PTF PROJECT OVERVIEW

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PTF SCIENCE WORKSHOP

AUGUST 2008
The Palomar Transient Factory

- Wide-angle, variable cadence sky survey
- Realtime transient detection
- Realtime, automated transient classification
- Automated followup using multiple facilities
- Searchable archive of every detected source in every frame
<table>
<thead>
<tr>
<th>EXPERIMENT</th>
<th>SCIENCE GOAL</th>
<th>EXPERIMENT SETUP</th>
<th>P48 TIME USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dynamic cadence</td>
<td>Explore unknown territories in transient phase space</td>
<td>R and g’ bands</td>
<td>41%</td>
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<td></td>
<td>fast transients on timescales &lt; 1 day.</td>
<td>60 second exposures</td>
<td></td>
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<td></td>
<td>Also: SNe, RR Lyr, CVs, AM CVn, flare stars, ...</td>
<td>cadence from one minute to one day</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Gets to roughly m=21 in R and g’</td>
<td></td>
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<tr>
<td>2. 5-day cadence survey</td>
<td>SNe 1a; core-collapse SNe; AGN; quasars; extragalactic novae; luminous red novae; ...</td>
<td>~8000 deg^2 / year</td>
<td>40%</td>
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<td>3 - 8 day cadence after weather. 60 second exposures.</td>
<td></td>
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<tr>
<td>3. Single-field</td>
<td>Transiting planets; stellar eclipses &amp; variability</td>
<td>R-band continuous observations of a single field.</td>
<td>11%</td>
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<tr>
<td>4. H-alpha</td>
<td>1/2 sky deep H-alpha survey</td>
<td>during bright time; H-alpha on and off imaging.</td>
<td>8%</td>
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</tbody>
</table>
The Palomar Transient Factory

People (some)

Nicholas Law
Project Scientist

Robert Quimby
Software Lead

Rich Dekany
Camera lead

Carl Grillmair
Archive Lead

Peter Nugent
RT Detection

Joshua Bloom
Classification

PTF Science Workshop
August 26-28 2008
Scheduler

- Automated observation control system
- Commands telescope – all observations executed automatically
- Attempts to guarantee cadences (within weather constraints)
Wide-angle Survey Camera

- Caltech & Palomar
- P48 – robotic 48 inch Schmidt telescope @ Palomar
- 100 MPixel CCD array
- 1” sampling, 2.3 X 3.4 degree field of view
- Two filters
- 2 arcsec FWHM image quality specified
- Reaches approx \( m=21 \) in 60 secs (30 sec readout)
Realtime transient detection

- LBL
- Automated, rapid astrometric & photometric reduction
- Image differencing fast enough to see rapid transients as data is taken
Realtime transient classification

- Berkeley
- Realtime classification of transients detected by LBL
- Probabilistic classification on basis of all available information
- Takes followup data into account
Followup

- Led by automated “Followup Marshal” at Caltech
- Using probabilistic classifications and knowledge of the telescope resources available to automatically choose “optimal” followup program
PTF Archive

- IPAC
- Full archive of all PTF data
- Searchable database of all sources detected in every image taken (variable or not)
- Retrieve photometric, astrometric, source upper limit, etc. information
Data quality verification

• Multi-layered
• On mountain
  – automated twice-daily checkout of P48 camera optics + CCDs
  – Focus monitor also checks for obvious problems during the night
• Off-mountain
  – IPAC archive provides more detailed image quality statistics to be monitored by PTF team