NEOWISE Restart: Update

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NEOWISE = Near-Earth Objects + WISE

**WISE**
- 40 cm telescope in Sun-synchronous orbit
- Four channels: 3.4, 4.6, 12 and 22 µm
- Observed >158,000 minor planets
- > 34,000 new asteroids and comets discovered
- Launched in Dec 2009; operated through February 2011

**NEOWISE**
- Planetary mission, no hardware development
- Developed enhanced WISE Moving Object Processing System (WMOPS)
- Processed WISE data to detect and characterize (size, albedo) asteroids
- All data from prime mission released
NEOWISE Reactivation
Expected Science Return

- Only ~1000-2000 NEOs have any sort of physical properties measured beyond H & orbit out of ~11,000 known to date

- Detect & characterize ~2000 near-Earth objects (NEOs) over 3 year survey at 3.4 & 4.6 μm
  - Derive diameters to ±25%, albedos to ±50%
  - Tens of thousands of Main Belt asteroids + comets

- Discover ~100 new NEOs (25% potentially hazardous)

- Set additional constraints on subpopulations of NEOs, including Earth Trojans and potentially hazardous asteroids

- Data delivery policies same as prime mission
Instrument Performance

- Image quality, photometric accuracy, astrometry, sensitivity all unaffected by 32 month hibernation

Prime mission: 2011

Reactivation mission: 2014
Moving Object Processing

- Routine processing of data using moving object processing software began late December, 2013
  - First new NEO discovered 6 days later: 2013 YP139

- Regular deliveries to Minor Planet Center (MPC) being made

- Pipeline running at SNR=4.5

- Running 3x per week

- Currently detecting ~0.7 NEO/day out of ~35 minor planets/day in single-frame images (no stacking)
Preliminary Thermal Fits:
Cryo vs. Restart

Reactivation Diameter (km)

\[ \sigma_D = 21\% \]

Reactivation Albedo

\[ \sigma_{p_V} = 35\% \]
First Sky Coverage
Complete: June 16, 2014
Preliminary Results

- Two new comets
- NEO discoveries are large, dark; 25% potentially hazardous asteroids
Discovery of Large NEOs

Near-Earth Asteroid Discoveries
Large Asteroids (kilometer sized and larger)

Half Year Intervals

Number Discovered

15 July 2014
Alan B. Chamberlin (JPL)
• Discovered at -72° declination on April 23, 2014
• ~3 lunar distance flyby on June 8, 2014
2014 HQ124

- Thermal fit: 330±120 m effective spherical diameter
- Radar: 370 m along long axis
C/2013 A1 Siding Spring:
Jul 28, 2014
Image: Gerbs Bauer
Data Access & Use

• All NEOWISE data from Prime Mission have been publicly released & are available through NASA’s Infrared Science Archive (IRSA):
  – Diameters & albedos in team papers (heading to PDS)
  – irsa.ipac.caltech.edu

• First NEOWISE Restart data release March 2015; annually thereafter
  – neowise.ipac.caltech.edu

• >100 peer-reviewed papers spanning wide range of topics
Conclusions

• Survey operations begun Dec. 23, 2013; science data processing begun

• Follow-up observations needed, particularly in southern hemisphere
  – Thanks to LCOGT, Bob Holmes, Alan Gilmore, & amateur observers

• First data release March 2015; annually thereafter
  – neowise.ipac.caltech.edu

• Will return ~double the number of NEO physical properties known, + tens of thousands of Main Belt asteroids