

PTF/ZTF

Palomar Transient Factory/Zwicky Transient Facility

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2018.04.27

Palomar Transient Factory
Zwicky Transient Facility

PTF

succeeded by iPTF

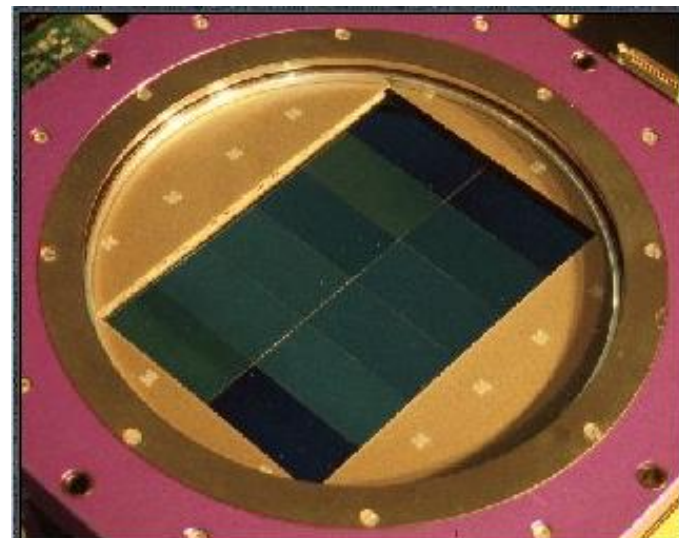
PTF/ZTF



- PTF: An astronomical survey using a **wide-field survey camera** designed to search for **optical transient and variable sources** such as variable stars, supernovae, asteroids and comets
- Running time: Mar 2009 ~ Dec 2012
- Successor: iPTF(Intermediate Palomar Transient Factory) 2013~2017
- ZTF: PTF transitioned to ZTF in 2017
- Telescope: 1.2-meter **Samuel Oschin Telescope**
- Location: Palomar Observatory(San Diego county, Canifornia)

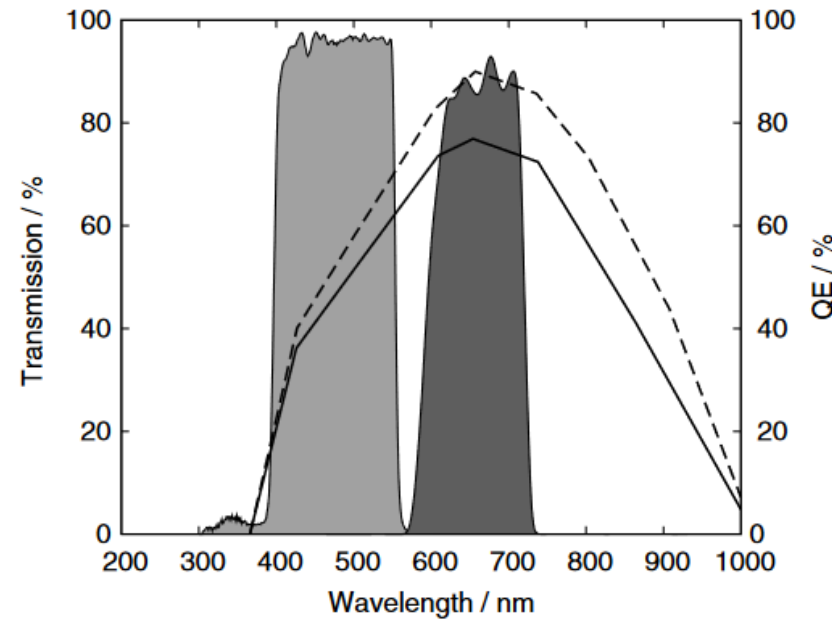
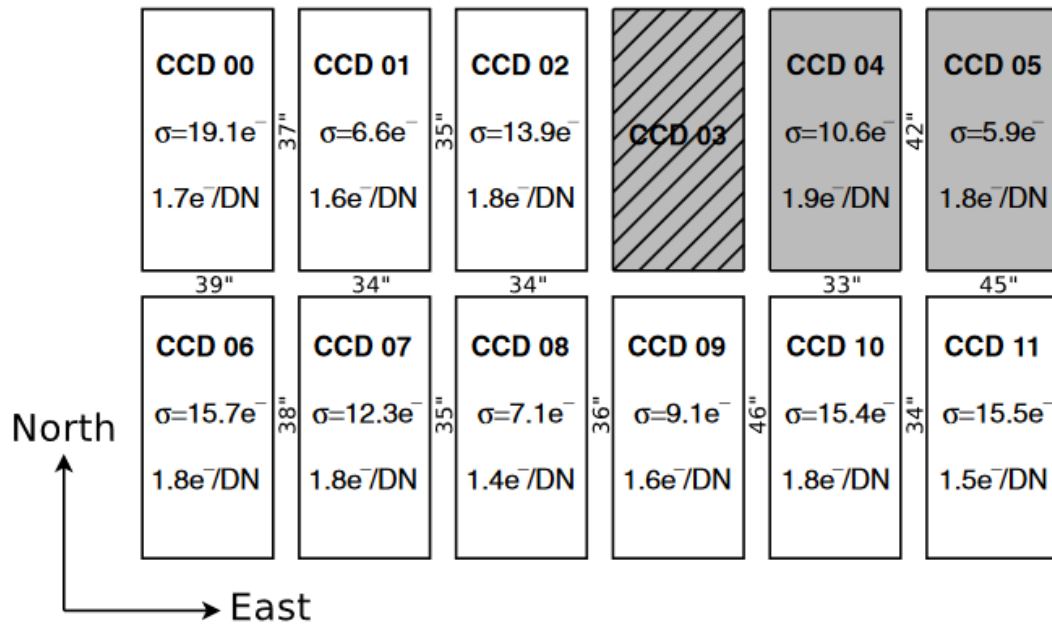
(i)PTF facilities

- CFHT12k mosaic camera
- View of field: 7.8 square degrees (more than 1.5 times the size of the full moon)
- Each exposure: 42x28 arcmin
- Pixels: 12,288 x 8,192 (15 micron/pixel)
- Prime focus: f/4
- Scale: 1 arcsec/pixel
- CCD: twelve 2048x4096 pixel
- Band: R(<20.5mag) g(<21mag) + H α + other filters



◀ CCD06 EXT07 g=1.8	◀ CCD07 EXT08 g=1.7	◀ CCD08 EXT09 g=1.4	◀ CCD09 EXT10 g=1.5	◀ CCD10 EXT11 g=1.8	◀ CCD11 EXT12 g=1.5
◀ CCD00 EXT01 g=1.5	◀ CCD01 EXT02 g=1.5	▶ CCD02 EXT03 g=1.6	▶ CCD03 EXT04 g=1.5	◀ CCD04 EXT05 g=1.3	◀ CCD05 EXT06 g=1.7

E CCDnn = detector name
N EXTnn = MEF extension number
◀ g = gain in e⁻/ADU
▶ = output position
 CCDB8 = binned by 8 mosaic



COMPARISON OF PTF WITH OTHER NEO SURVEYS

Survey	D ^a (m)	Scale (arcsec pixel ⁻¹)	FOV (deg ²)	Exposure (s)	Magnitude Limit (mag)	Coverage (deg ² hr ⁻¹)
PTF	1.2	1.0	7.78	60	21.0	300
LINEAR ^b	1.0	2.3	2.0	5	19.2	1050
Spacewatch ^c	1.8	1.0	0.3	150	22.6	7.2
Spacewatch	0.9	1.0	2.9	120	21.7	70
CSS ^d	1.5	1.0	1.2	60	21.5	600
CSS	0.7	2.5	8.1	30	19.5	420
CSS	0.5	1.8	4.2	60	19.0	92
Pan-STARRS1	1.8	0.3	3.0	30	24.0	360

(i)PTF Observation and data reduction

- Projects
 - supernova search(cadence: 5 day)
 - a rapid transient search(cadence: 90s~1day)
 - a search for eclipsing binaries and transiting planets in Orion
 - a 3π sr deep H-alpha survey
- Data processing
 - Infrared Processing & Analysis Center (**IPAC**; Caltech), Lawrence Livermore Berkeley Laboratory (**LBL**) in real time
 - Transient discovery pipeline & a machine learning algorithm for source/artifact classification
 - subjected to both human and machine vetting
- Data Products
 - Light curves
 - Follow-up spectroscopy
 - Forced photometry service
 - Images, source photometry

(i)PTF Scientific legacy

- Discovery of the youngest type Ia supernova SN 2011fe
- the identification of new classes of super-luminous supernovae and Calcium-rich transients
- discovery of a pre-explosion outburst from a Type IIIn supernova
- discovery of many novae, asteroids, and variable stars

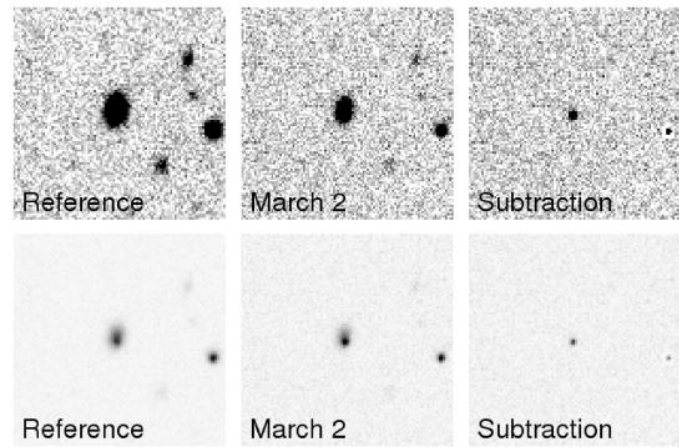
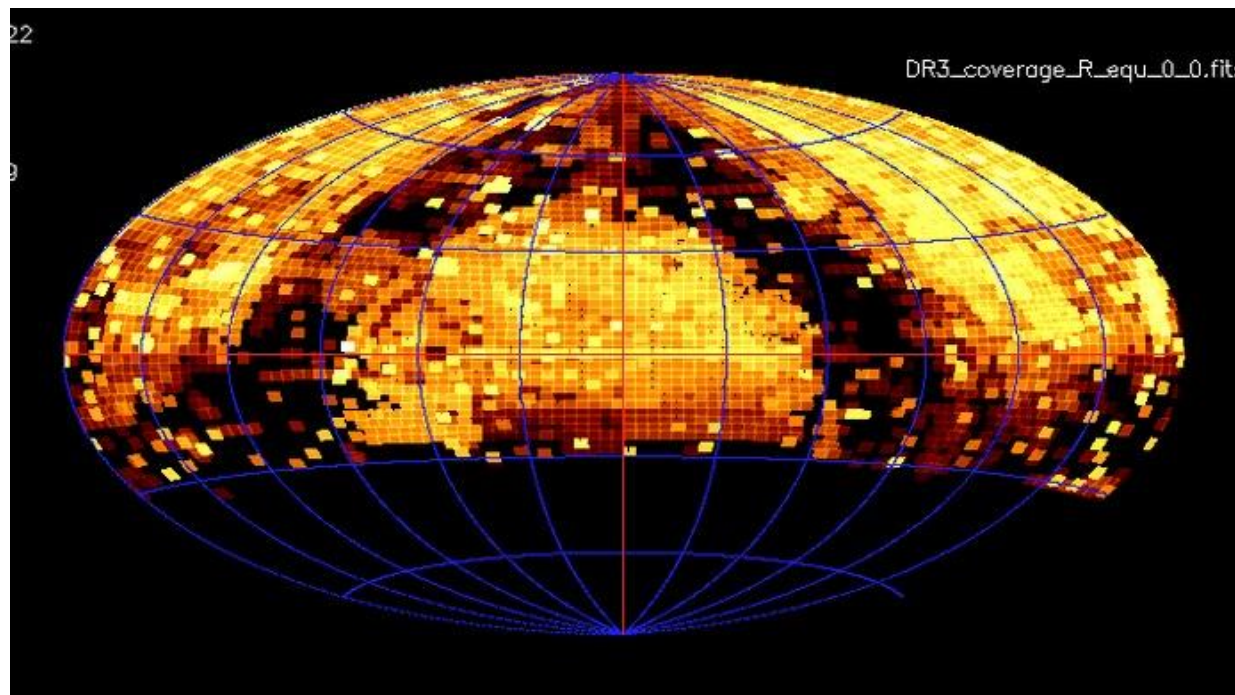
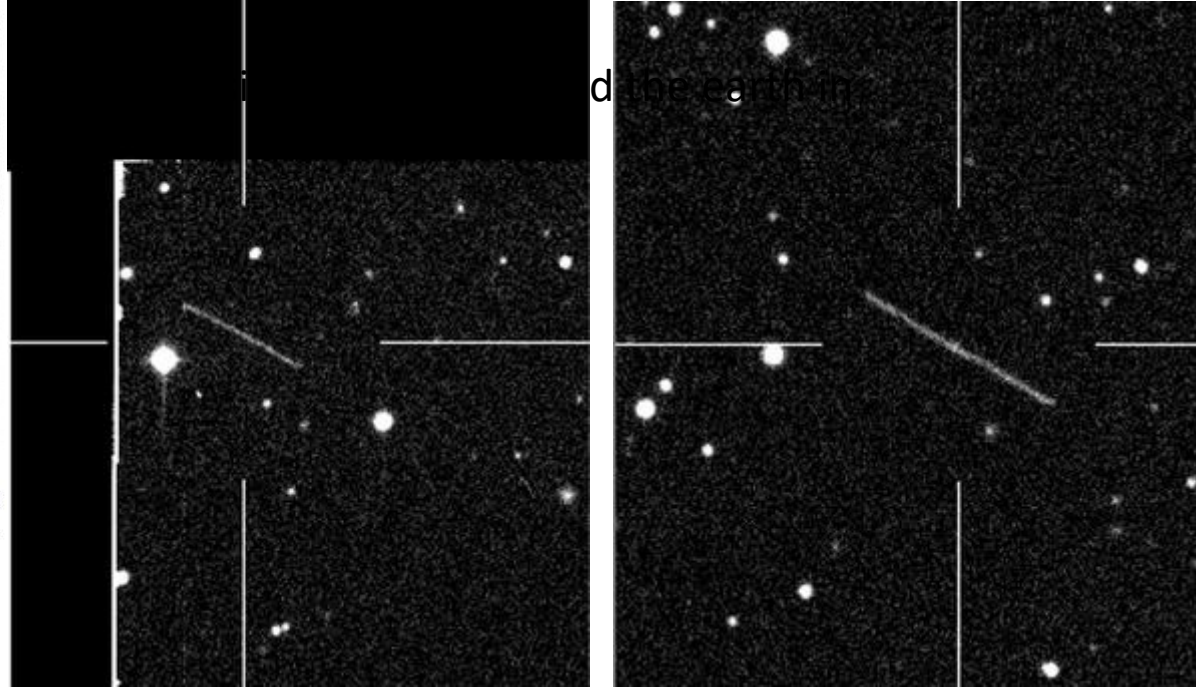


FIG. 10.—The detection images of SN 2009av, I¹T¹'s first confirmed transient detection. The top and bottom row show the same images at different stretches.



3rd data release: January 1,
2013 ~ January 28, 2015

ZTF

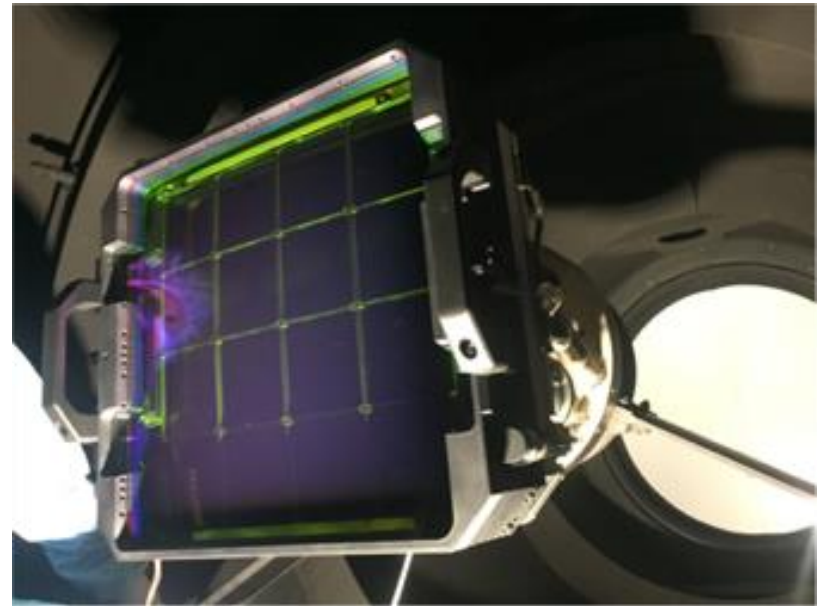
2017~

ZTF

- An optical survey to search rare and fast evolving optical transients
- Science
 - **Active Galactic Nuclei & Tidal Disruption Events**
 - **Stellar Astrophysics**
 - **Cosmology with type Ia Supernovae**
 - **Electromagnetic, Gravitational Waves & Neutrinos Counterparts**
 - **Solar System Bodies**
 - **Physics of Supernovae & Relativistic Explosions**
 - **Andromeda Galaxy**

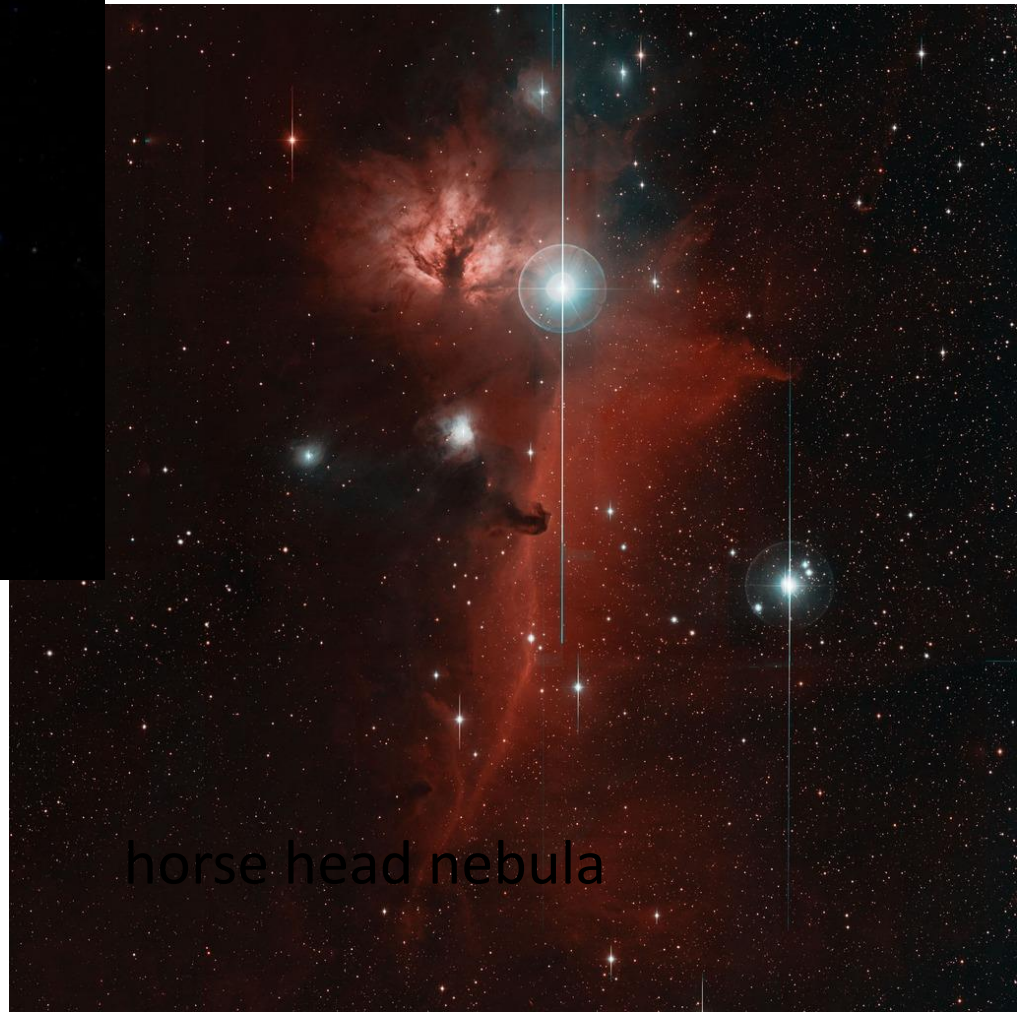
ZTF technical

- Camera of FOV of 47 square degree(each image will cover 235 times the area of the full moon)
- Image quality: 2.0" FWHM
- Bands: ZTF g, ZTF r, ZTF I (limit 20.5mag)



	PTF	ZTF
Telescope	Samuel Oschin 48-inch Schmidt	
Field of View	7.8 square degrees	47 square degrees
Detectors	11 2k x 4k CCDs	16 6k x 6k CCDs
Pixel size	15 micron	15 micron
Pixel scale	1.0"/pixel	1.0"/pixel
Median Delivered Image Quality	2.0" FWHM	2.0" FWHM
Exposure Time	60 sec	30 sec
Readout Time	30 sec	10 sec
Median Single Visit Depth	20.5 mag	20.4 mag
(5 sigma, R band)		
Filters	Mould-R, g	ZTF g, ZTF r, ZTF i

ZTF First light



horse head nebula

The Zwicky Transient Facility (ZTF) begins

ATel #11266; *S. R. Kulkarni (Caltech) on behalf of the Zwicky Transient Facility team*
on 7 Feb 2018; 01:43 UT

Credential Certification: Matthew Graham (mjpg@caltech.edu)

Subjects: Optical, Asteroid, Cataclysmic Variable, Comet, Star, Supernovae, Variables

Referred to by ATel #: 11274, 11567

Tweet

S. R. Kulkarni on behalf of the Zwicky Transient Facility (ZTF) announces the first confirmed results from the project. ZTF is led by the California Institute of Technology, US and includes IPAC, US; Los Alamos National Laboratory, US; University of Maryland, US; University of Wisconsin at Milwaukee, US; University of Washington, US; Oskar-Klein Center of the University of Stockholm, Sweden; DESY and Humboldt University of Berlin, Germany; Weizmann Institute of Science, Israel; and the University System of Taiwan,

Survey Name	IAU Name	RA (J2000)	Dec (J2000)	Disc. Date	Disc Mag
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18.2 0.07	Ia -4d a				
ZTF18aaaaoaeq	SN2018mf	10:22:09.78	+10:26:23.9	2458132.93684	
19.6 0.107	Ia -7d b				
ZTF18aaaajrso	SN2018kv	13:43:59.86	+30:56:00.9	2458131.96891	
18.8 0.08	Ia +0d c				
ZTF18aaaoktp	SN2018mg	10:56:53.58	+79:16:42.5	2458131.96044	
20.1 0.11	Ia +5d d				
ZTF18aaanzph	SN2018kc	10:30:58.44	+23:47:18.2	2458131.96044	
19.9 0.06	Ia +0d e				
ZTF18aaarlyh	-	02:10:39.05	+53:37:51.2	2458092.60025	17.7 -
CV - f					
ZTF18aaaeeatk	-	05:53:36.12	+12:32:49.9	2458129.75191	17.6 -
CV - g					
ZTF18aaaaaorq	-	06:35:41.57	+27:44:47.8	2458129.75723	18.0 -
CV - h					
ZTF18aaaedoi	-	05:38:02.93	+42:06:58.7	2458129.74659	19.2 -
- Pulsator?	i				

references

- N. Law et al. "The Palomar Transient Factory: System Overview, Performance, and First Results. PASP, 121, 1395(2009)(<http://adsabs.harvard.edu/abs/2009PASP..121.1395L>)
- ZTF home: <http://www.ztf.caltech.edu/>
- PTF home: <https://www.ptf.caltech.edu/>

Thanks