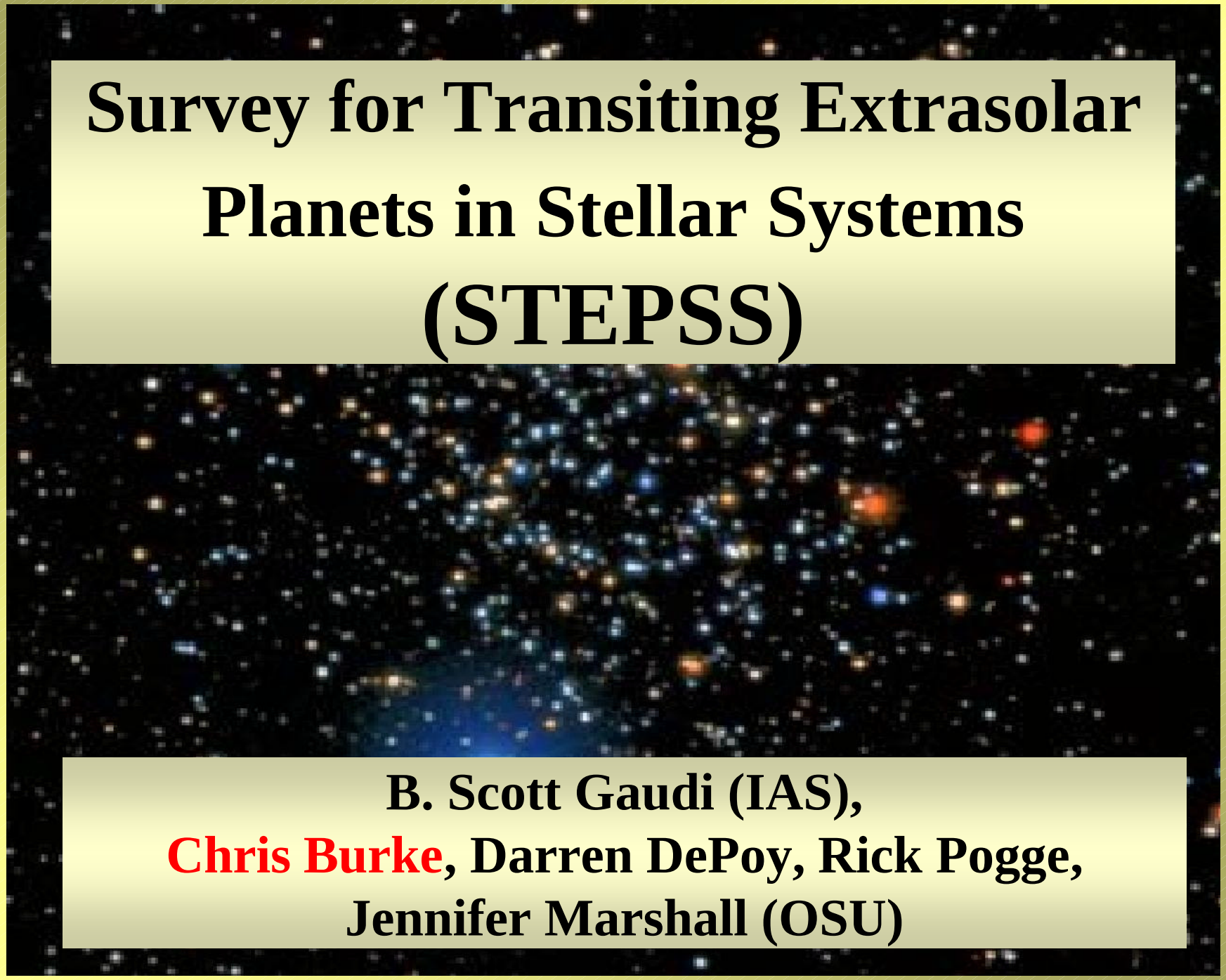
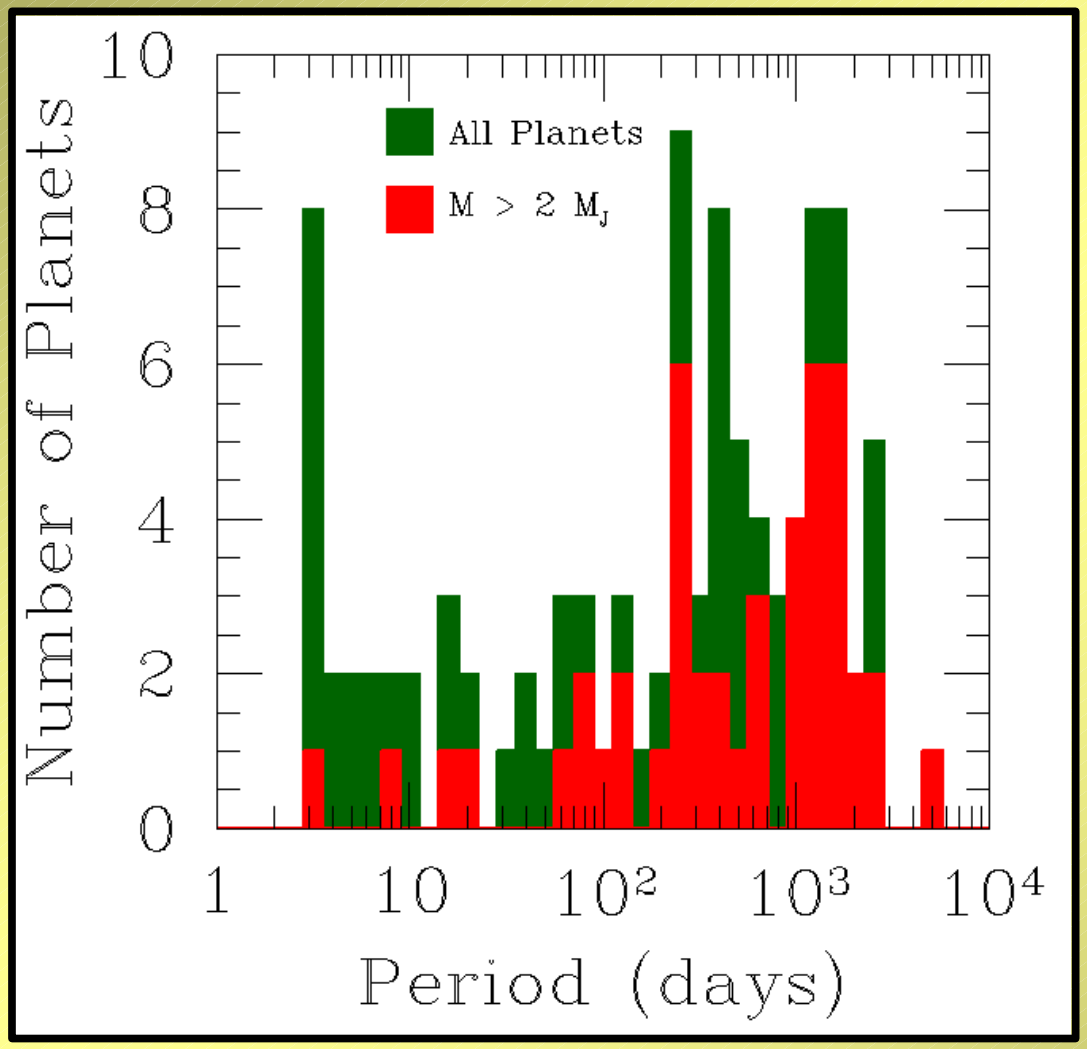
Survey for Transiting Extrasolar Planets in Stellar Systems (STEPSS)



B. Scott Gaudi (IAS),
Chris Burke, Darren DePoy, Rick Pogge,
Jennifer Marshall (OSU)

Properties of Known Companions



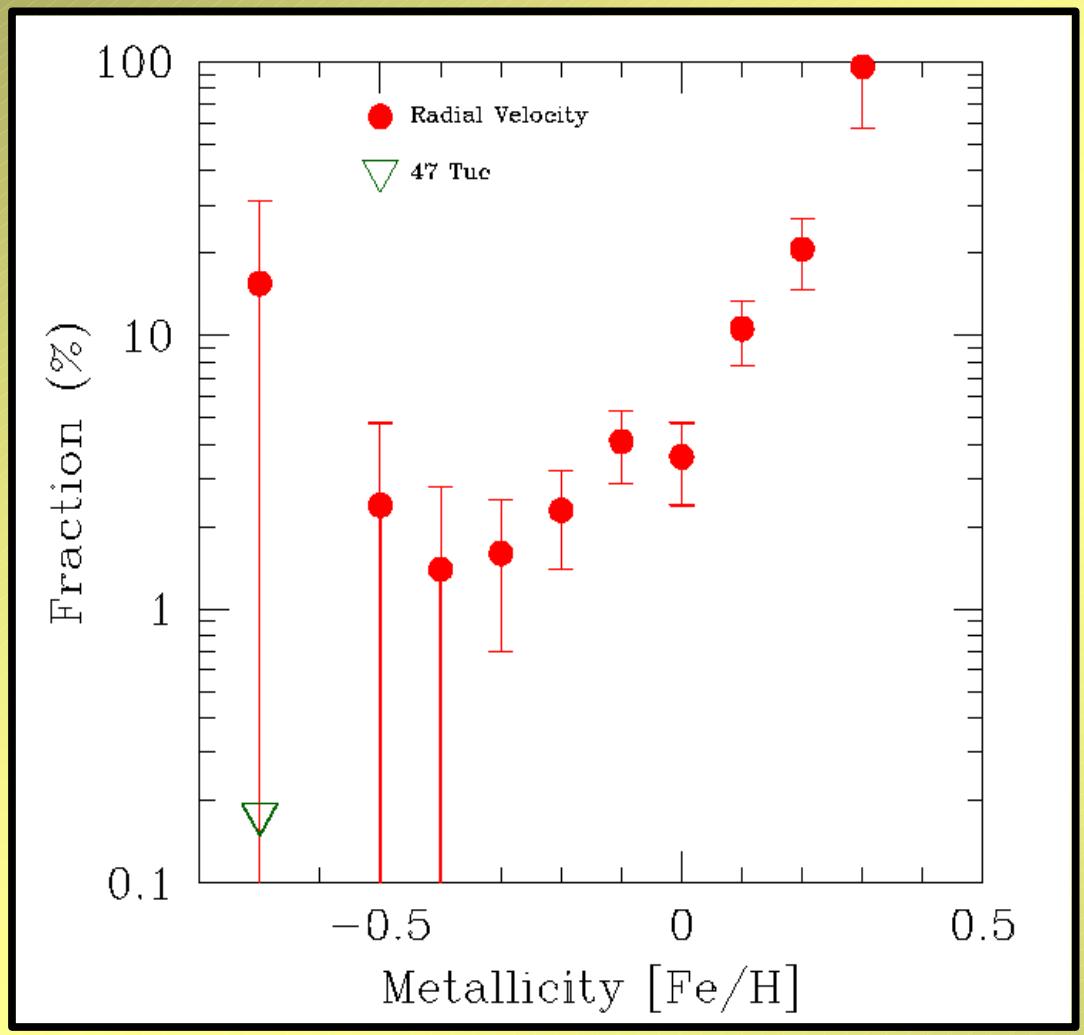
Piling up at P=3d

Migration?

Paucity of Giant, Close-In Planets

Related to BD Desert?

Properties of Known Companions



Reid (2002)

Frequency Increases with Metallicity

Nuture or Nature?

47 Tuc?

Why Stellar Systems?

•Advantages:

Primaries have common properties

Explore the effects of:

Stellar Density

Age

Metallicity [Fe/H]>0

(Open clusters)

Primaries have known properties

Statistics easy.

Compact systems

Point-and-shoot

•Disadvantages:

Relatively Faint Stars

Follow-up difficult

Small Number of Stars

Difficult to probe f<5%

•Requirements:

Many (20) Consecutive Nights

Large FOV

Modest Aperture

Specifics

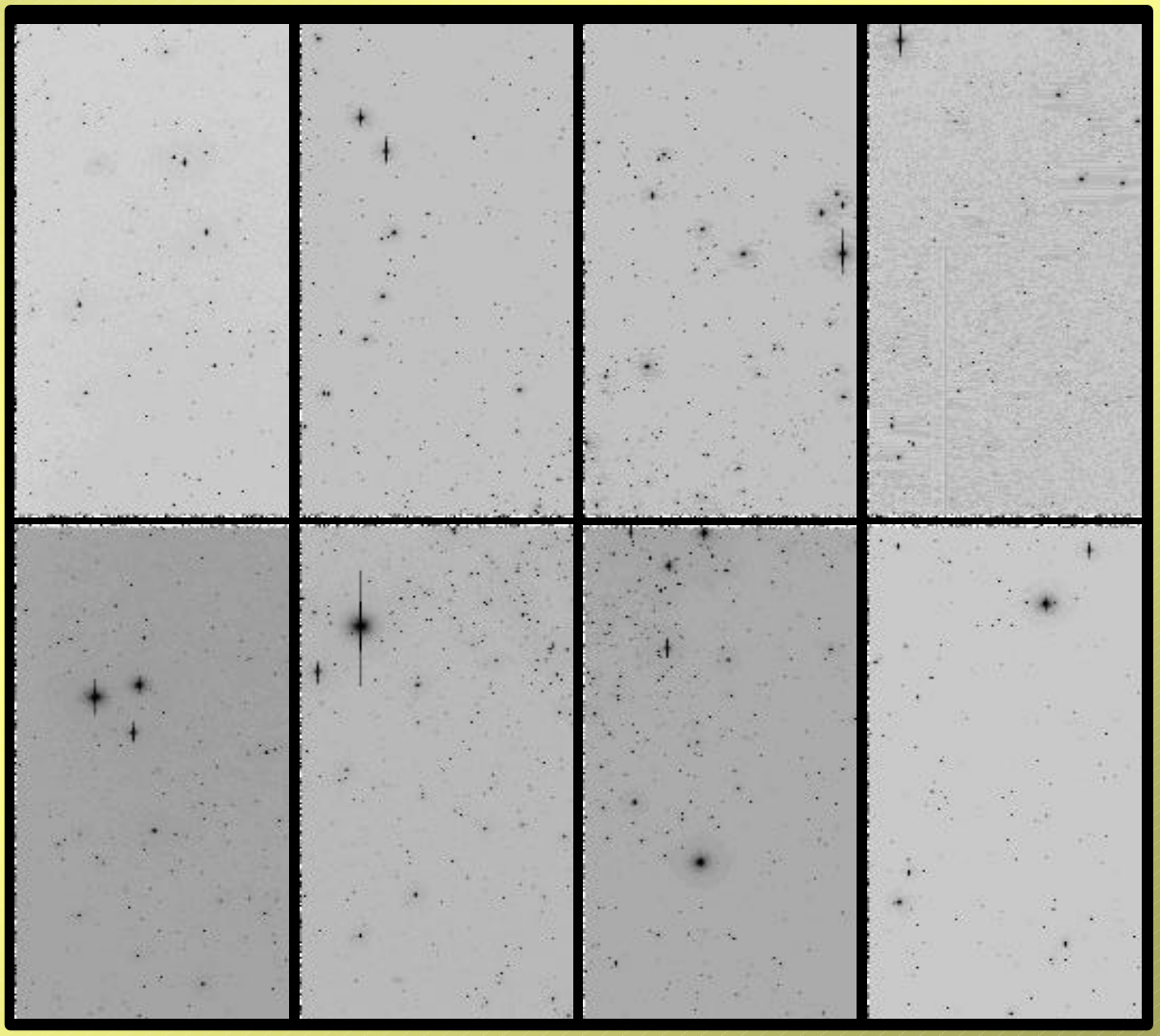
•MDM 2.4m

8192x8192 4x2
Mosaic CCD

25x25 arcmin^2

0.18”/pixel

Fall 2001
19 nights
NGC 1245
1 Gyr
[Fe/H]~0.0 ?



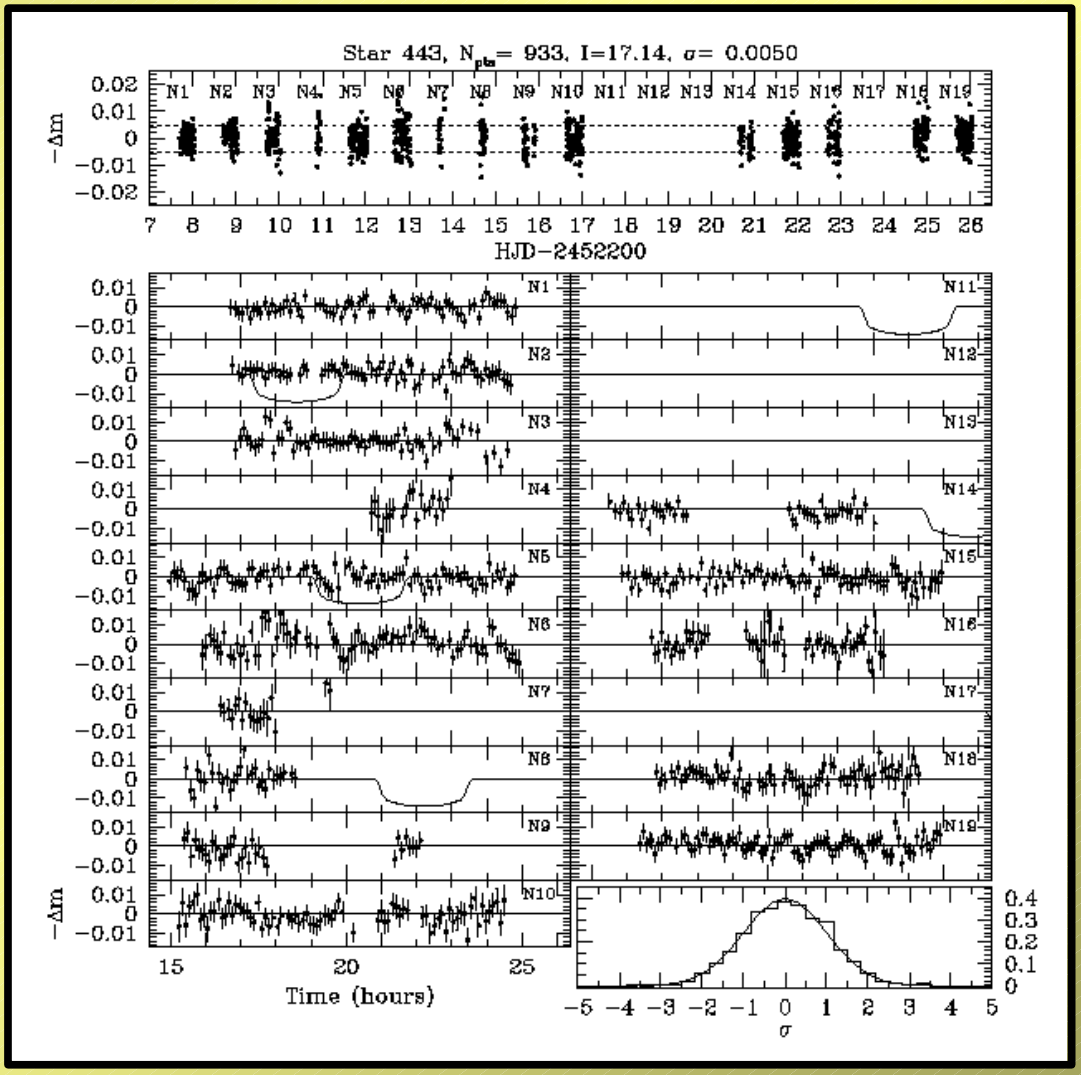
NGC 1245

4-5 minute sampling

15 nights with data

9 full nights

0 photometric nights

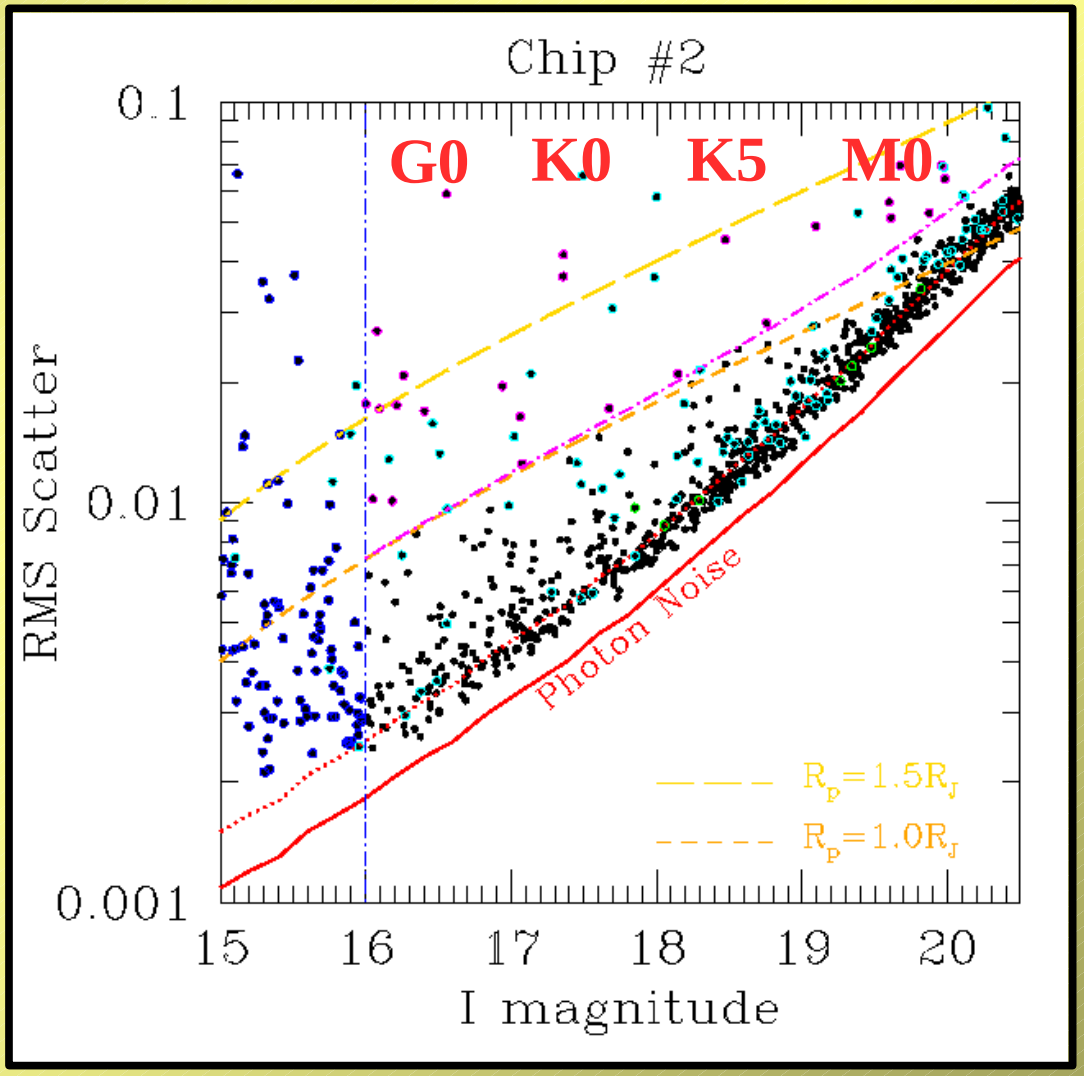


NGC 1245

Saturate at I=16
Sensitive to
Jupiter-size for
G0-M0 primaries

6881 objects
-259 variable
-519 saturated
-652 blended
- 43 too faint
5408 pass all cuts

~2500 cluster members



NGC 1245

Window Probability:

$$< P_W >_{3-11} = 15\%$$

Transit Probability:

$$< P_T >_{3-11} = 8\%$$

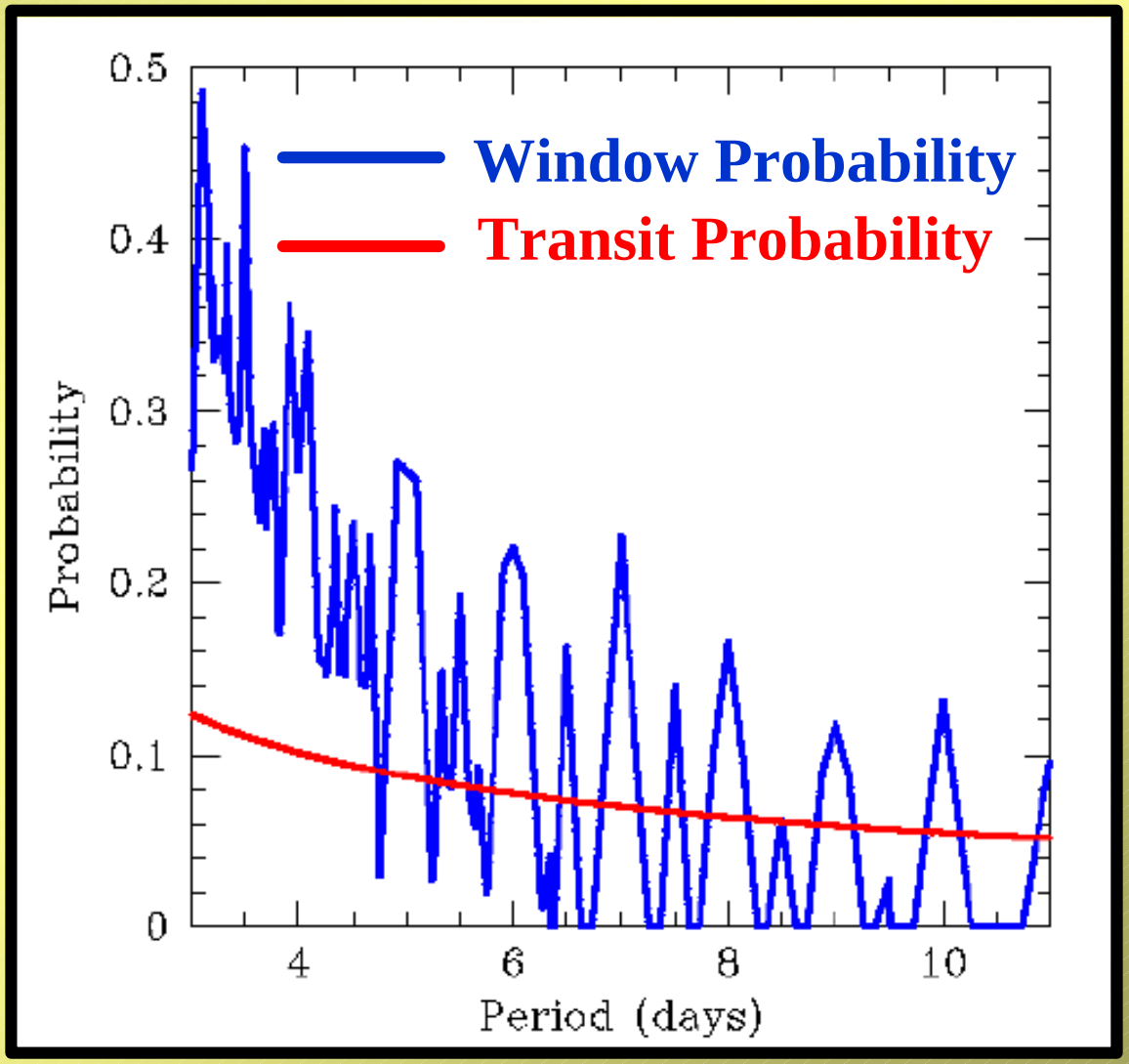
Total Probability:

$$P_{tot} = f_{3-10} P_T P_W$$

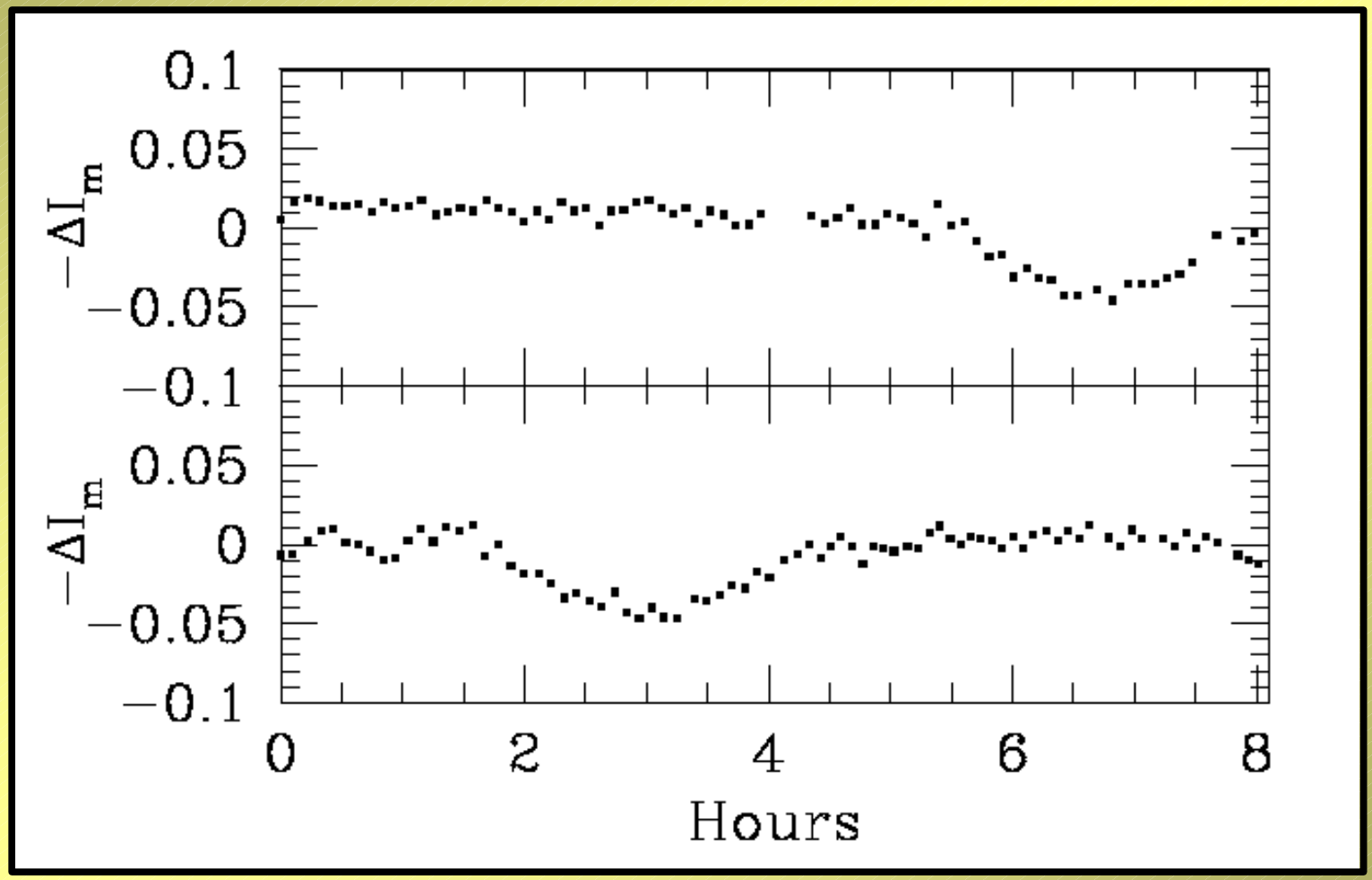
Number of transits:

$$N_{\exp} = N_* P_{tot}$$

Expect ~3 transits for $f_{3-10} = 10\%$



NGC 1245



Period = 3.2 days, Depth ~ 4% ⟶ Grazing Binary

STEPSS - Results & Future Prospects

NGC 1245

[Fe/H]=??

$f_{3-10} \leq 10\%$

NGC 2099

[Fe/H]=0.05

37 nights: $f_{3-10} \leq 3\%$

NGC 2682 (M67)

[Fe/H]=0

20 nights in February

Future:

1-2 Clusters/Year

Metallicity determinations