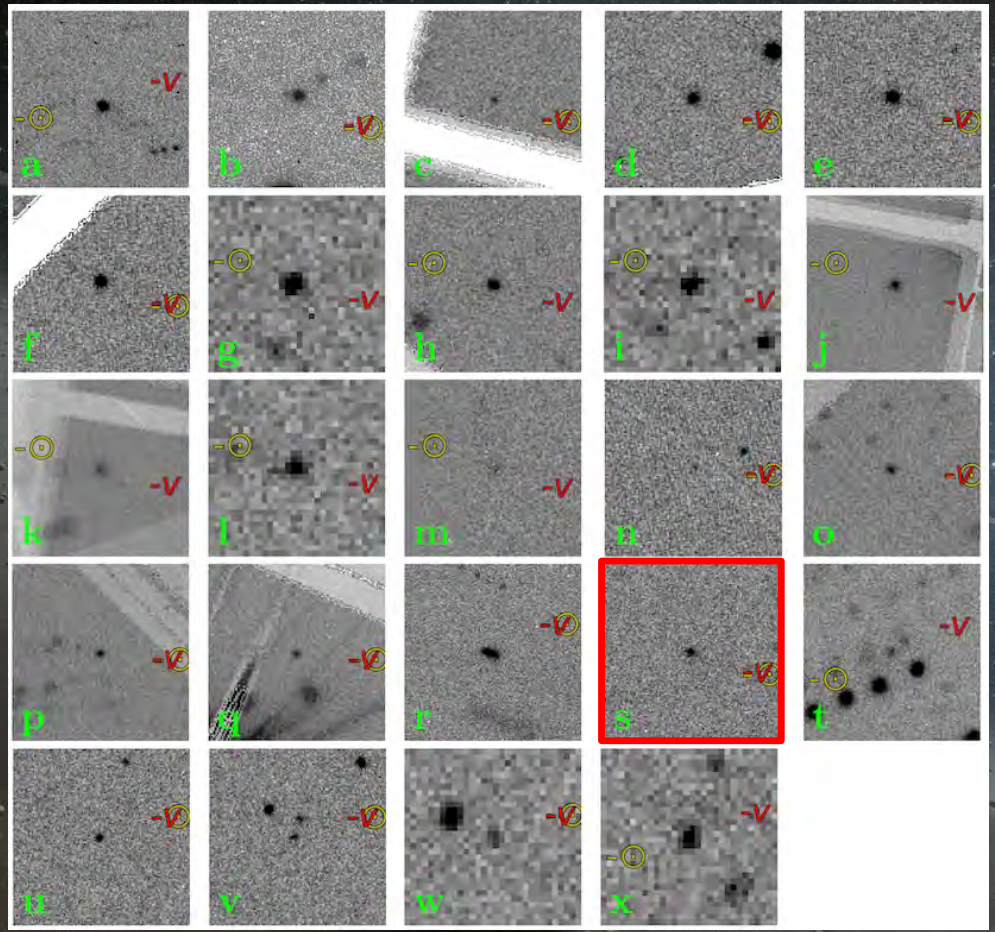
Sky locations of our 16M processed thumbnails from archival data



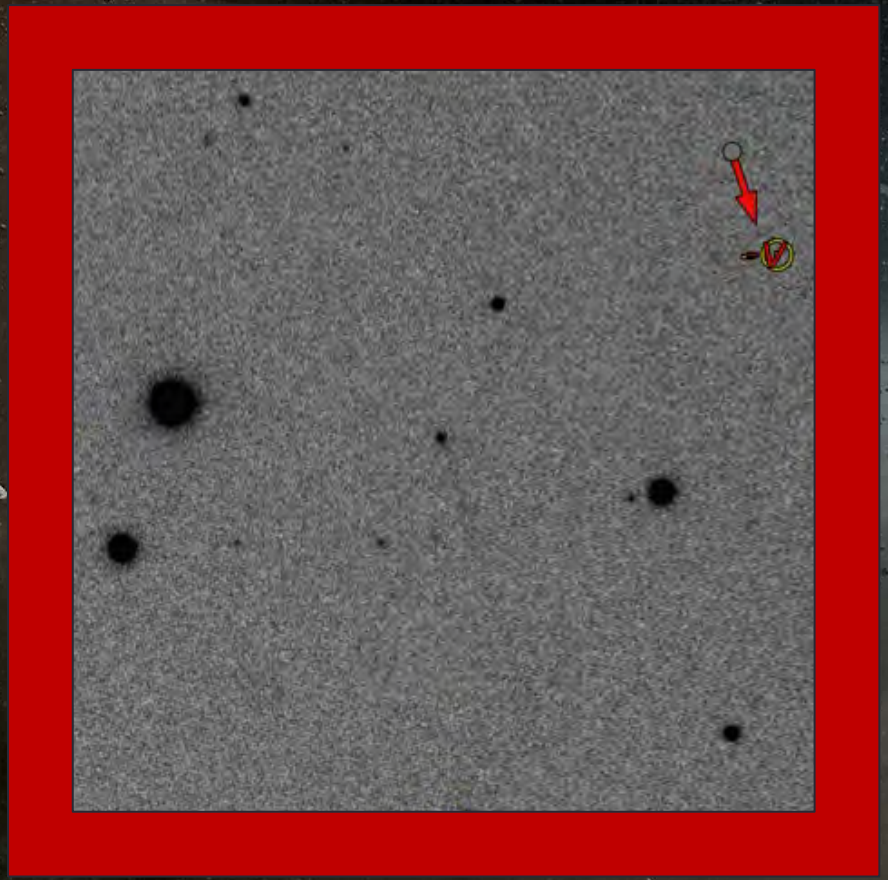
Methods: SAFARI: Searching Asteroids for Activity Revealing Indicators (Chandler+ 2018)

Results: Archival Images

- In 10s of millions of images, found 24
- Catalog of data + images
- -⊙ and -*v* are expected tail directions
- Red box: image with activity (s)
- All others: no activity or inconclusive



Found: Second Activity Epoch



- Archival image from July 22, 2016
- We identified a long thin tail
- Dark Energy Camera
- Blanco 4 m telescope (Chile)
- Observers: Dustin Lang, Alistair Walker

Findings

- We found the object was active previously
- 8th known recurrently active asteroid
- Cause: probably ices sublimating
- A “Main Belt Comet”

Image by Colin Orion Chandler, Chad Trujillo, Scott Sheppard

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- Prior activity: 2016 July 22
- Most likely cause: ice sublimating
- Probable “Main Belt Comet”

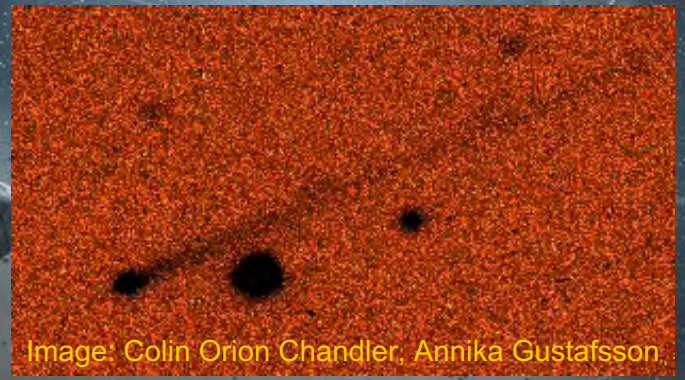

Image: Colin Orion Chandler, Annika Gustafsson