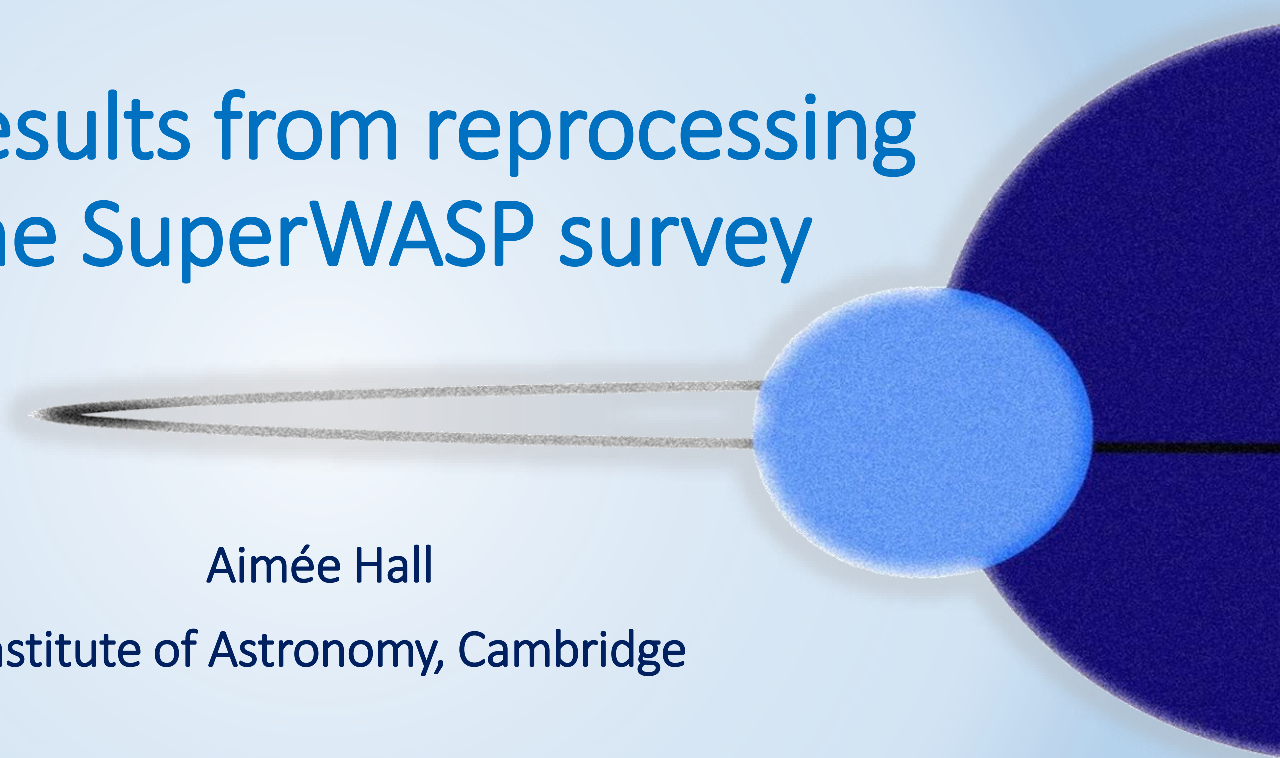
Early results from reprocessing of the SuperWASP survey



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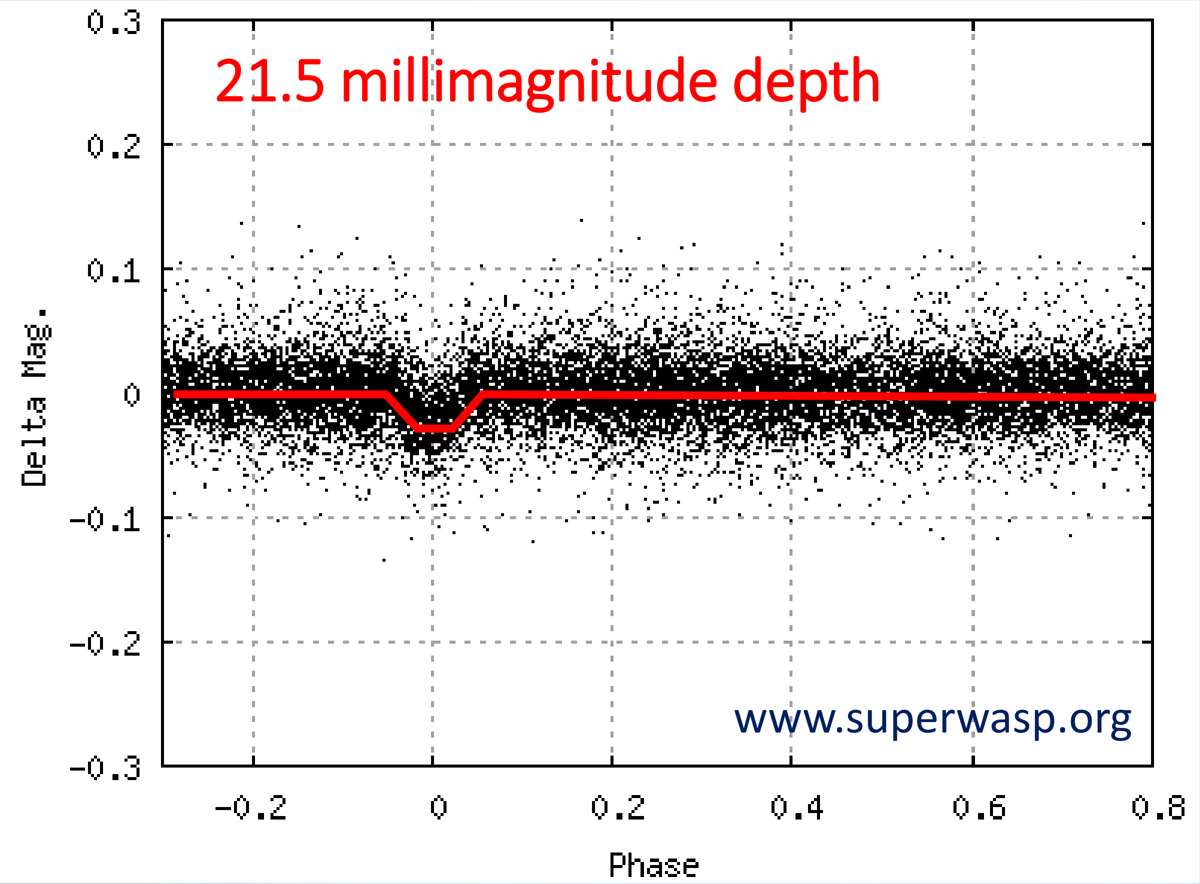
Simon Hodgkin, Gabor Kovacs, Jonathan Irwin

Anderson, D. R.; Armstrong, D.; Barros, S. C. C.; Brown, D.; Collier Cameron, A.; Doyle, A. P.; Faedi, F.; Gómez Maqueo Chew, Y.; Haswell, C. A.; Hébrard, G.; Hellier, C.; Lendl, M.; McCormac, J.; Norton, A. J.; Parley, N.; Pollacco, D.; Queloz, D.; Skillen, I.; Smalley, B.; Triaud, A. H. M. J.; P. J.; Udry, S.; Watson, C.; West, R. G.; Wheatley

SuperWASP Reprocessing



Aims:

Quantify systematics

Reduce noise

Detect shallower transits

Survey fainter stars - M dwarfs

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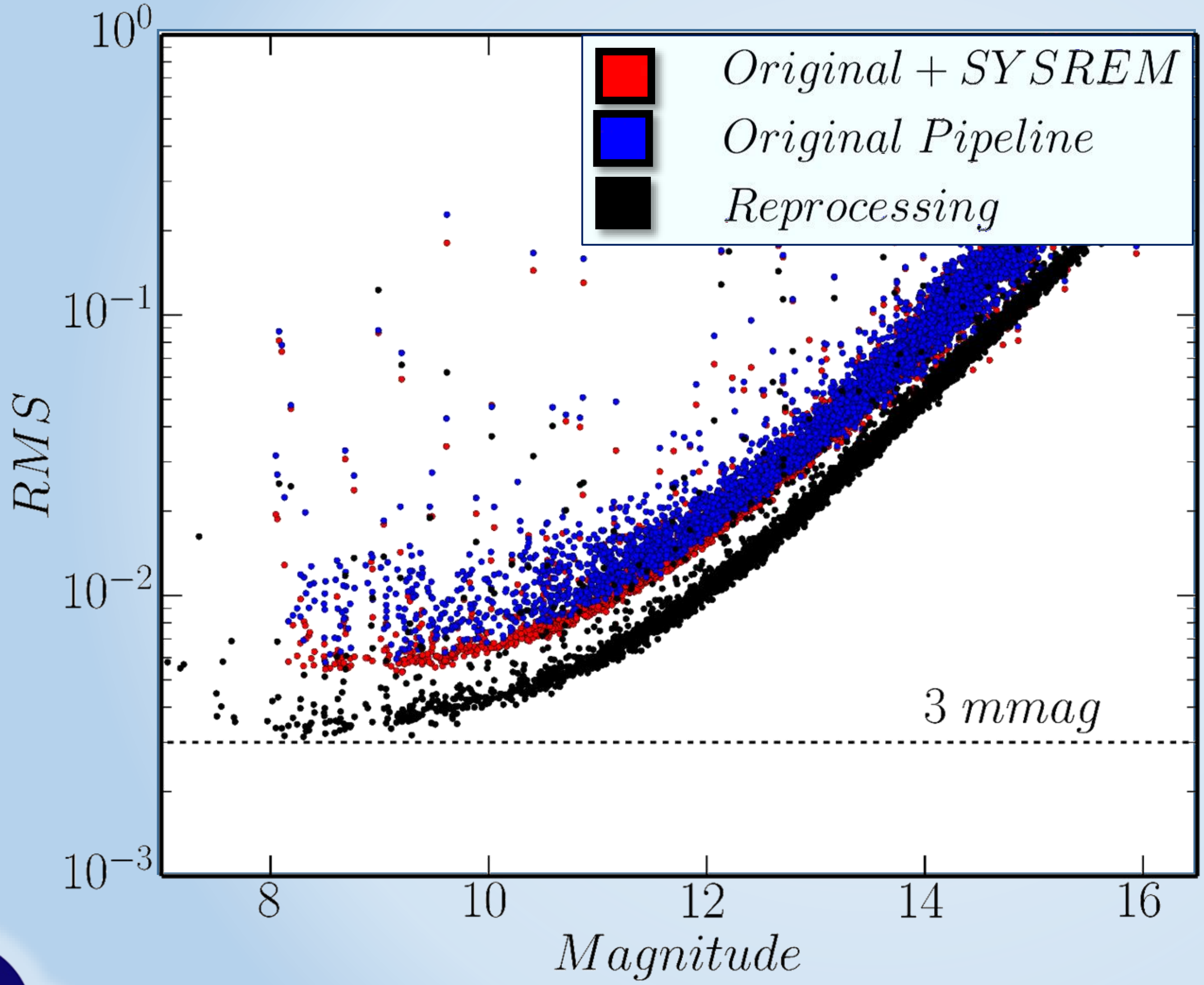
Reprocessing: Noise Reduction



How?

Co-located list-driven photometry

Soft-edged apertures

Robust background estimation

Seasonal flatfields

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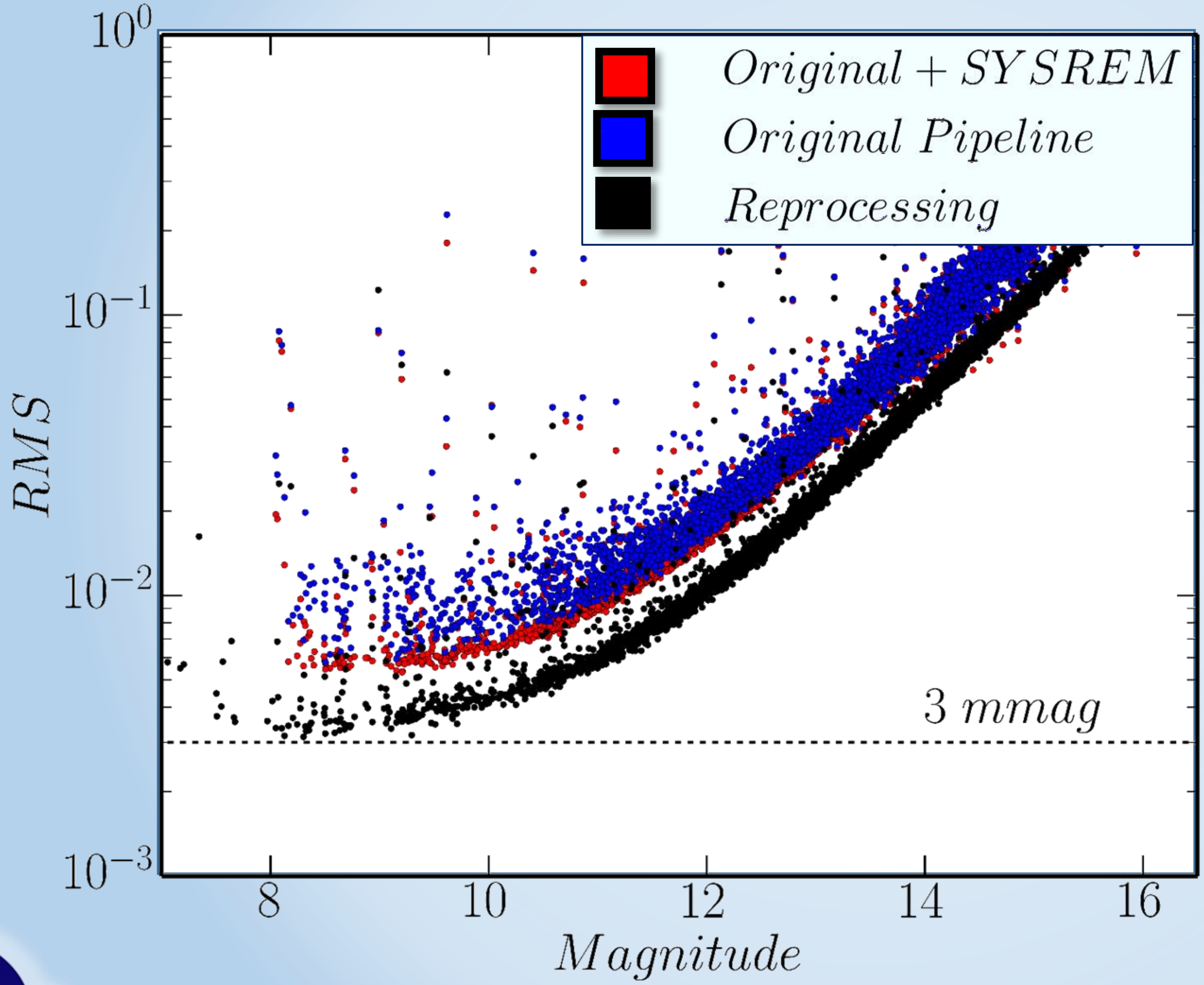
Reprocessing: Noise Reduction



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

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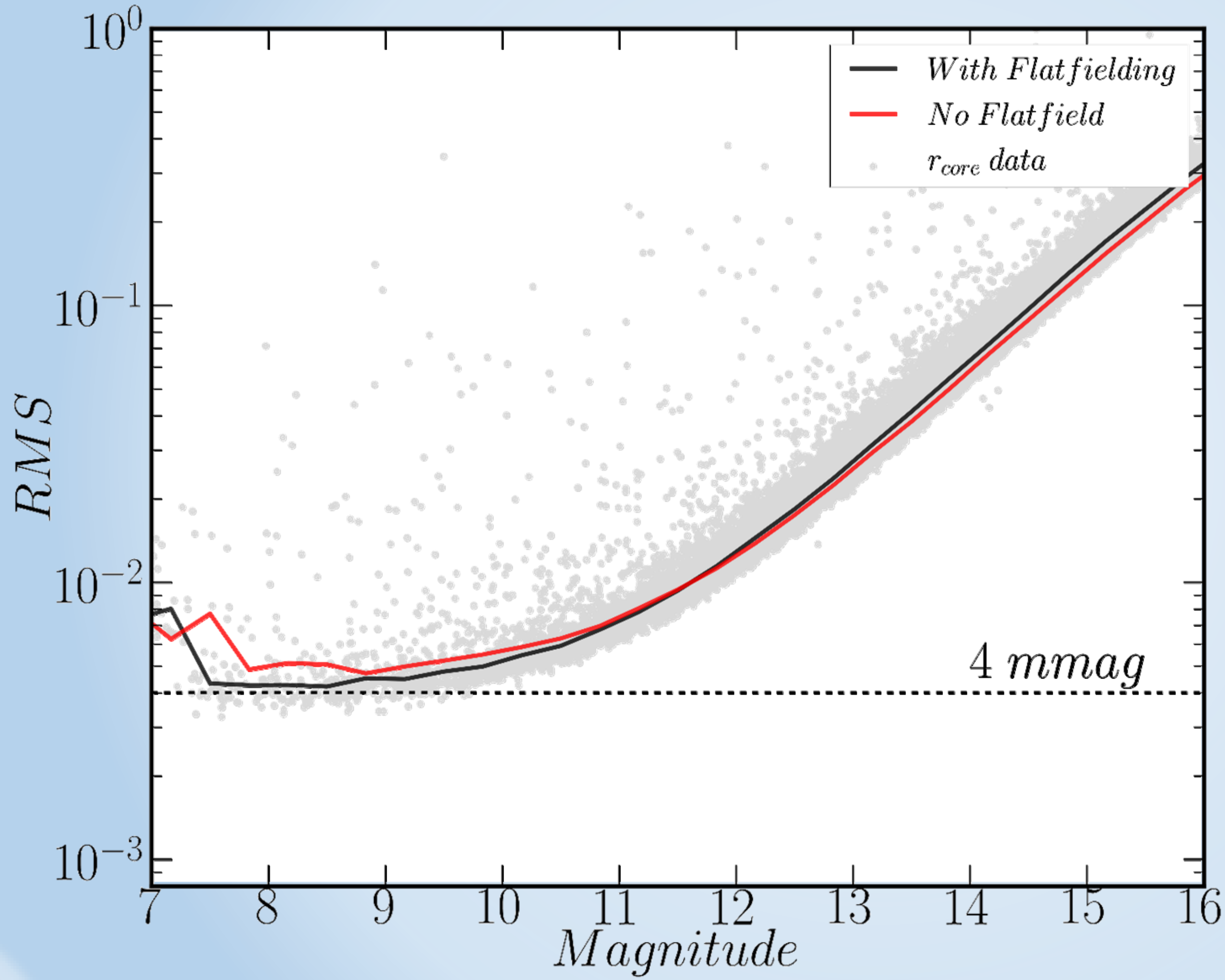
The role of flatfields



A small change

Flatfielding improves rms by 0.5-1mmag

Unexpectedly small contribution

Twilight flats bluer than (red) stars – added noise?

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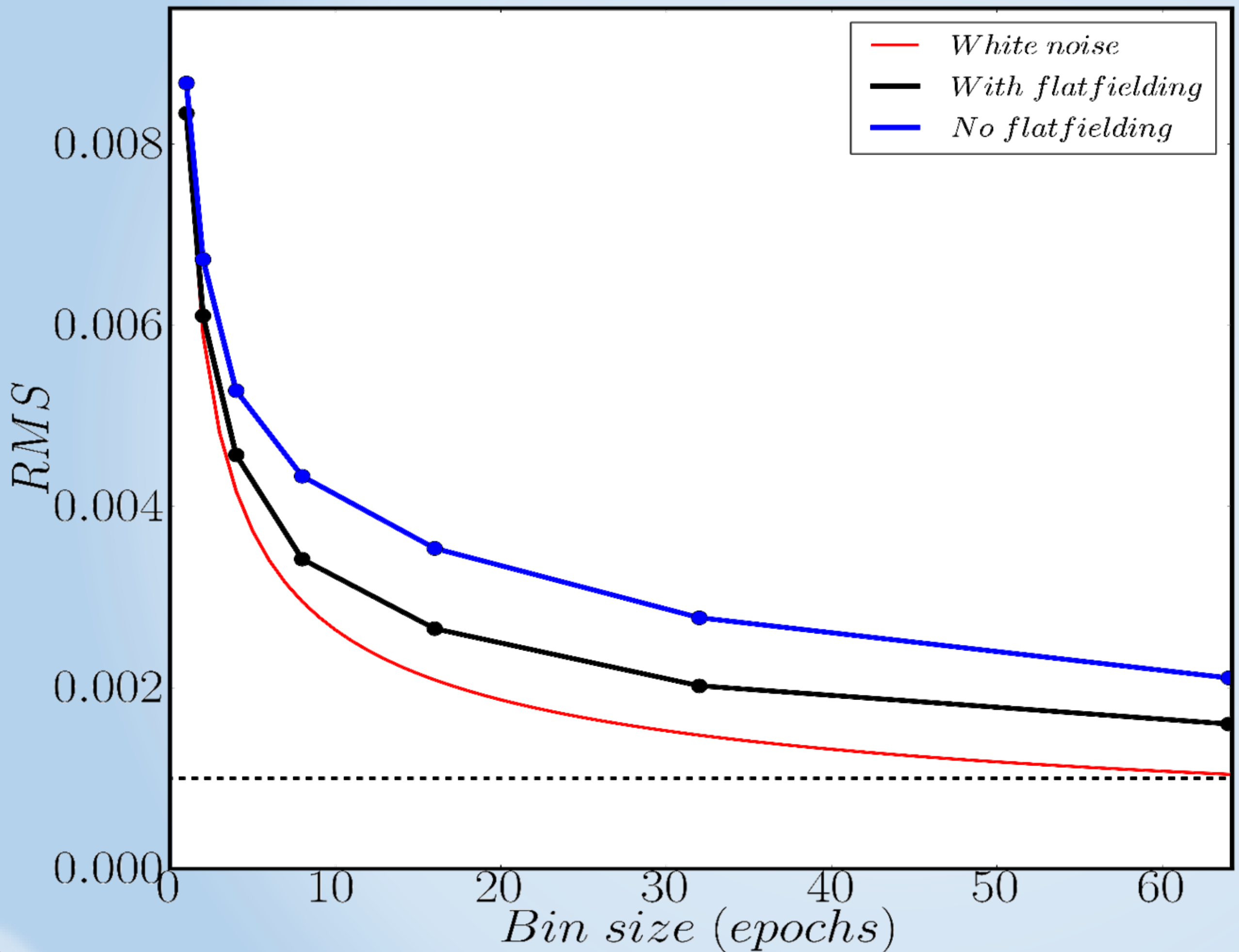
Flatfields: a small improvement



Binning:

Flatfielding improvement remains

Reduction in correlated red noise

rms ~2 mmag binned (8 < V < 12)

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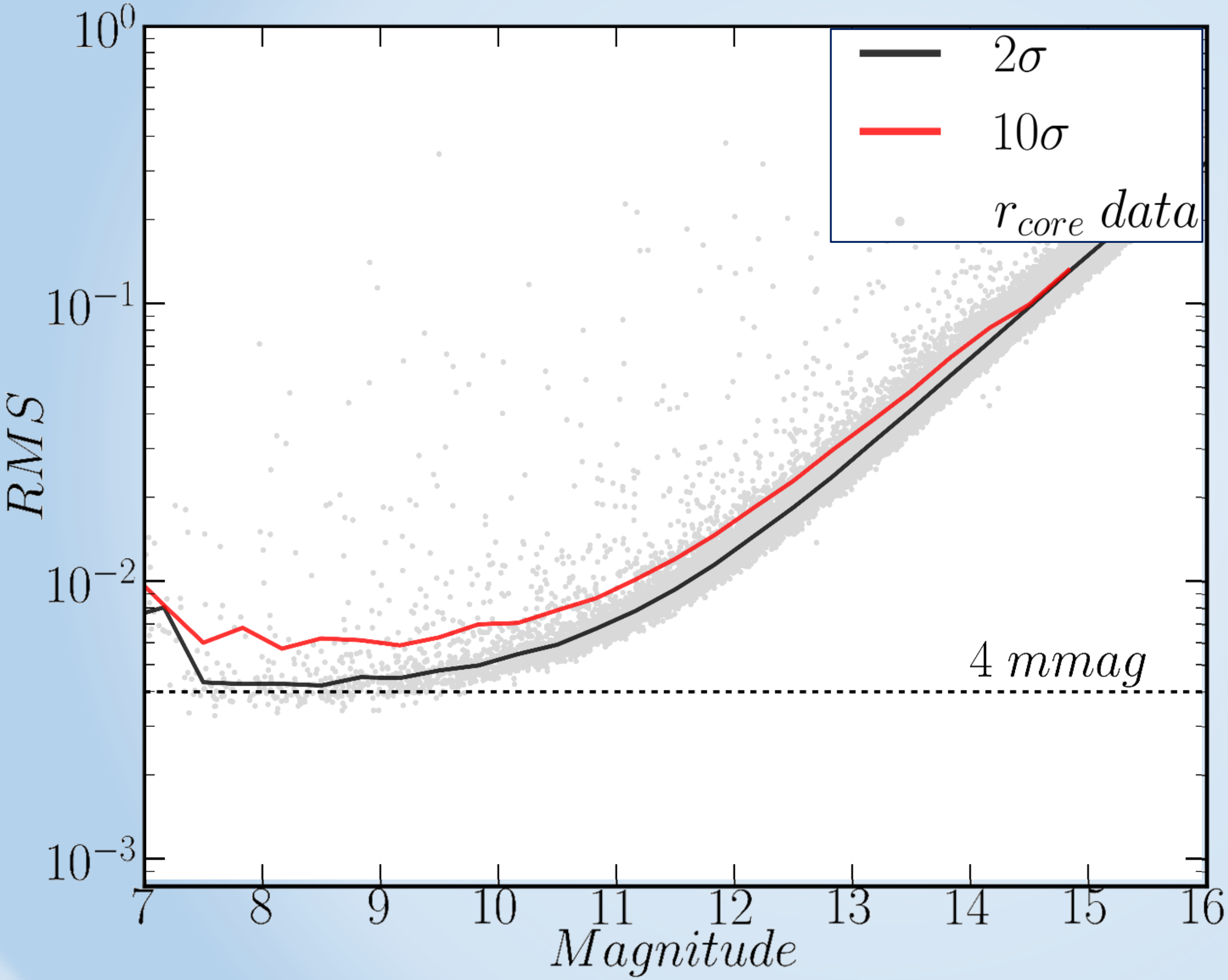
Don't ignore fainter stars



<u>Source detection</u>

10σ threshold: limited to <14.8 mag

2σ threshold: deeper, to 16 mag

<u>Crowded fields:</u>

Accounting for faint contaminants greatly reduces rms noise

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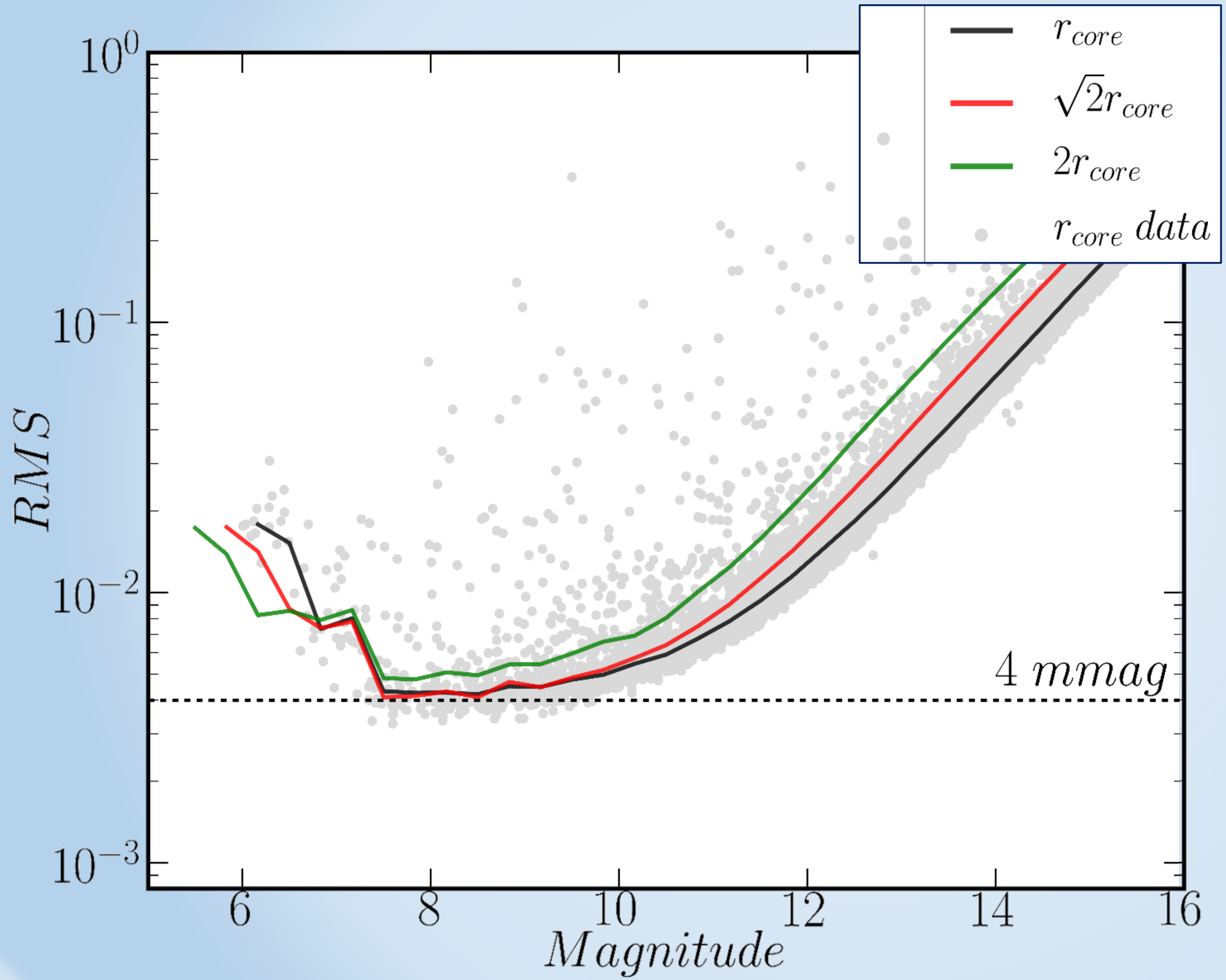
Aperture optimisation



Binning:

Aperture radius
r_{core} = 3.5 pixels

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

Information in wings of saturated stars?

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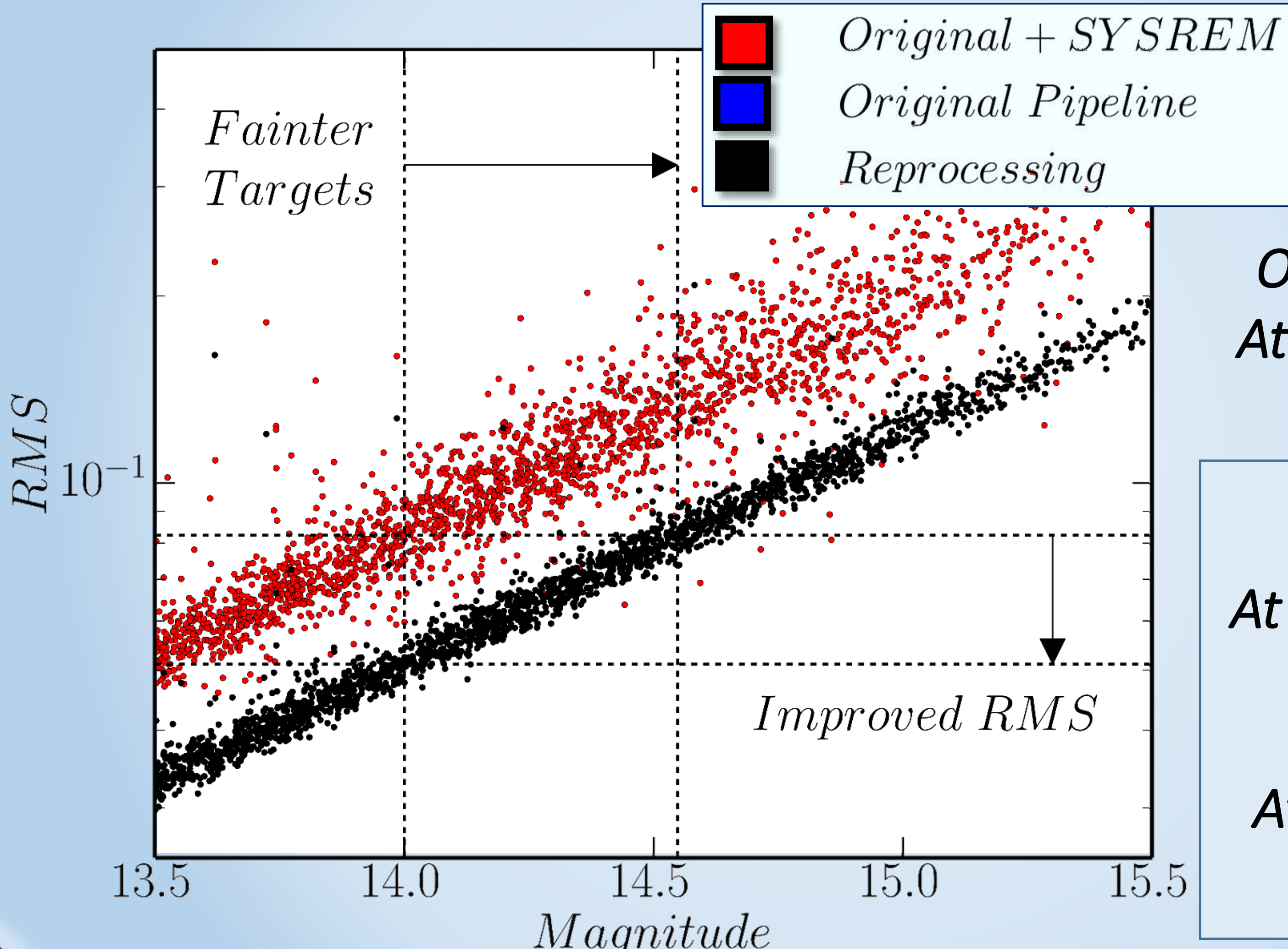
Hunting for fainter dwarfs



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

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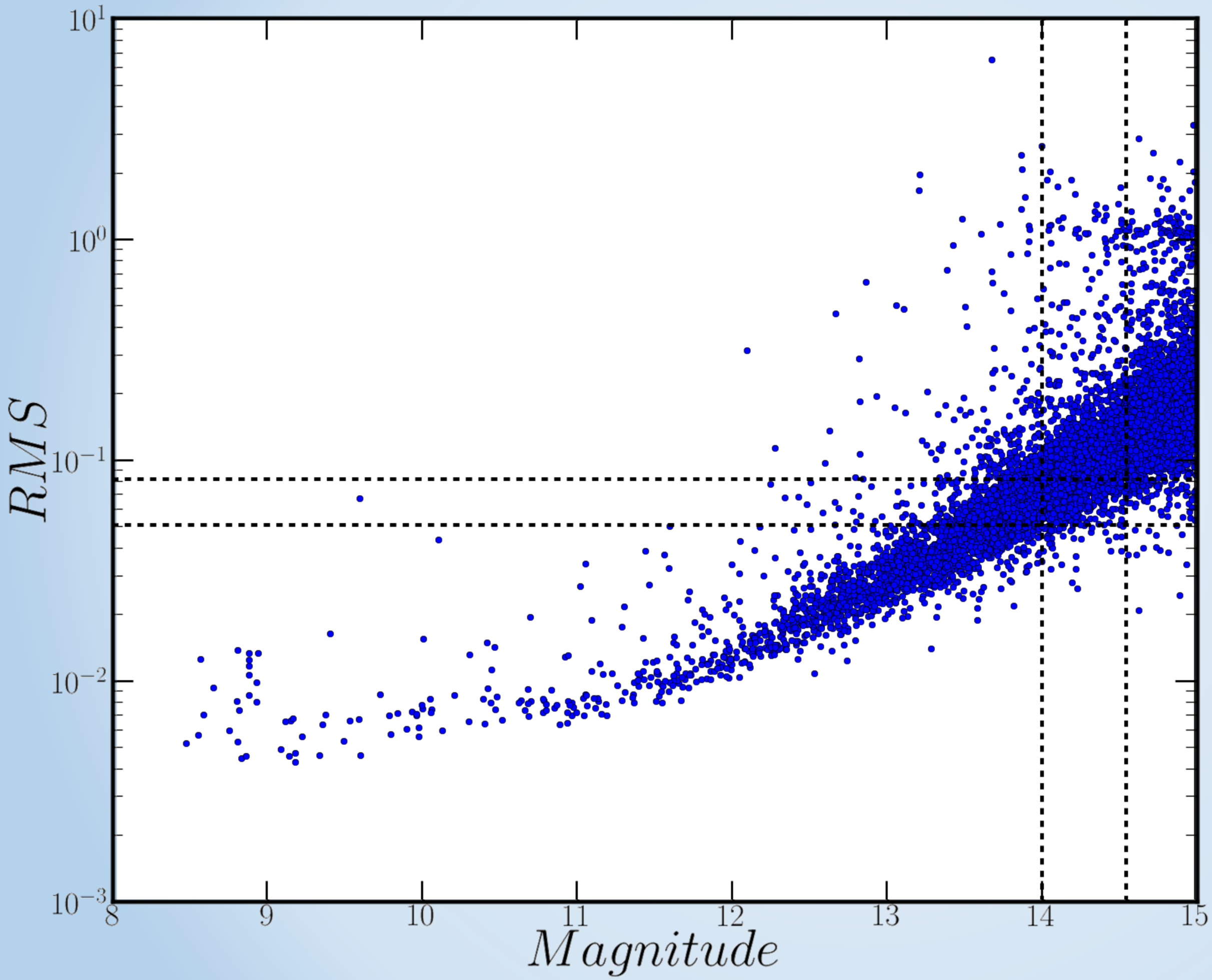
Dwarf Stars in SuperWASP



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

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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

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