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

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Submitted to The Astrophysical Journal Letters
Active Asteroids

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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
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Active Asteroids

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**Problem: fewer than 30 known**

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- Space exploration
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- Active asteroids: a viable reservoir?
New Active Asteroid Notice

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

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
• $-\varnothing$ 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
- 8\textsuperscript{th} 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”