

Small Telescopes

C. Bailyn, Yale University

Systems Workshop II

May 13-14, 2004



“Small” Telescopes in the 21st Century

- Science with small telescopes
- SMARTS – the Small and Moderate Research Telescope System – lessons learned
- A strawman proposal for 2-5m telescopes for the next decade

RESEARCH USES ONLY

Types of “Small” Telescopes

Modern alt-az 3-5m (ARC, WIYN, SOAR)

Old equatorial 3-5m (Palomar, NOAO 4m's)
multi-purpose user runs

Old 1-2m telescopes

formerly multi-purpose user runs –
now somewhat reduced usage

New < 3m special purpose telescopes
(Sloan, 2MASS, GRBs)

Intermediate aperture, intermediate use

Science with Small Telescopes

of nights *more important* than # of photons

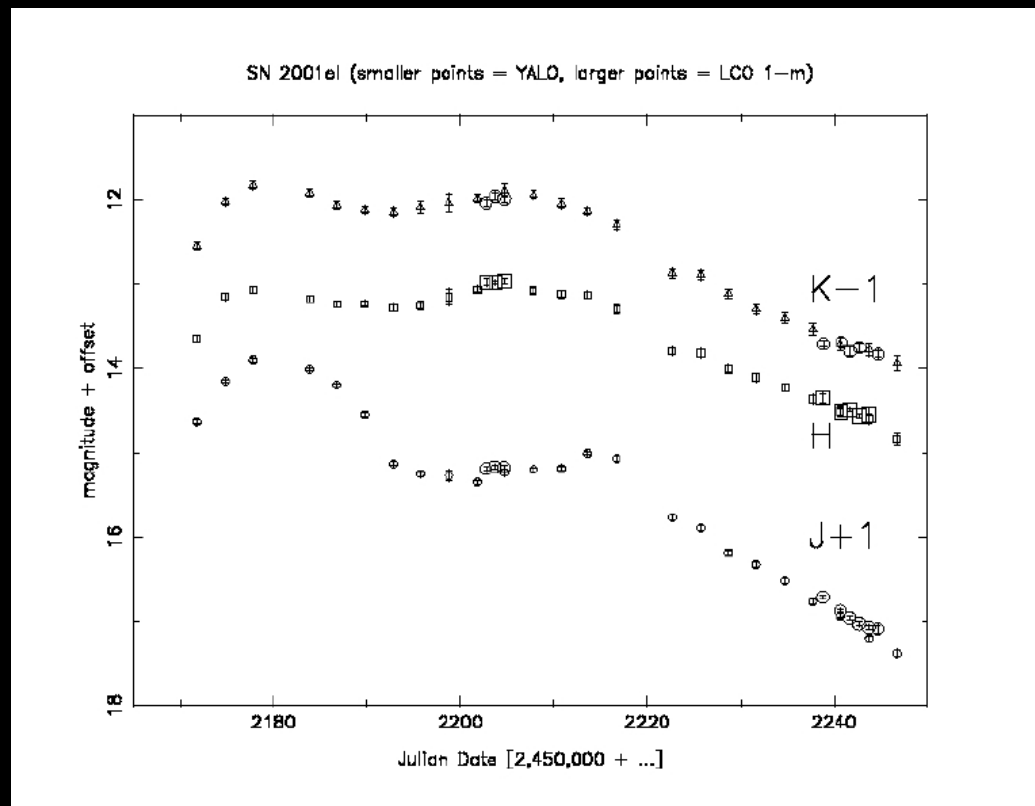
time critical observations

high overhead observations

Science with Small Telescopes

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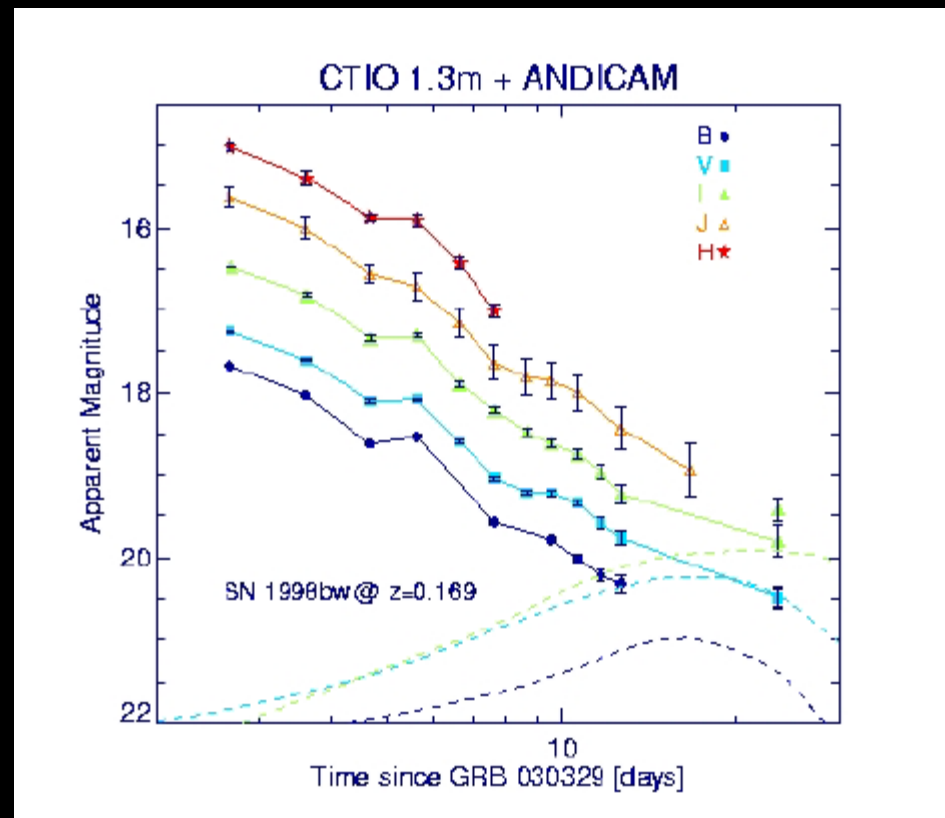
Time Critical Projects I: Monitoring



Science with Small Telescopes

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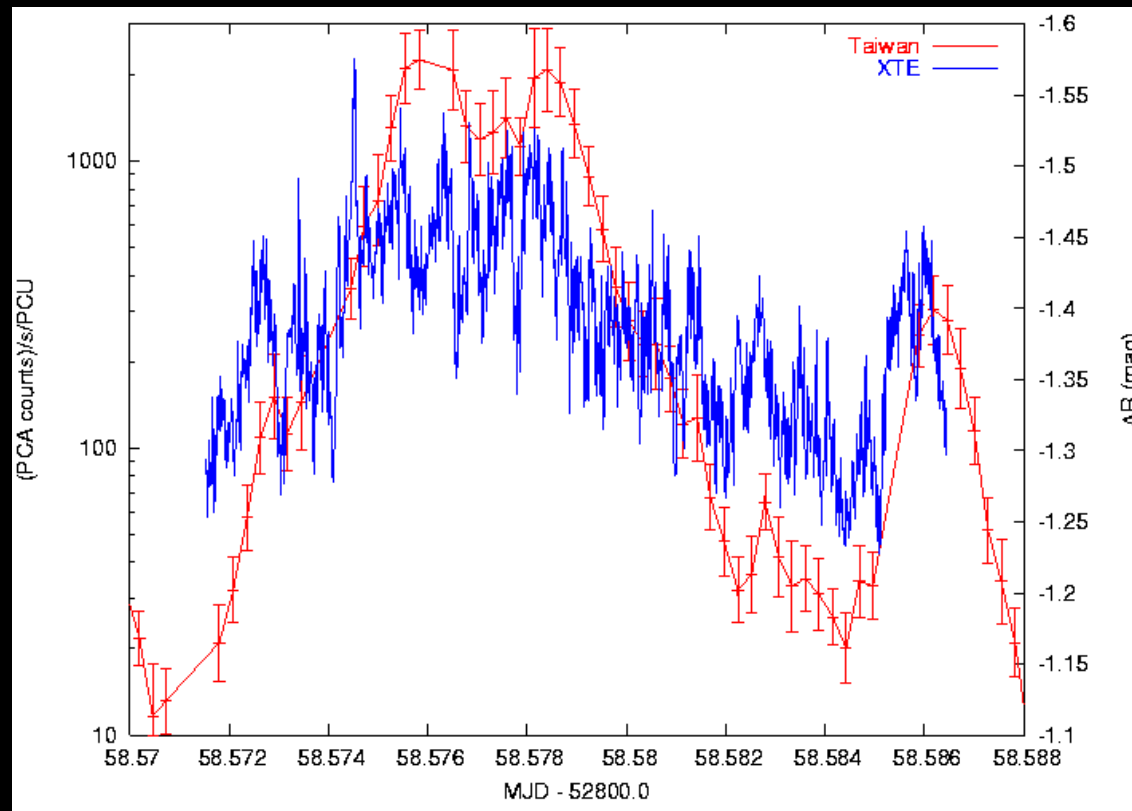
Time Critical Projects II: ToO



Science with Small Telescopes

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Time Critical Projects III: Multi- λ



Science with Small Telescopes

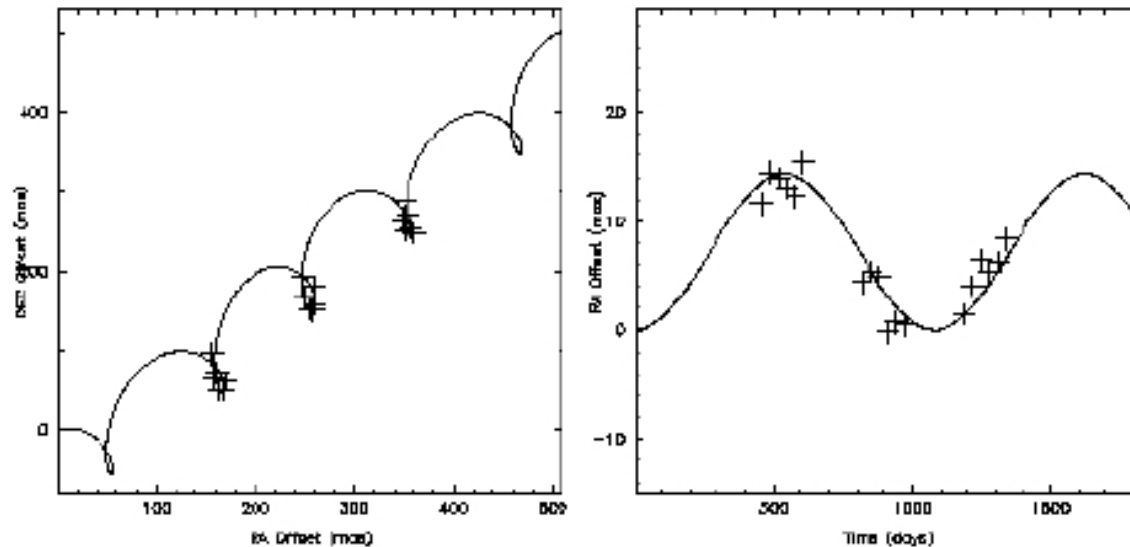
#of nights *more important* than # of photons

High Overhead Projects I: Calibration

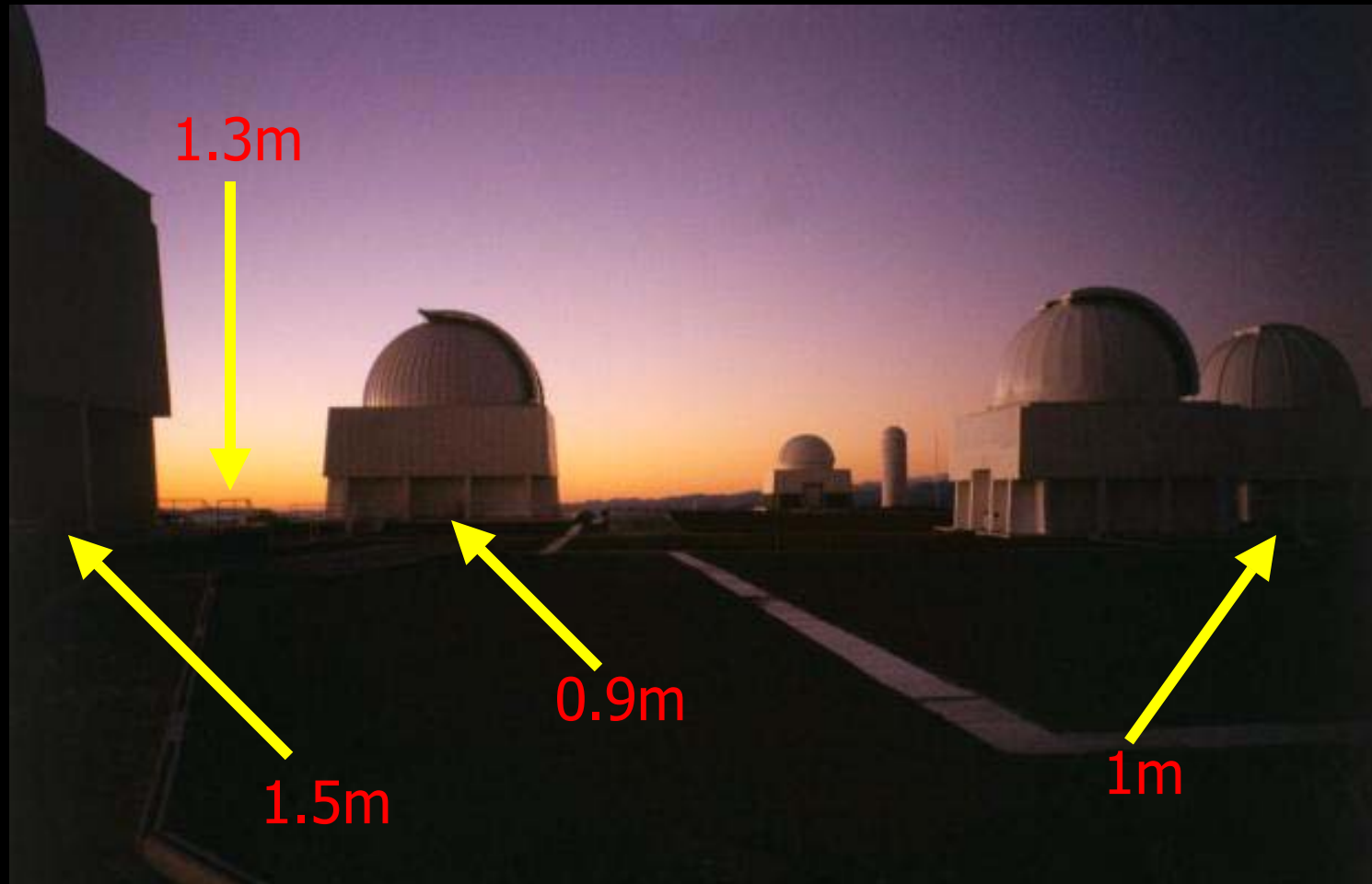
Science with Small Telescopes

#of nights *more important* than # of photons

High Overhead Projects II: Bright Targets



S.M.A.R.T.S. (2003-2005) Cerro Tololo Interamerican Obs.



SMARTS Philosophy

- No instrument changes!
- Instruments/observing modes driven by particular projects, but available to all
- Telescope time *not* split evenly by telescope for each institution
- Institutional priority lists merged to generate consortium priority list for scheduling
- “Secondary” projects fill in the gaps – not counted against primary allocation

SMARTS Telescopes 2004

- 0.9m + 2KCCD alternating service & user
- 1m + 4KCCD alternating service & user
(coming in August/Sept)
- 1.3m + ANDICAM monitoring queue only
- 1.5m + RCSpec monitoring service & user
- 1.5m + 2K IR survey mode service only
(coming later this year)

SMARTS Time Allocation

- 12 current partners (including NOAO)
- 25% to those who provide telescopes
- 25% to those who provide instruments
- 50% to those who provide operating cash
(by rule: 25% to NOAO, 10% to Chile)

NOTE: institutions are *not* required to divide time equally between different telescopes

SMARTS Financing

2003-2005

- 405K\$ Start-up/retention funds
- 360K\$ Departmental funds
- 365K\$ Grants (NASA)
- 680K\$ Discretionary research funds/gifts
- 1810K\$ TOTAL

SMARTS Lessons Learned:

What Worked Well

- Money/effort/instruments more easily found *for specific projects* than for facilities
- Making telescope/instruments available for minor projects enhances science and builds community support
- Scientists from smaller institutions provide an excellent resource for operations
- Operations greatly enhanced by occasional access to larger pool of expertise

SMARTS Lessons Learned: Opportunities for the Future

- Sporadic off-site leadership (scientific and bureaucratic) not ideal
- Financial models developed for medium and large telescope projects (TSIP, AOSS) are inappropriate
- Legal instruments for membership require much greater flexibility

Moderate Aperture Telescopes in 2014

- In the south-west USA: Palomar 5m, Mayall, WIYN, ARC, Lick 3m, MDM 2.4m, Stewart 90", McDonald 84", NOAO 81" (and more?)
- Continued "Large Telescope" operation of all (or any!) of these telescopes is very unlikely
- One possibility: "SMARTSification" of these telescopes – a strawman proposal

Moderate Aperture Telescopes in 2014 – Organization

- Time sharing between observatories!!
- No instrument changes – duplications only if deliberate – instruments/operations determined by major projects, but available to all members
- Membership and telescope shares from contributions of telescopes, instruments, operating cash, *and* scientific/technical leadership – no fixed shares
- National community gets access through NOAO contributions

Moderate Aperture Telescopes in 2014 – Operations

- Each mountain has appropriate low-level engineering support at private observatory level – accept some loss of nights
- Consortium-wide staff of specialized engineering support available to *all* sites
- Small central administration (not NOAO) organizes contributions from scientists at member institutions – such contributions count toward consortium shares

Moderate Aperture Telescopes in 2014 – Instrumentation

- NSF-sponsored instrumentation program *not* like TSIP, in which public telescope time accrues in exchange for dollars
- Instead, private telescope time accrues from institutional contributions (*including* scientist time/effort), regardless of grant dollars provided. NOAO can compete (on behalf of community)
- Major consortium members play explicit role in peer review process
- Fully private instruments possible (zero grant dollars) but must be approved in similar manner

Moderate Aperture Telescopes in 2014 – Potential Positive Outcomes

- A complete suite of appropriate capabilities based on PI-driven large projects
- Private resources injected into the system
- Active involvement from scientists at a wide range of institutions
- Collaborations across institutions

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