NEOZTF: USING THE ZWICKY TRANSIENT FACILITY TO FIND NEW NEAR-EARTH OBJECTS

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HTTPS://WWW.ZTF.CALTECH.EDU/

THE ZTF SURVEY

- A multi-purpose time-domain astrophysics survey with a number of experiments, each of which defines its own cadence
- Uses the 48” Oschin Schmidt telescope at Palomar Observatory
- Median R-band limiting magnitude of 20.4
- 30-s exposures
- 47.7 deg^2 field of view
- g, r, and i filters
- Data taken every night with good weather
- First light November 1, 2017
- Science survey began March 17, 2018

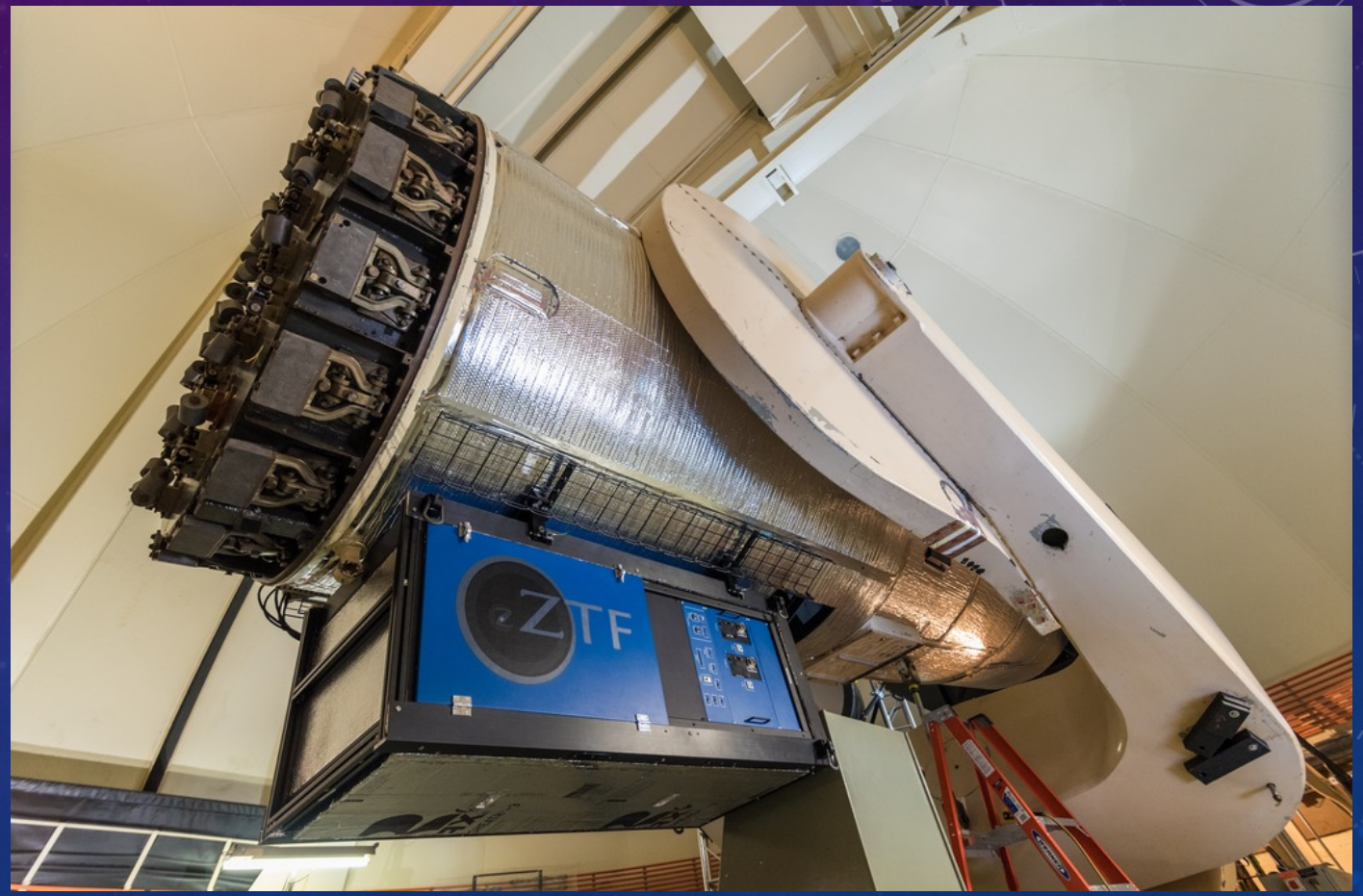
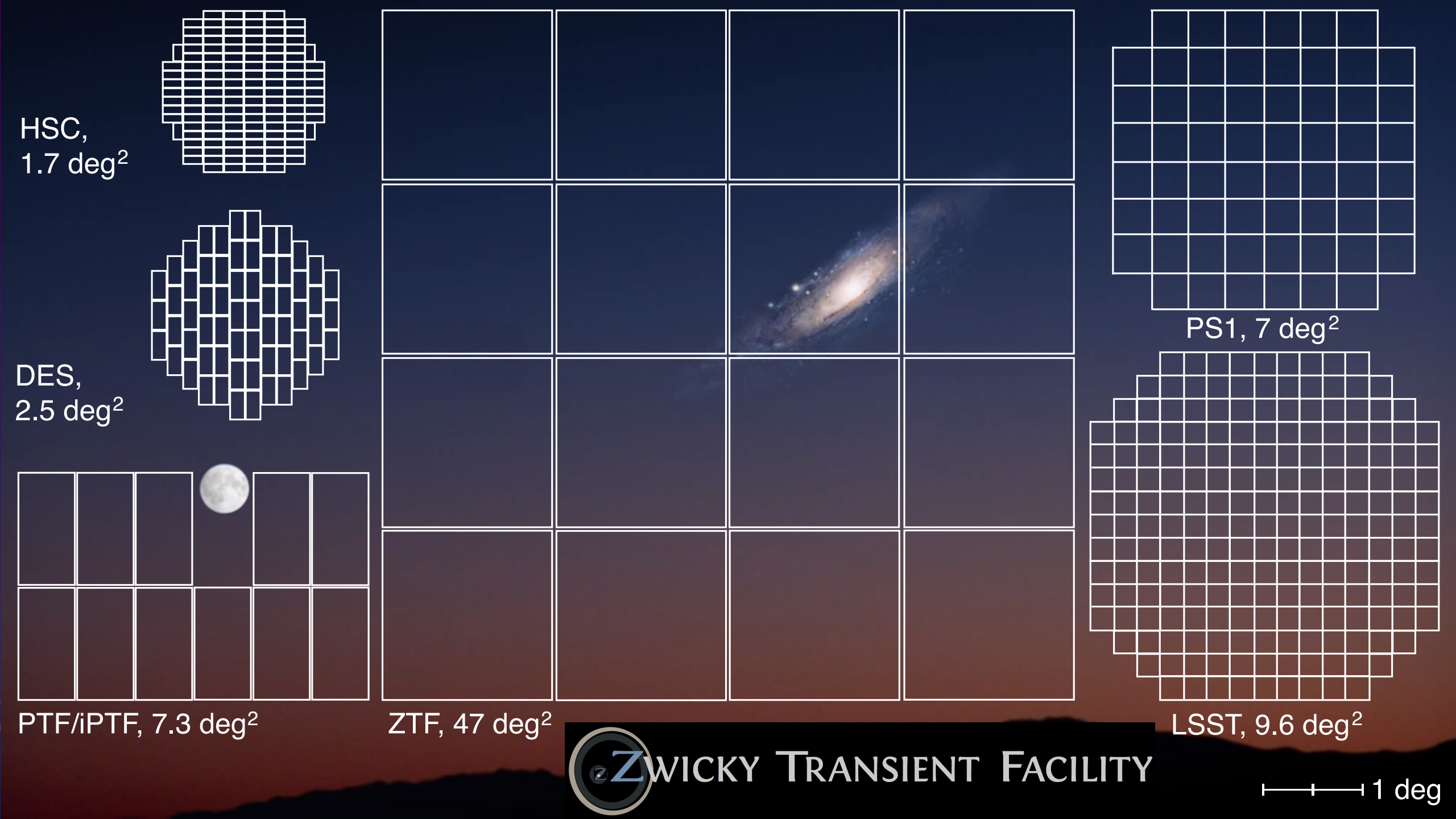
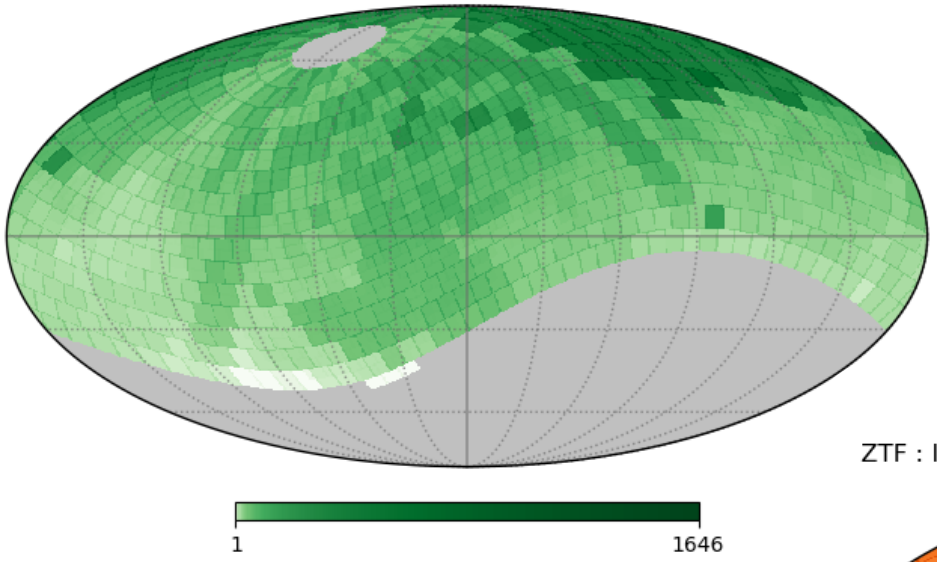


Photo credit: Caltech Optical Observatories, https://www.ztf.caltech.edu/image/ztf-installed

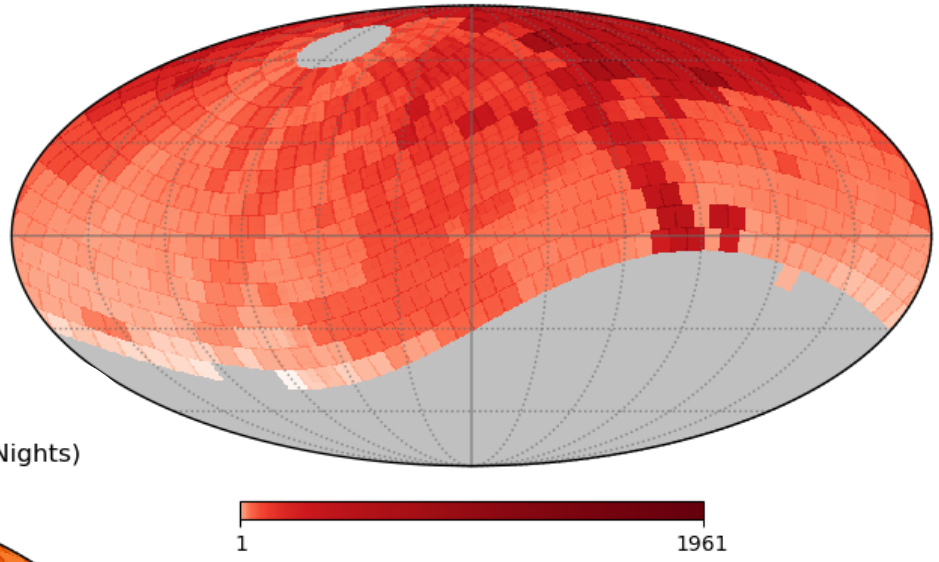

HSC,
1.7 deg²
DES,
2.5 deg²
PS1, 7 deg²
PTF/iPTF, 7.3 deg²
ZTF, 47 deg²
LSST, 9.6 deg²
Zwicky Transient Facility
1 deg

SKY COVERAGE

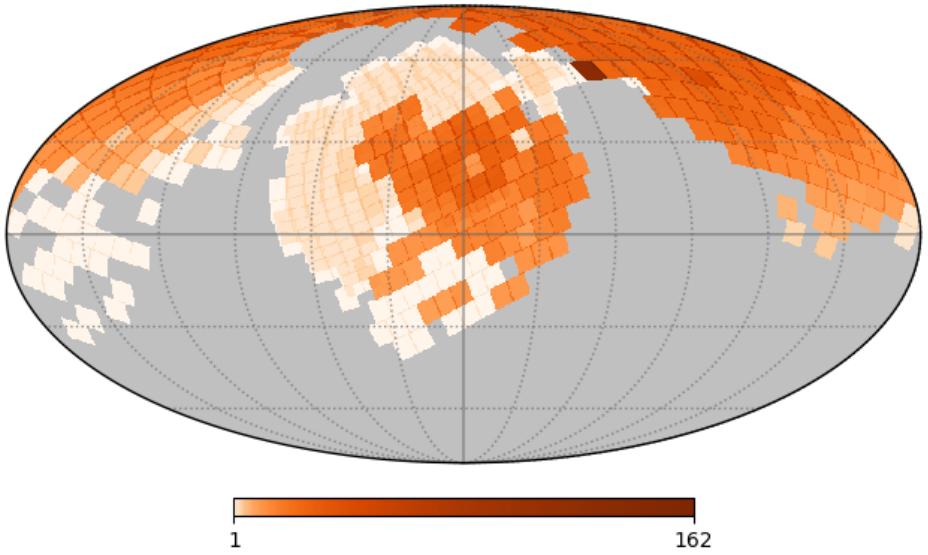
ZTF : G : Ecliptic : All Programs : Thru 2018-10-05 (162/197 Nights)



ZTF : R : Ecliptic : All Programs : Thru 2018-10-05 (166/197 Nights)



ZTF : I : Ecliptic : All Programs : Thru 2018-10-05 (85/197 Nights)



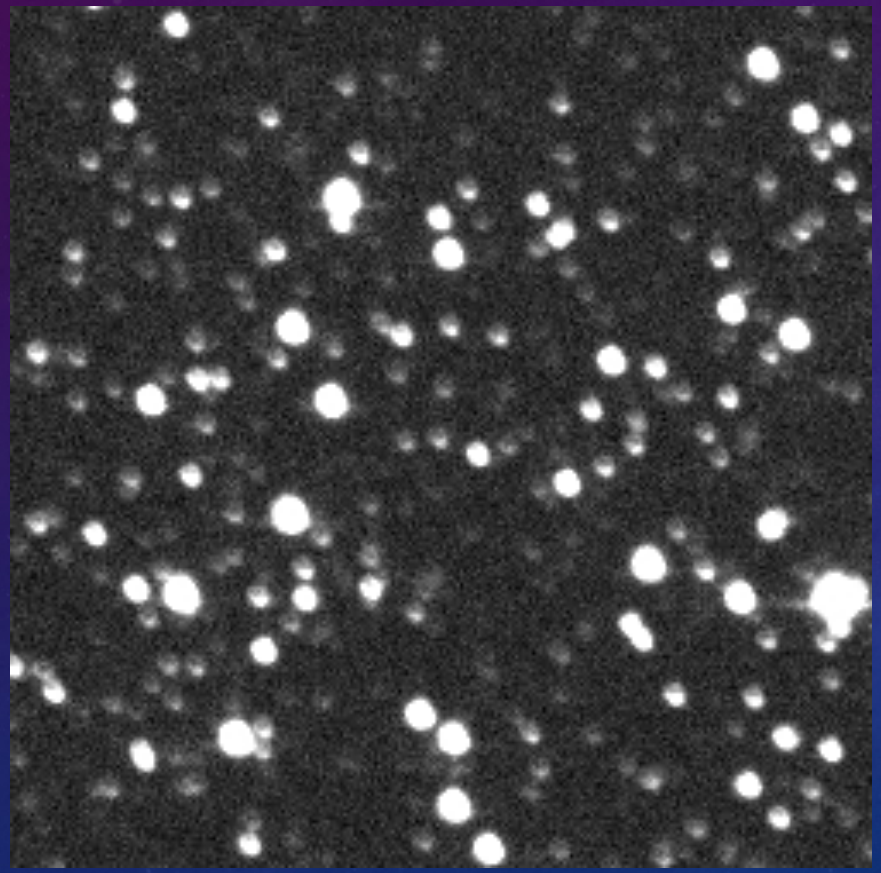
NEOZTF: USING ZTF TO FIND NEAR EARTH OBJECTS

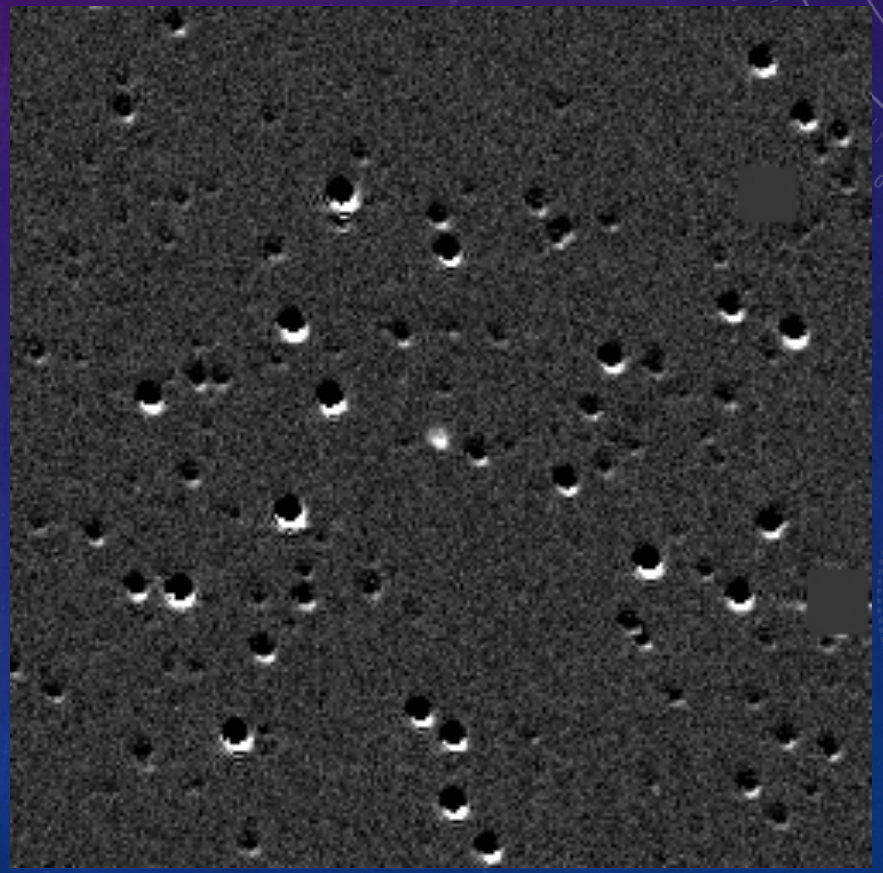
- Asteroid and NEO searches are conducted on the data stream in serendipity mode

- ZMODE = ZTF Moving Object Discovery Engine
  - A pipeline for linking multiple point-like transients into a tracklet

- ZSTREAK: a pipeline for identifying trailed objects in difference images

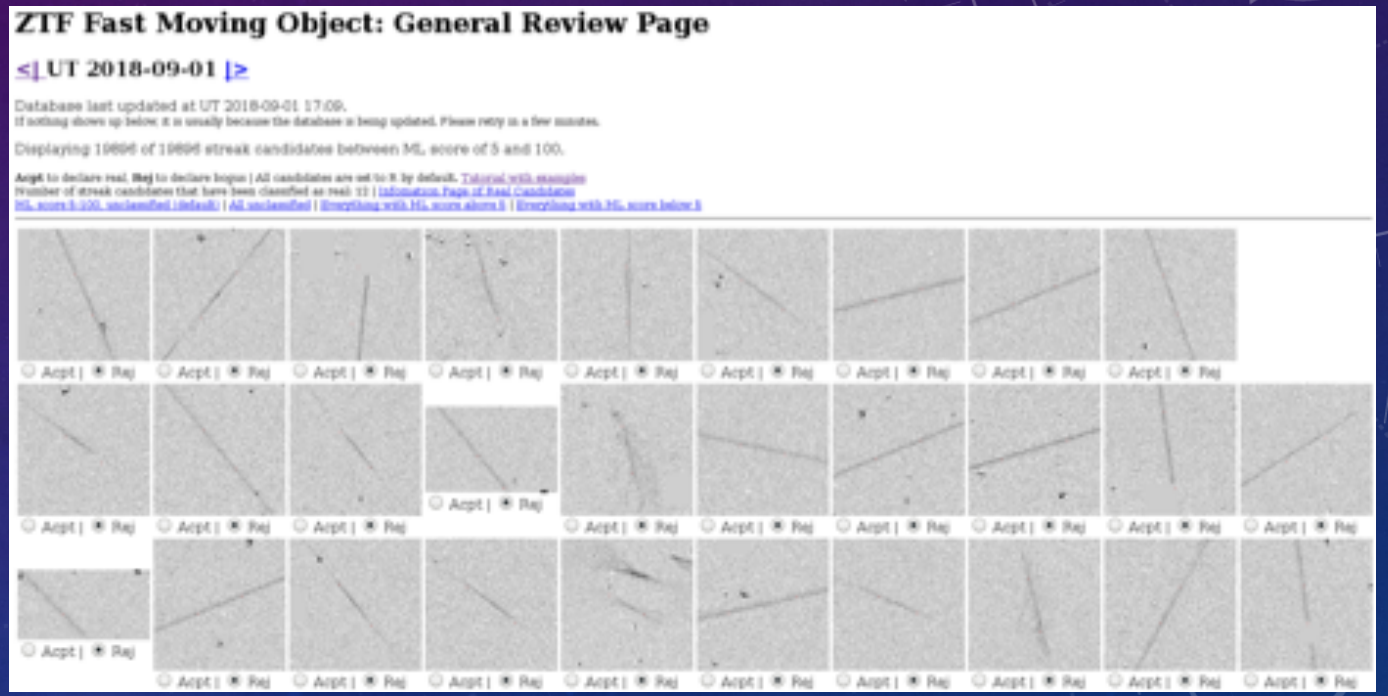
ZMODE = ZTF MOVING OBJECT DISCOVERY ENGINE

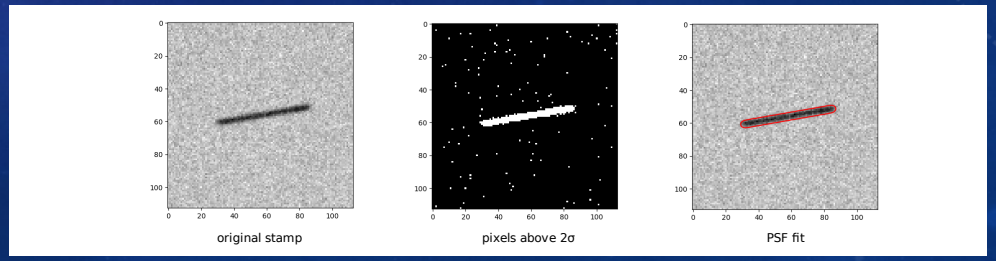




ZSTREAK: FAST MOVING NEO DISCOVERY

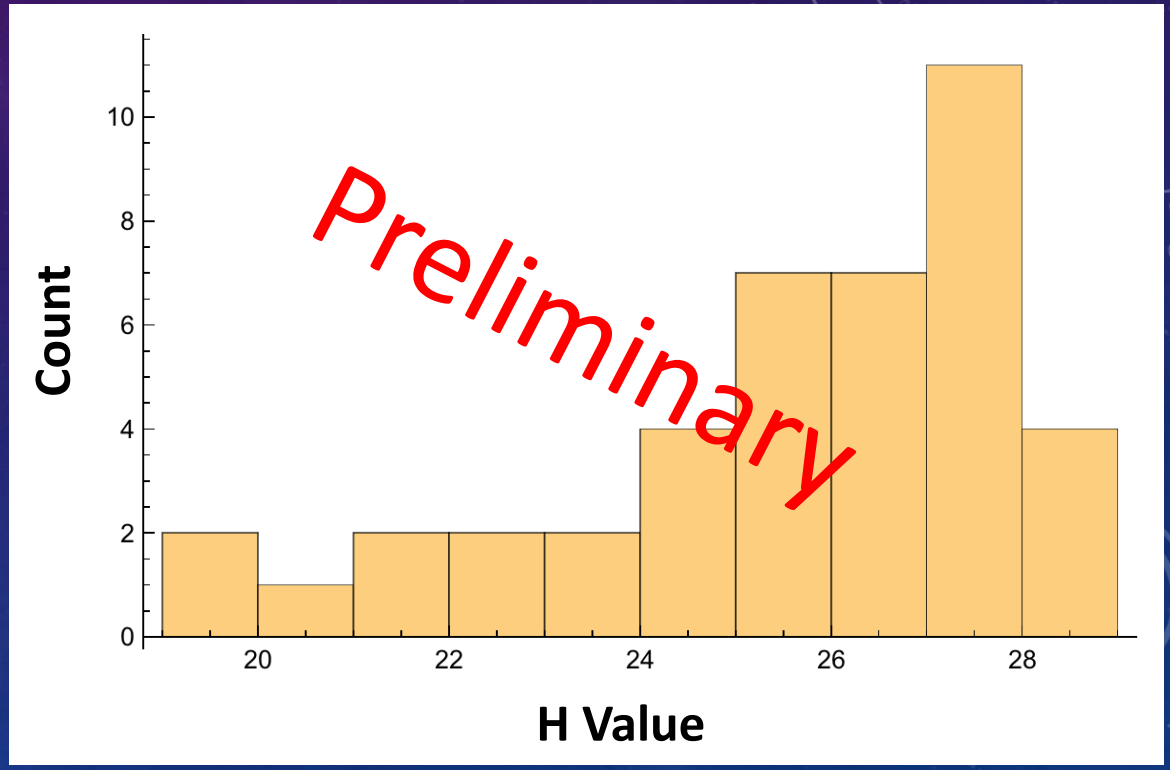
- Each night, the code finds ~60,000 to 80,000 candidate streaks
  - Machine learning winnows that down to ~10,000 – 30,000 that are scanned for real detections
- Roughly 1 – 2 dozen streak candidates are moved forward in the pipeline each night, and after final vetting are submitted to the MPC
  - Each streak gives two astrometry points, since you can use both ends of the streak
- Number of NEO candidates per night varies depending on cadence and where in the sky the images were taken





NEOZTF STATISTICS THUS FAR

- As of 20 Oct 2018, we have submitted 180 NEO candidates to the Minor Planet Center
- Of those, 91 were from ZMODE and 89 were from ZSTREAK
- 154 were real small bodies
- 43 MPECs for NEO discoveries
  - 12 from ZMODE
  - 31 from ZSTREAK



NEOZTF GOING FORWARD

- Most of the NEO-ZTF work is currently carried out by one postdoc (Quan-Zhi Ye) funded by an NSF grant
- Continuing to process ZTF data and submit NEO candidates to the MPC on a “best effort” basis
- First ZTF data release (direct and difference images and extractions) anticipated for Spring 2019

https://www.ztf.caltech.edu/