Early results from reprocessing of the SuperWASP survey

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SuperWASP Reprocessing

Aims:

- Quantify systematics
- Reduce noise
- Detect shallower transits
- Survey fainter stars - M dwarfs

21.5 millimagnitude depth

www.superwasp.org
Reprocessing: Noise Reduction

How?

- Co-located list-driven photometry
- Soft-edged apertures
- Robust background estimation
- Seasonal flatfields

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Reprocessing: Noise Reduction

Up to a factor of 2 reduction in rms noise for the brightest stars.

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The role of flatfields

A small change

Flatfielding improves rms by 0.5-1 mmag

Unexpectedly small contribution

Twilight flats bluer than (red) stars – added noise?
Flatfields: a small improvement

Binning:

Flatfielding improvement remains

Reduction in correlated red noise

rms ~2 mmag binned

(8 < V < 12)
Don’t ignore fainter stars

Source detection

10σ threshold: limited to <14.8 mag

2σ threshold: deeper, to 16 mag

Crowded fields: Accounting for faint contaminants greatly reduces rms noise

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Aperture optimisation

Binning:

Aperture radius $r_{\text{core}} = 3.5$ pixels

Saturation ($V>7.5$): rms improves with increasing aperture

Information in wings of saturated stars?
Hunting for fainter dwarfs

New parameter space:

Original pipeline:
At V=14: 0.08 mag rms

Reprocessing:
At V=14: 0.05 mag rms
At 0.08 mag rms: V > 14.5
Dwarf Stars in SuperWASP

Late K-M Dwarfs:

Our nearest exoplanets are probably around K and M stars.

Selection:
V>15, V-J > 2

8 fields, 480 sq deg:
9000 K-M dwarf targets
Conclusions

Improving noise in SuperWASP reprocessing:
Factor of 2 rms noise improvement for bright stars

Transit-searches around dwarf stars
SuperWASP can be a potential source of relatively
bright K and M dwarf stars for a transit survey

8 fields, 480 square degrees:
9000 K-M dwarf targets