Close Encounters of the Asteroid Kind

IRTF Rapid Response to NEO Flybys





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OBSERVATORY LOWELL

IRTF Future Directions Workshop • 12-14 February 2018

2008 TC3 / Almahata Sitta

7 October 2008

- 4m NEO (H=30.4)
- Discovered 19 hr before impact
- Meteorites recovered in Nubian desert

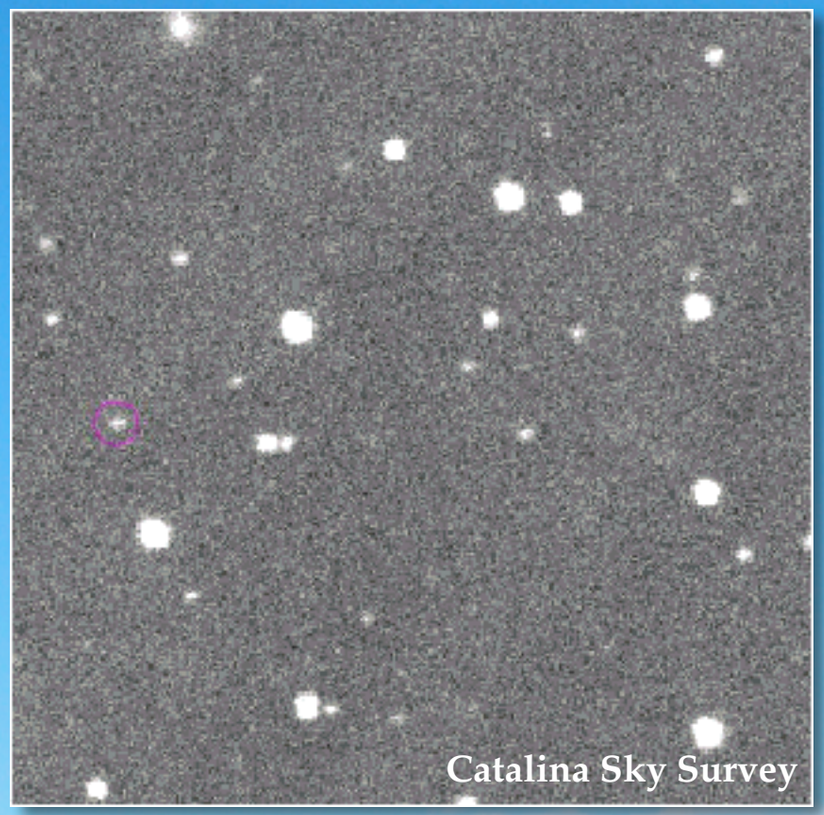
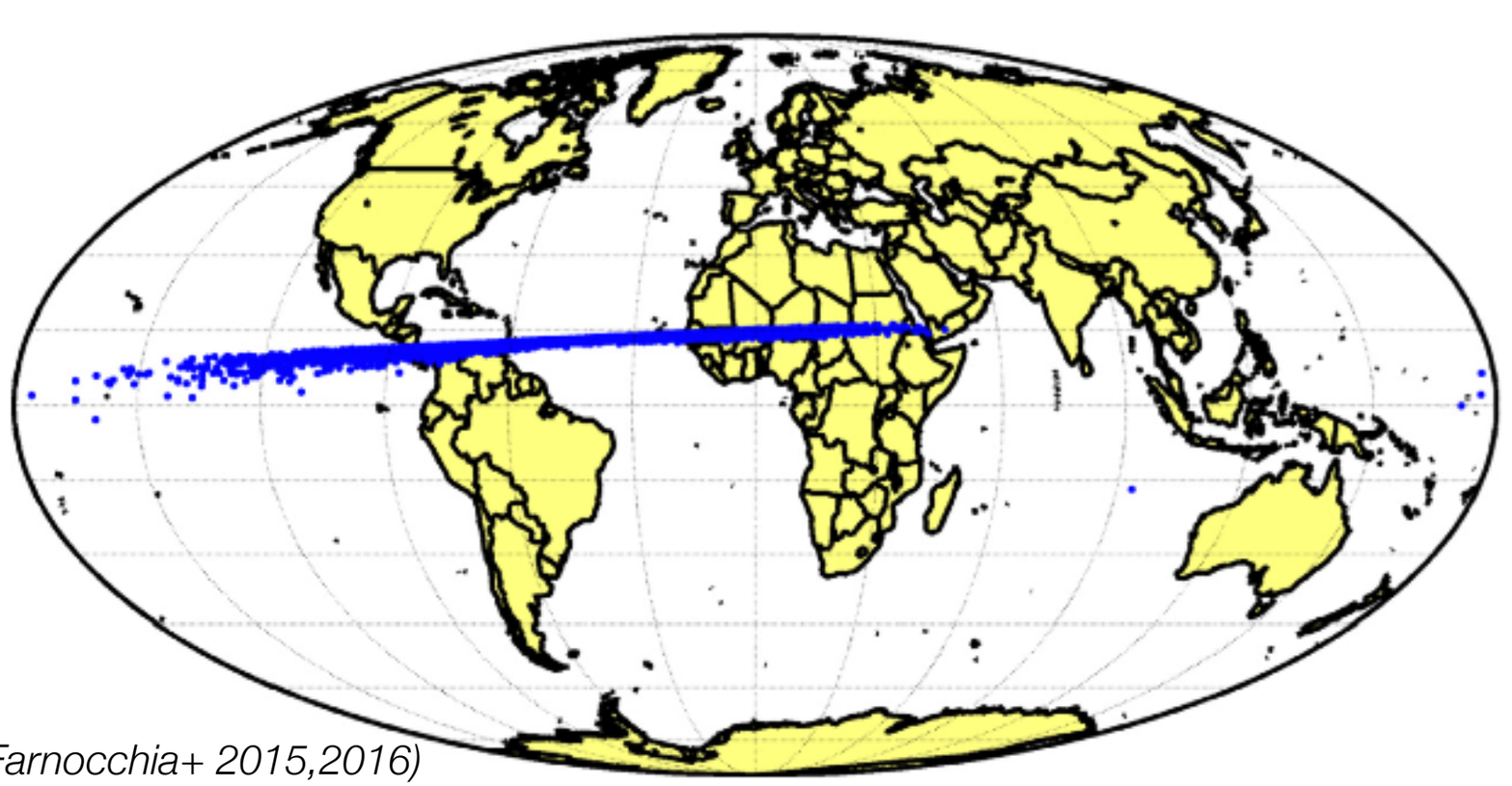


Image: Peter Jenniskens (SETI/NASA Ames)

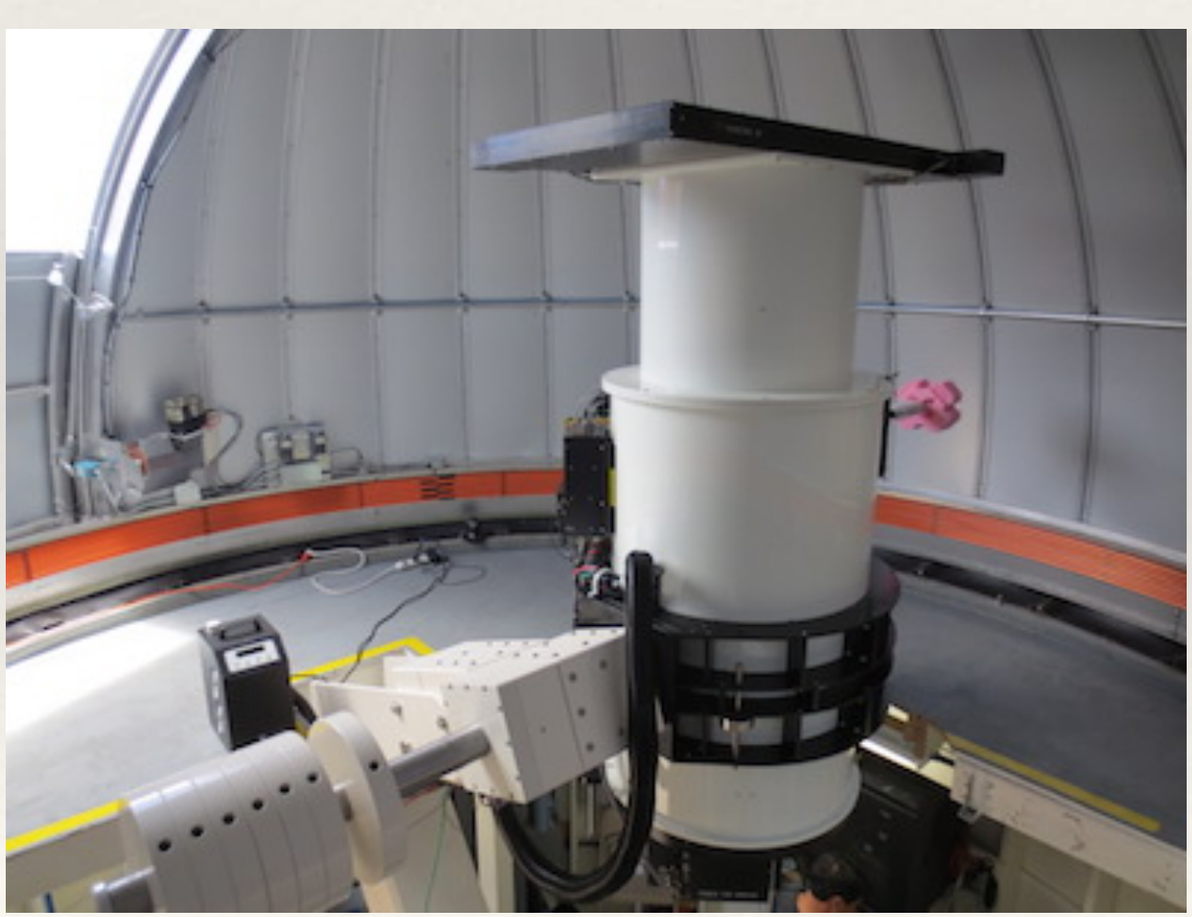
2014 AA

2 January 2014

- meter-scale object (H=30.9)
- found by Catalina Sky Survey
- discovered 21hr before impact



(Farnocchia+ 2015,2016)



NEOCP A106fgF

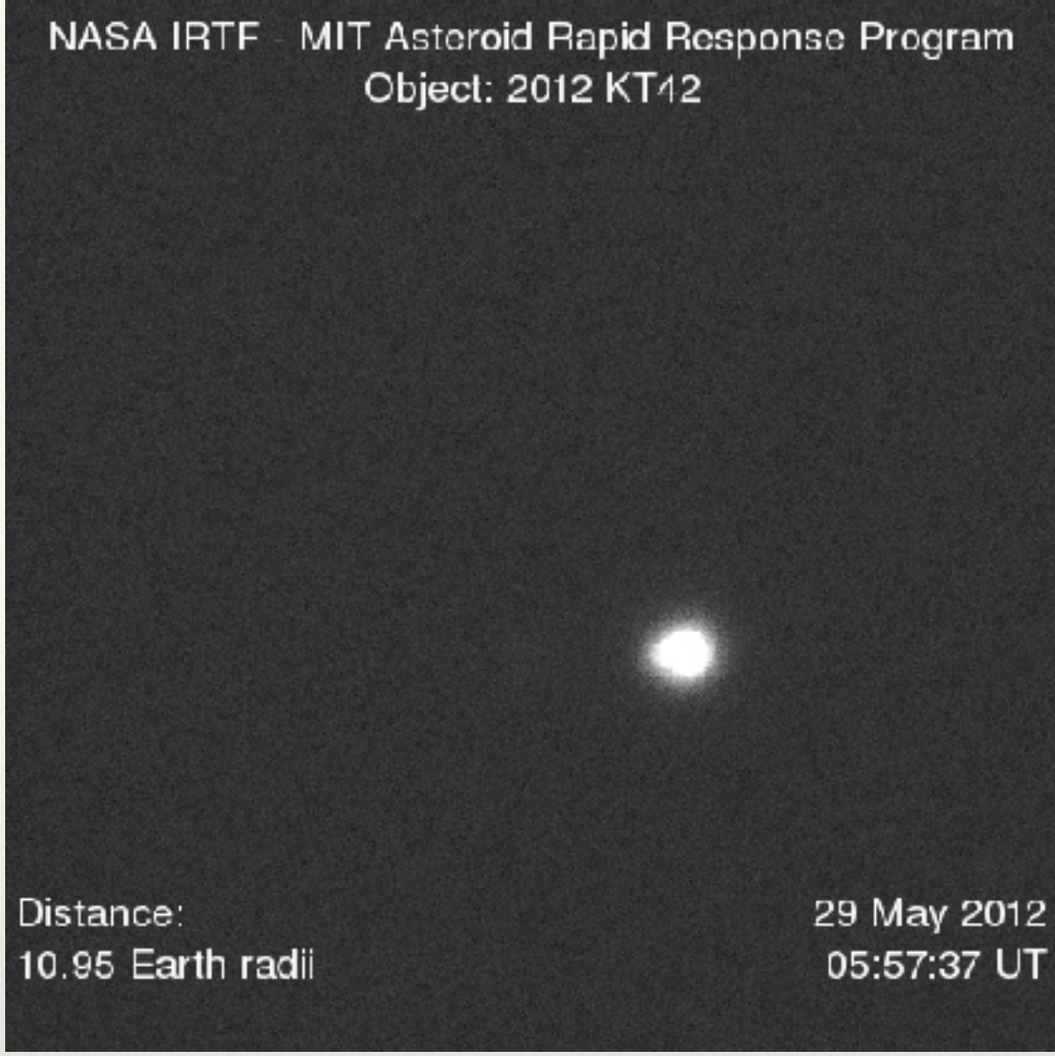
22 January 2018

- meter-scale object (H=31.1)
- found by ATLAS
- discovered 10hr before possible impact

Close Encounters of the Asteroid Kind

Started in 2009 by Rick Binzel (MIT)

Bobby Bus (UH), Gareth Williams (CfA),
Steve Chesley (JPL), Francesca DeMeo (MIT),
David Polishook (Weizmann),
Brian Burt (Lowell)



Objectives

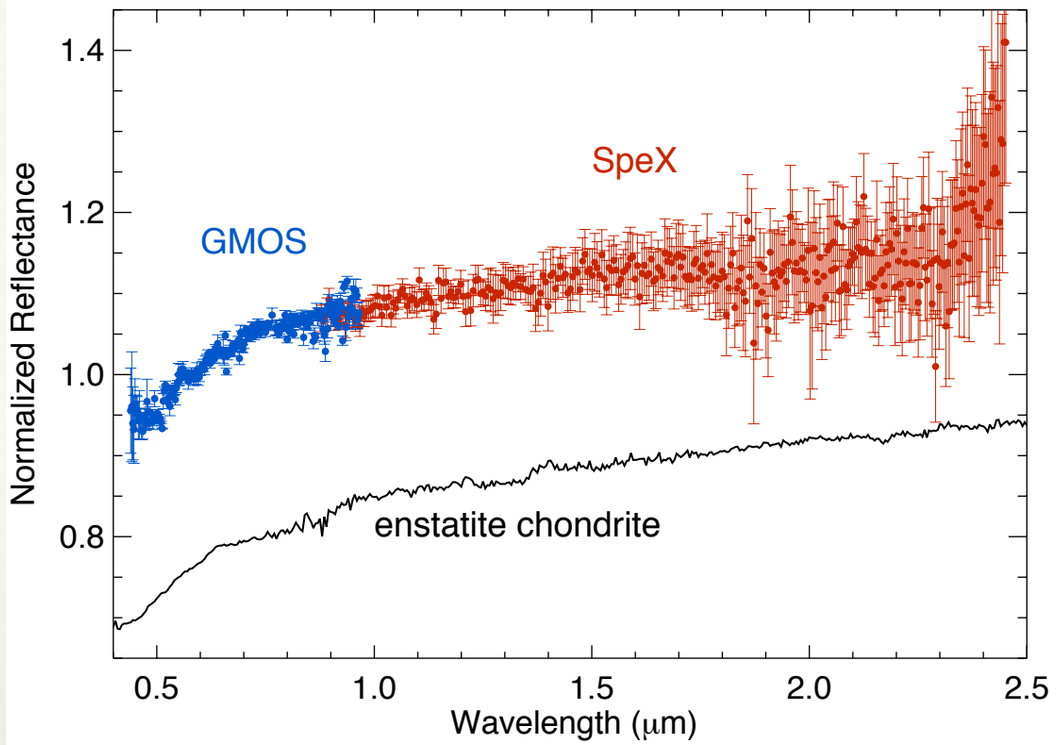
- Characterize pre-impact NEOs
  - *Spex*: JHK spectra
  - *MORIS*: Lightcurve photometry
- Constrain composition, mass, density, size, rotation state, impact energy
- Develop observing protocols
- Probe "seismic limit"

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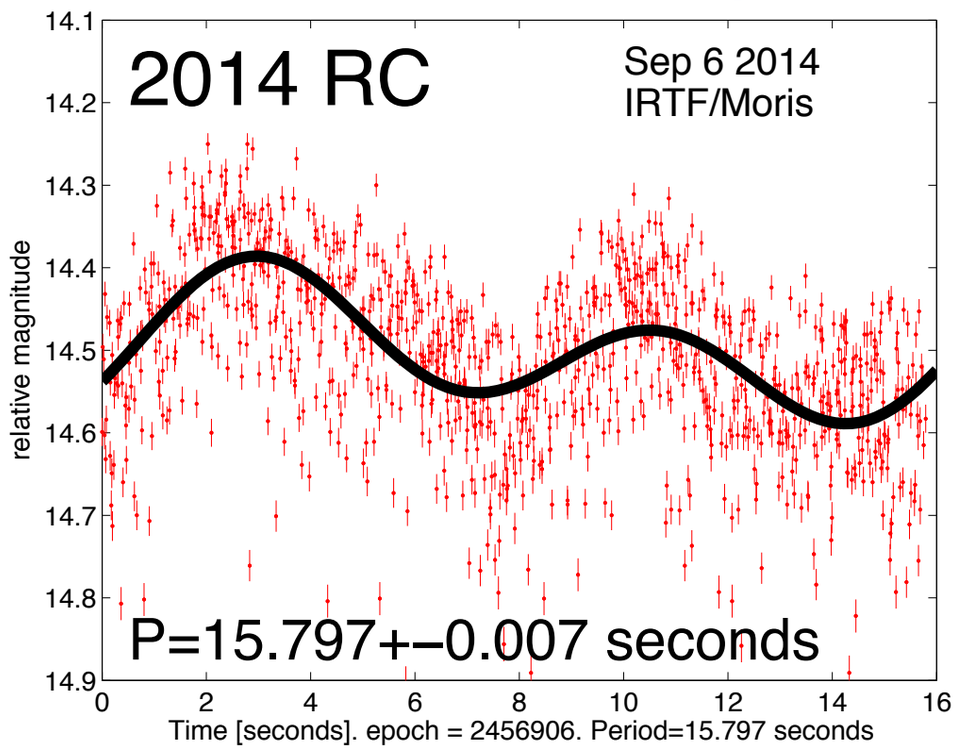
- Typically **2-3 hours / event**
- Typically **~1 event / year** (5 since 2012A)
- NASA Science Nuggets
- Included in multiple publications



Unusual Compositions



Fastest known rotation periods



The Future of NEO Encounters

- **Two objects in the past week inside ½ lunar distance:**
  2018 CB 2018 CN2

- **LSST will provide many more of these opportunities**



Critical capabilities:

- Rapid response, generally in the week around new Moon
- High non-sidereal tracking performance
- Increased integration with JPL Scout (NEOCP targets)
- Lightcurve quality limited by MORIS field of view (1’)
- Multi-instrument characterization (SpeX + MORIS + MIRSI +…)