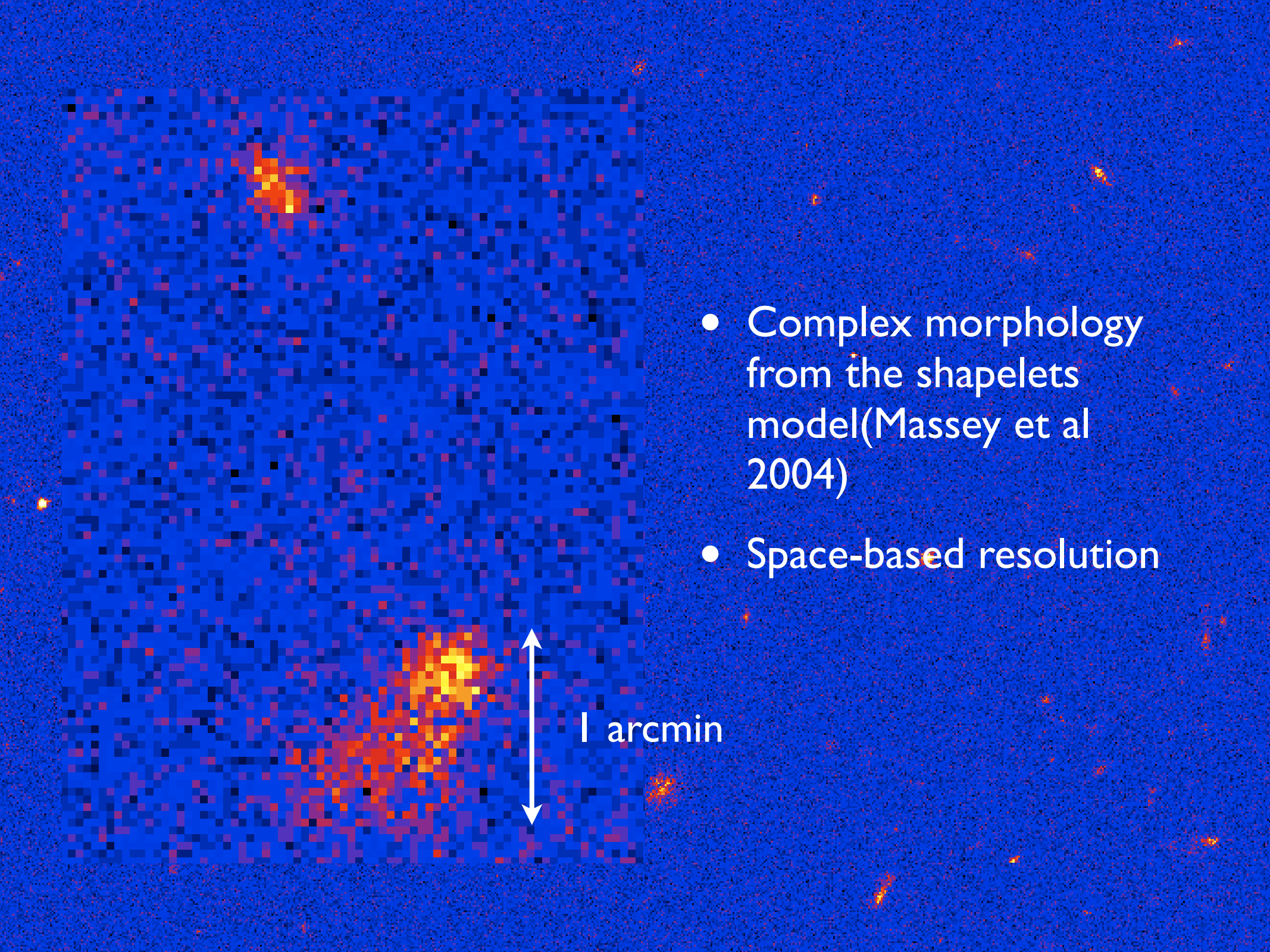
Space STEP 3

Shapelet Simulations: Will High,
Richard Massey and Jason Rhodes

Analysis:
Joel Berge (Shapelets)
Catherine Heymans (KSB+)
Rachel Mandelbaum (REGLENS)
Reiko Nakajima (BJ02/NB07)
Stephane Paulin-Henriksson (KSB+)
Jason Rhodes (RRG)
Tim Schrabback (KSB+)

Example image with e2 shear:

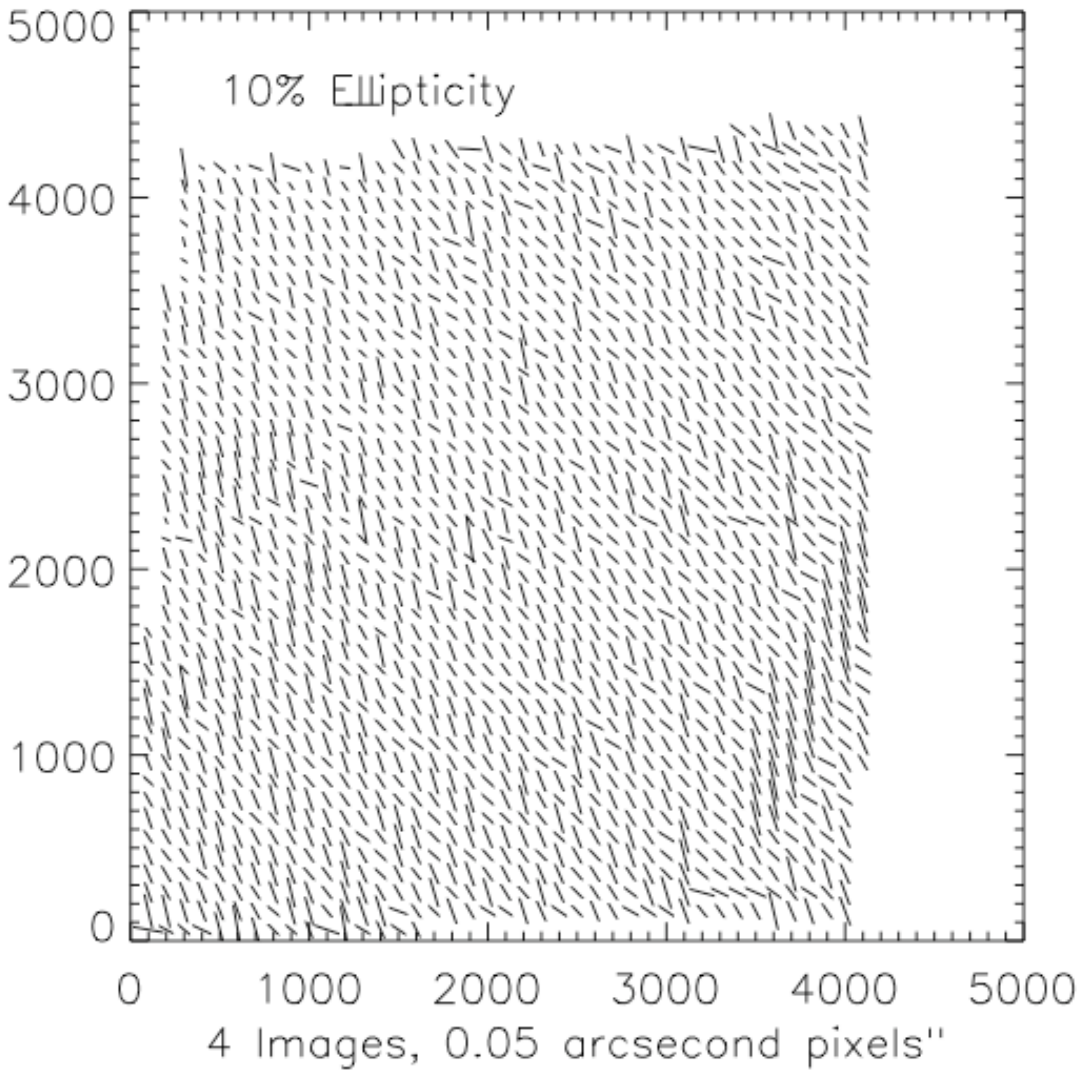


- Complex morphology from the shapelets model(Massey et al 2004)
- Space-based resolution

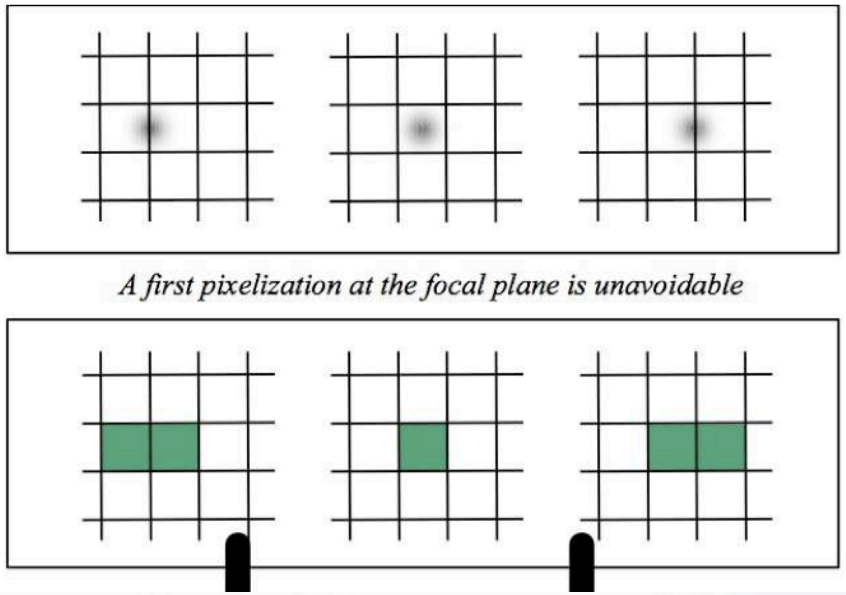
Caveats

- The galaxy model comes from a shapelet analysis of psf-convolved galaxies in the COSMOS data.
- As galaxies become fainter and smaller, their intrinsic ellipticities become rounder (ACS PSF or shapelet truncation?).
- This effected the RN and RM STEP2 analyses where the ellipticity distribution was initially considered to be constant as a function of magnitude and size.
- It is likely to have even more impact on STEP3.

PSF Caveat



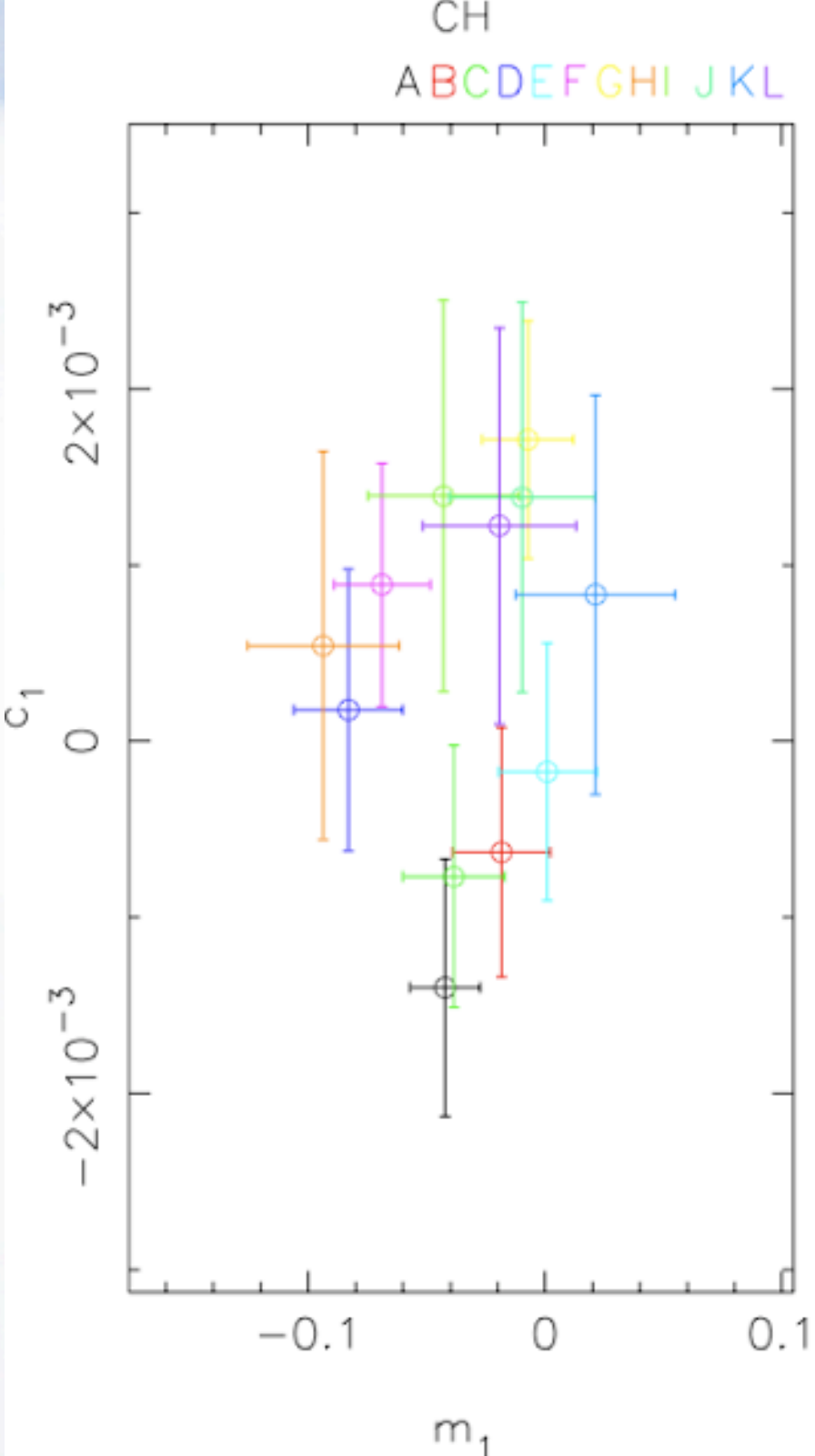
- PSF was assumed to be constant across the FOV. Resolved the issue of PSF modelling for large pixel scales.



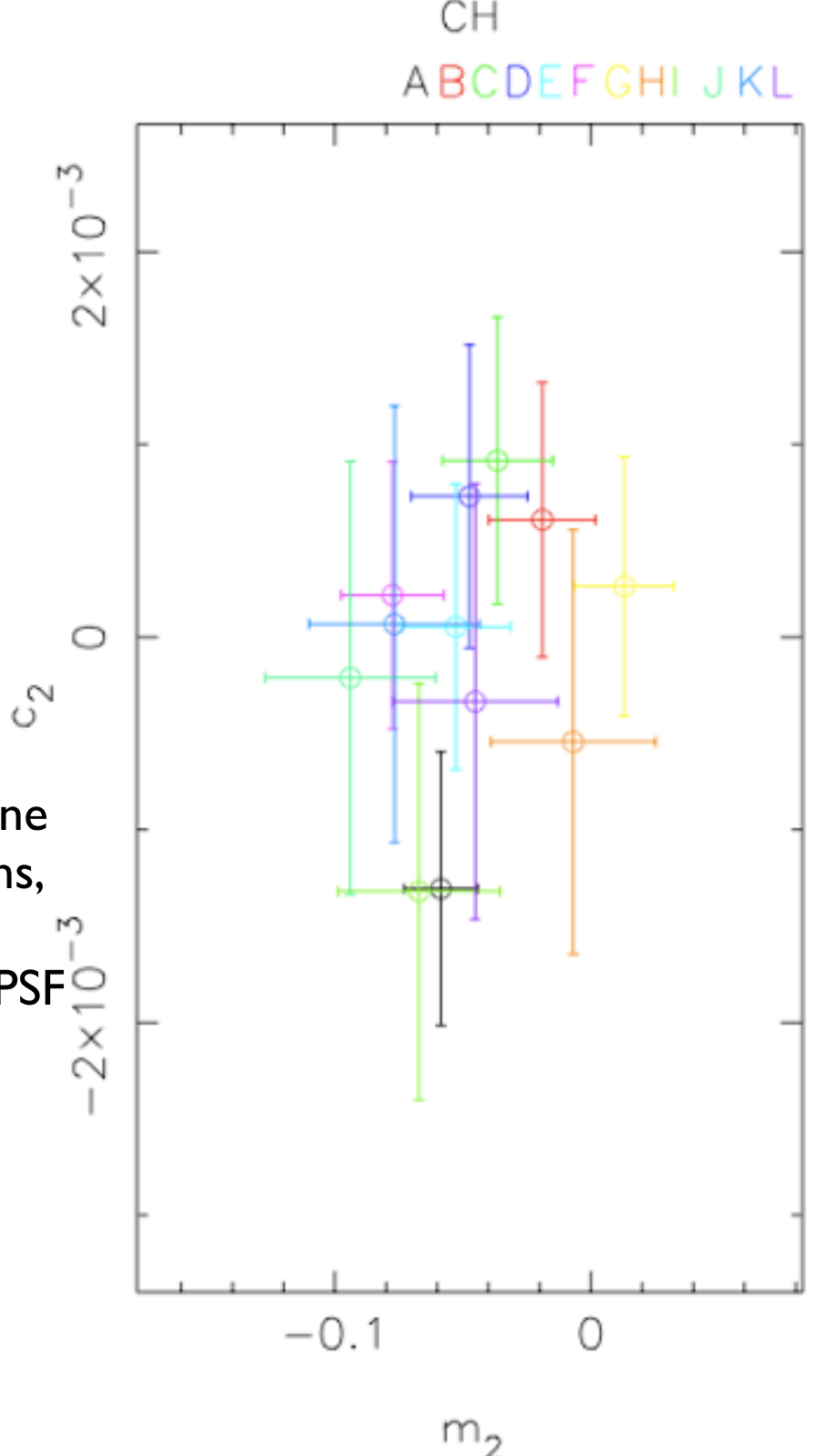
ACS example from Rhodes et al 2007

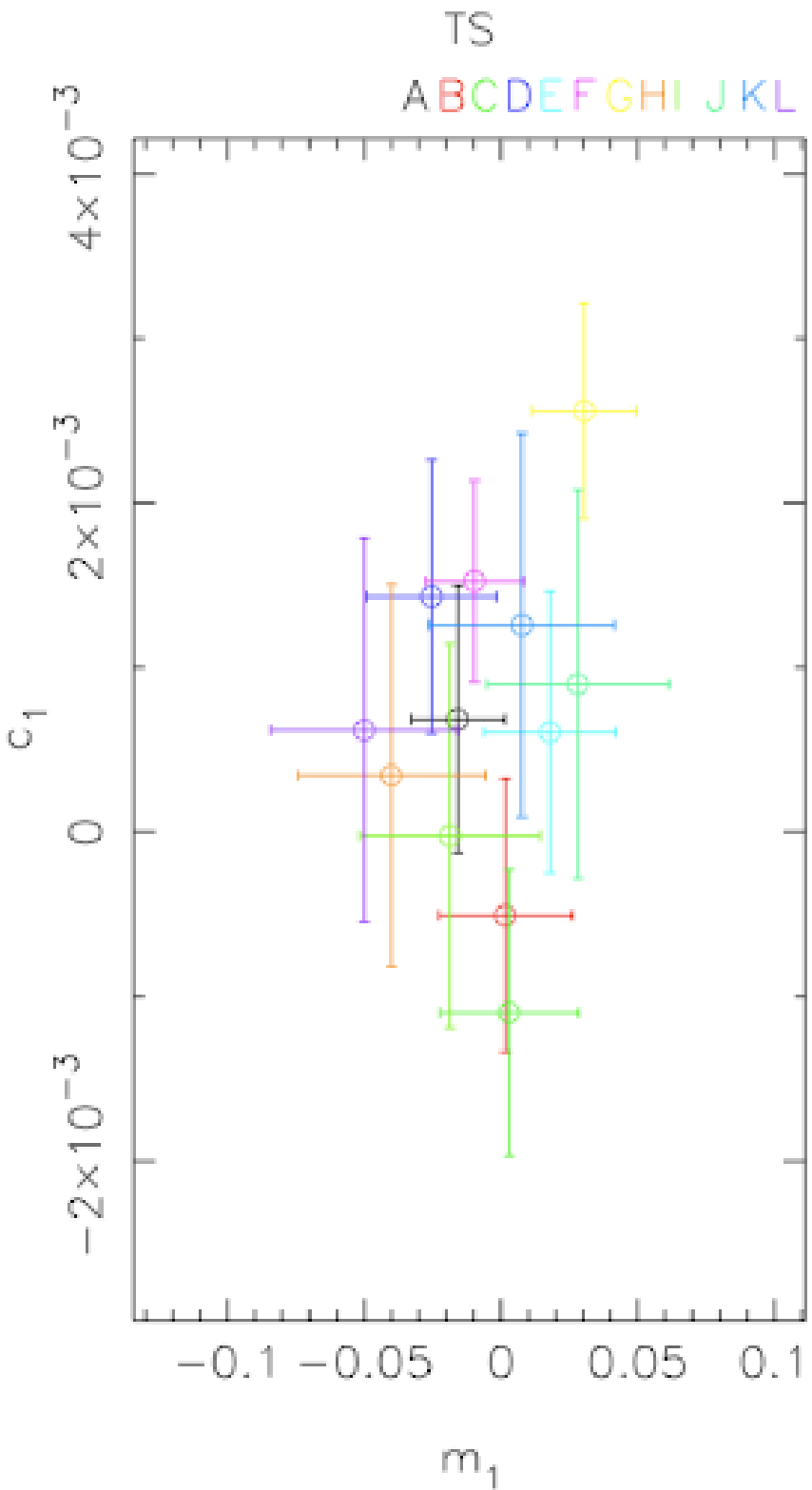
Space STEP Simulations

PSF ID	Pixel scale (arcsec)	PSF type	galaxy type
A	0.05	SNAP	Shapelet
B	0.10	SNAP	Shapelet
C	0.10	1.4m SNAP	Shapelet
D	0.04	ACS	Shapelet
E	0.10	ACS	Shapelet
F	0.04	ACS	Exponential
G	0.10	ACS	Exponential
H	0.04	ACS	Shapelet
I	0.04	ACS	Shapelet
J	0.04	ACS	Shapelet
K	0.04	ACS	Shapelet
L	0.04	ACS	Shapelet

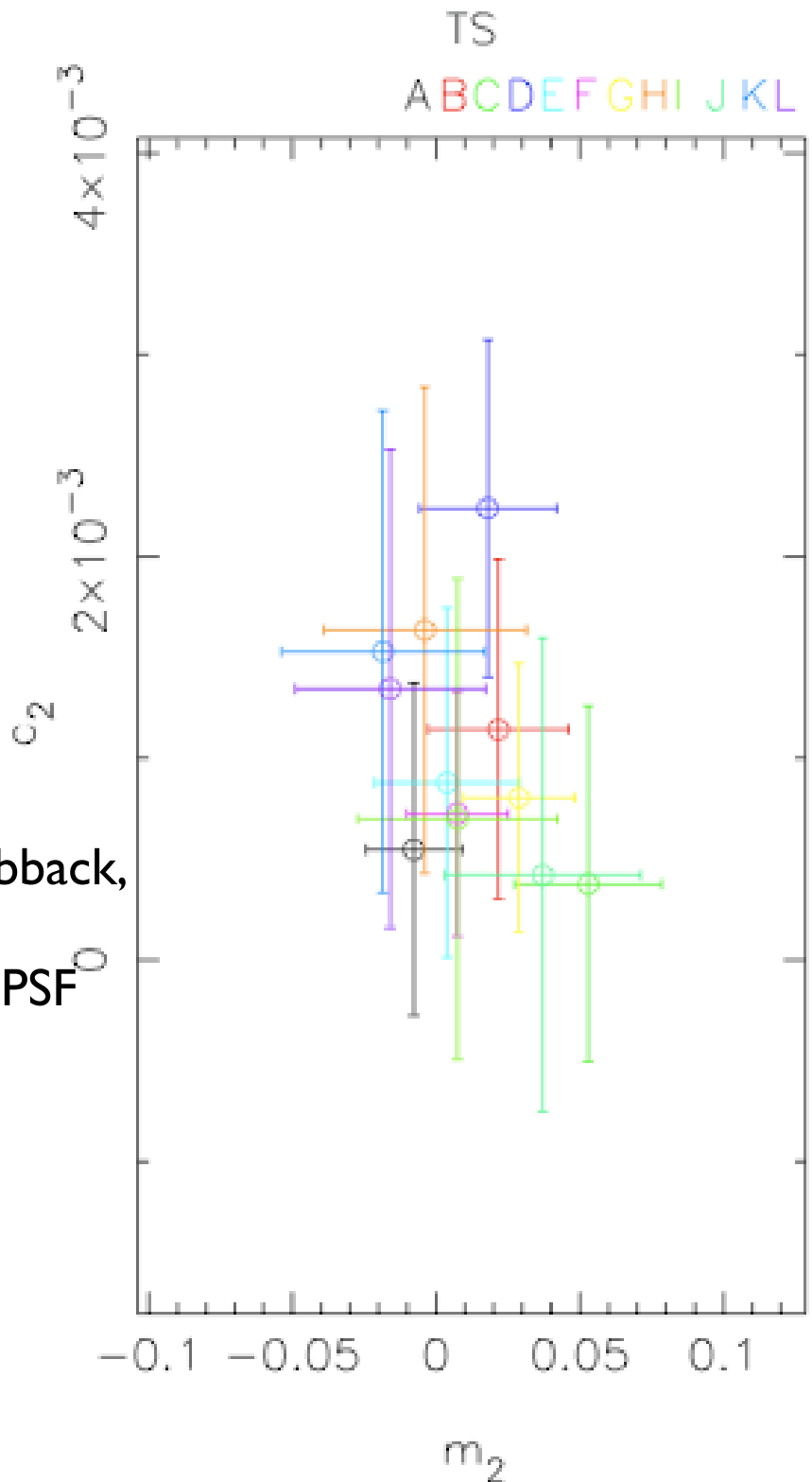


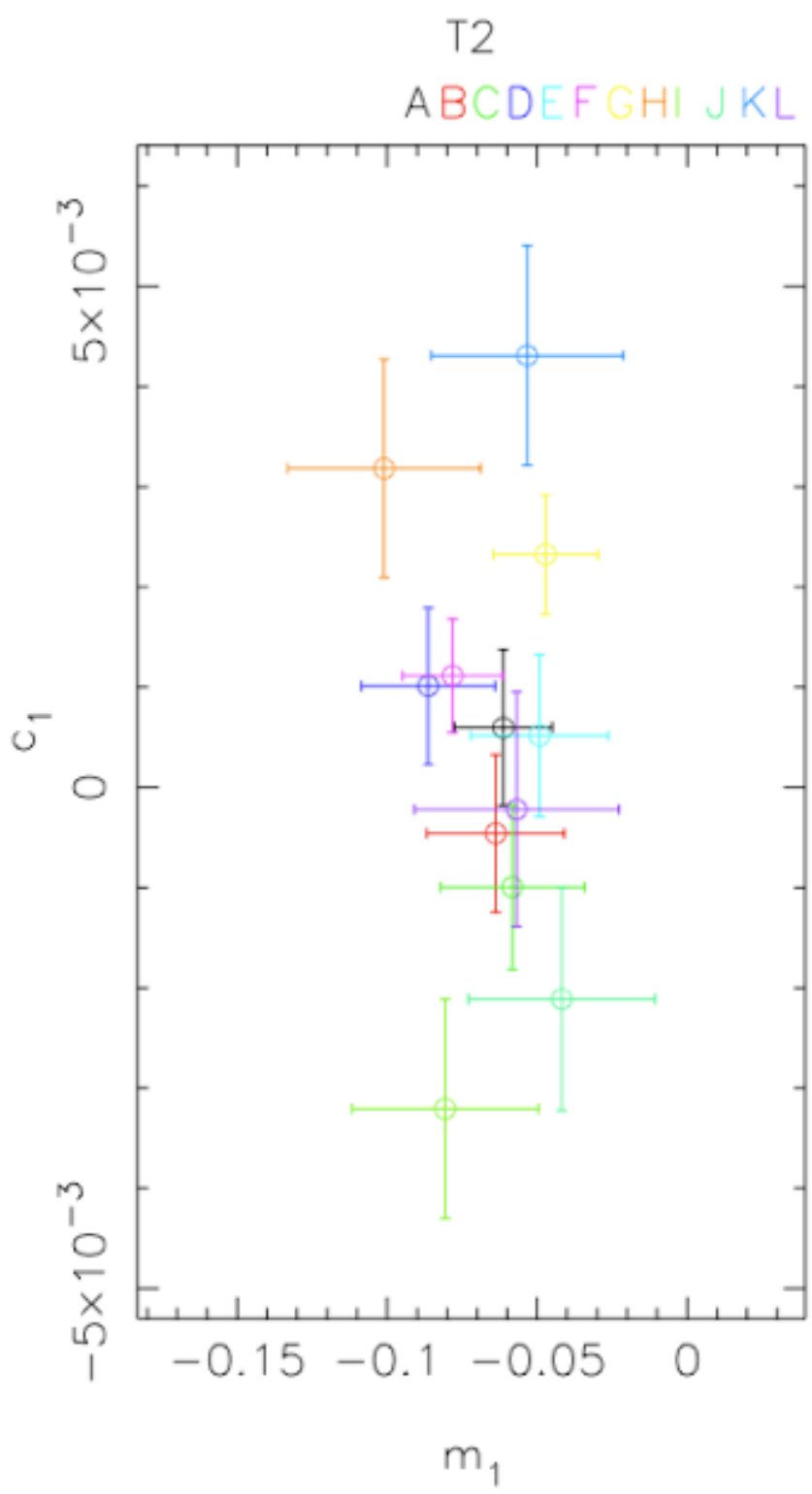
Catherine Heymans, KSB, low res PSF





Tim Schrabback,
KSB,
low res PSF





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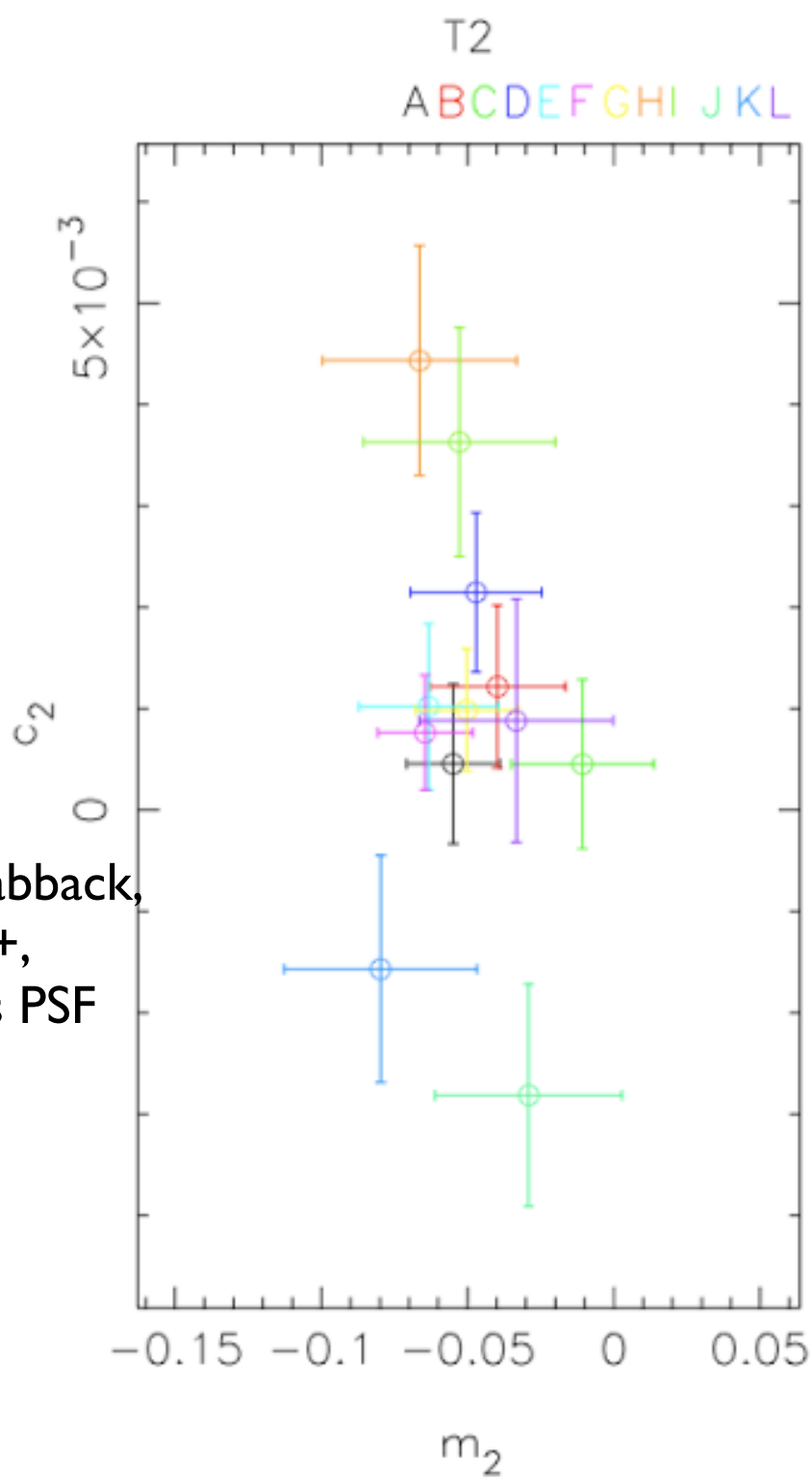
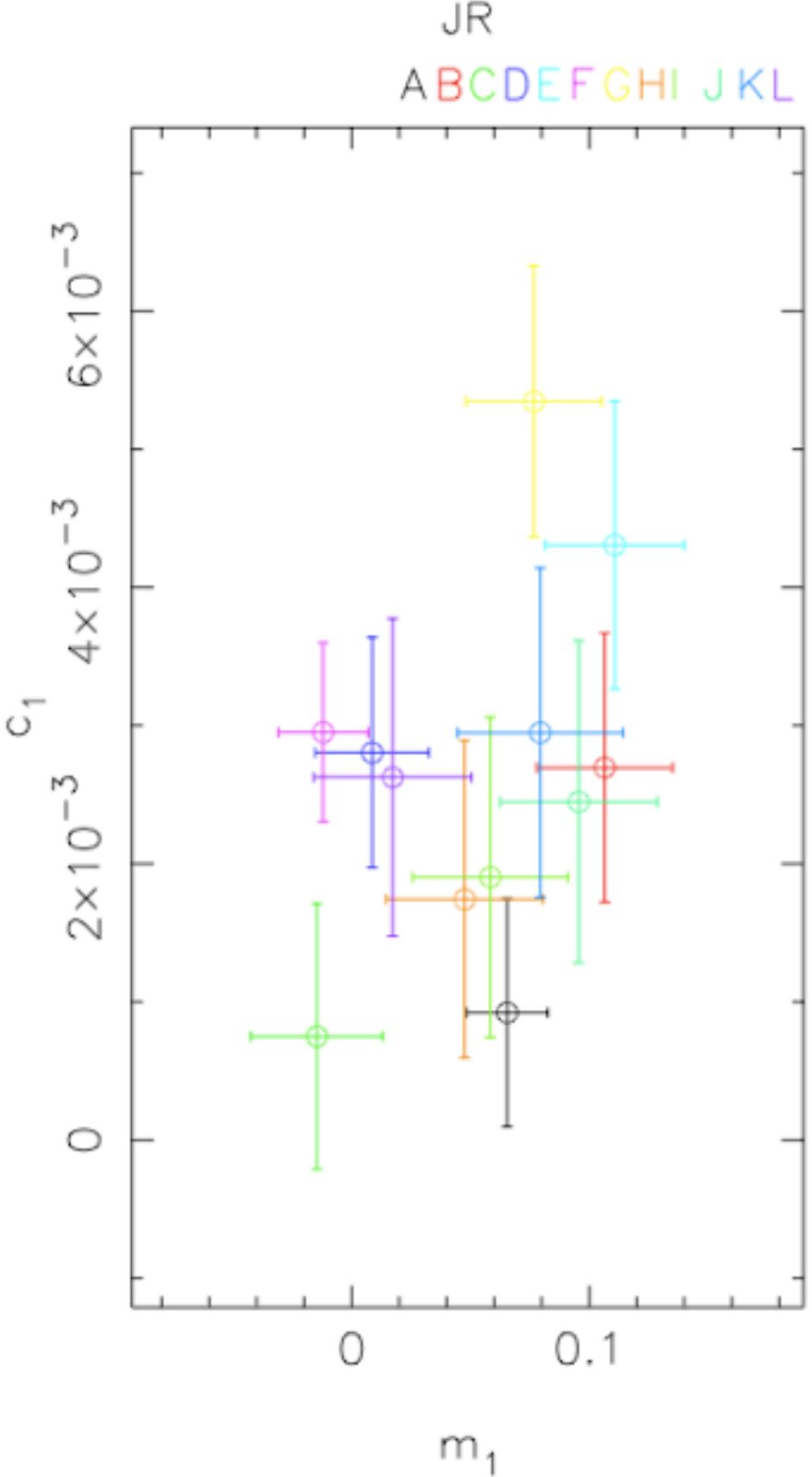
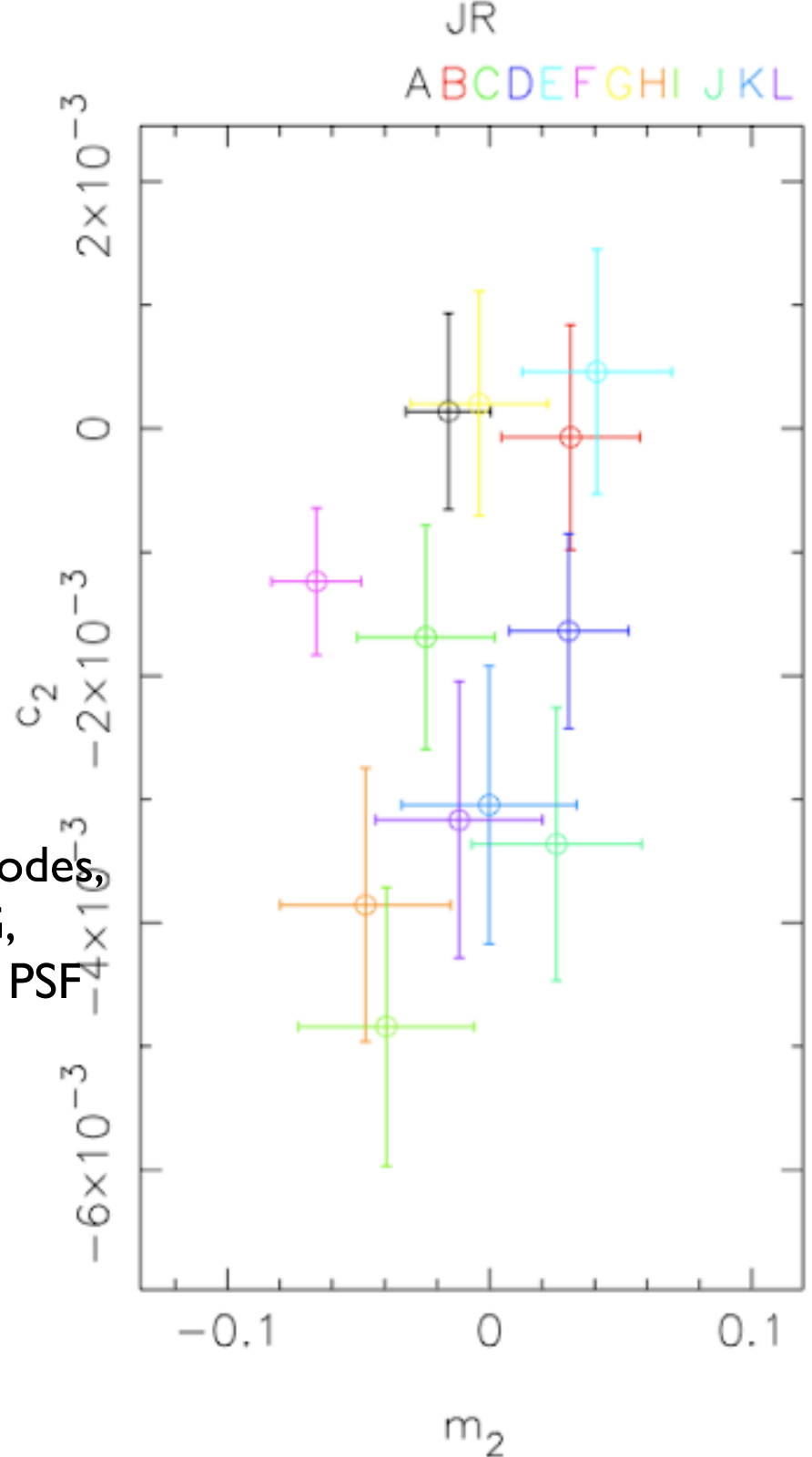
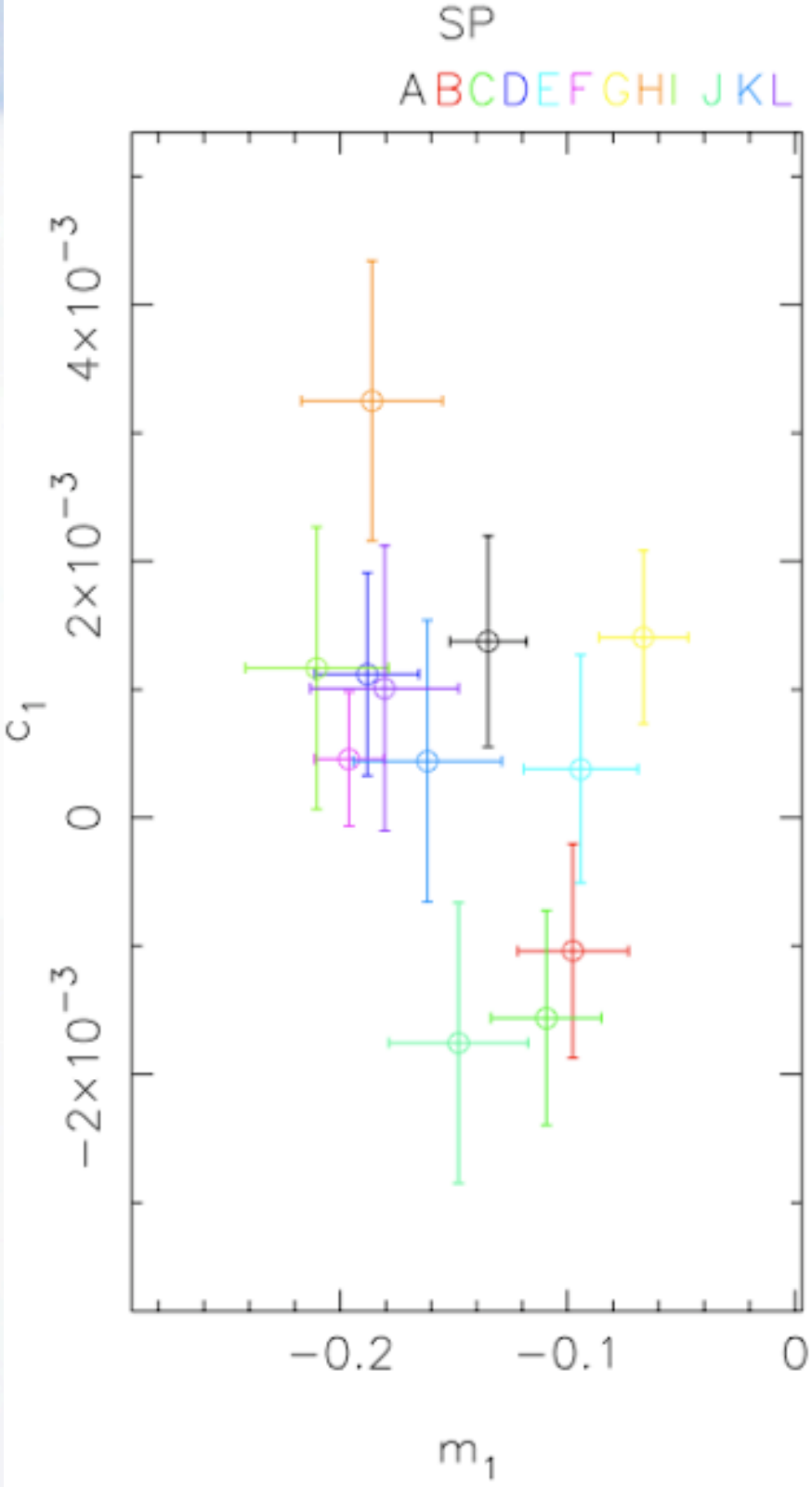


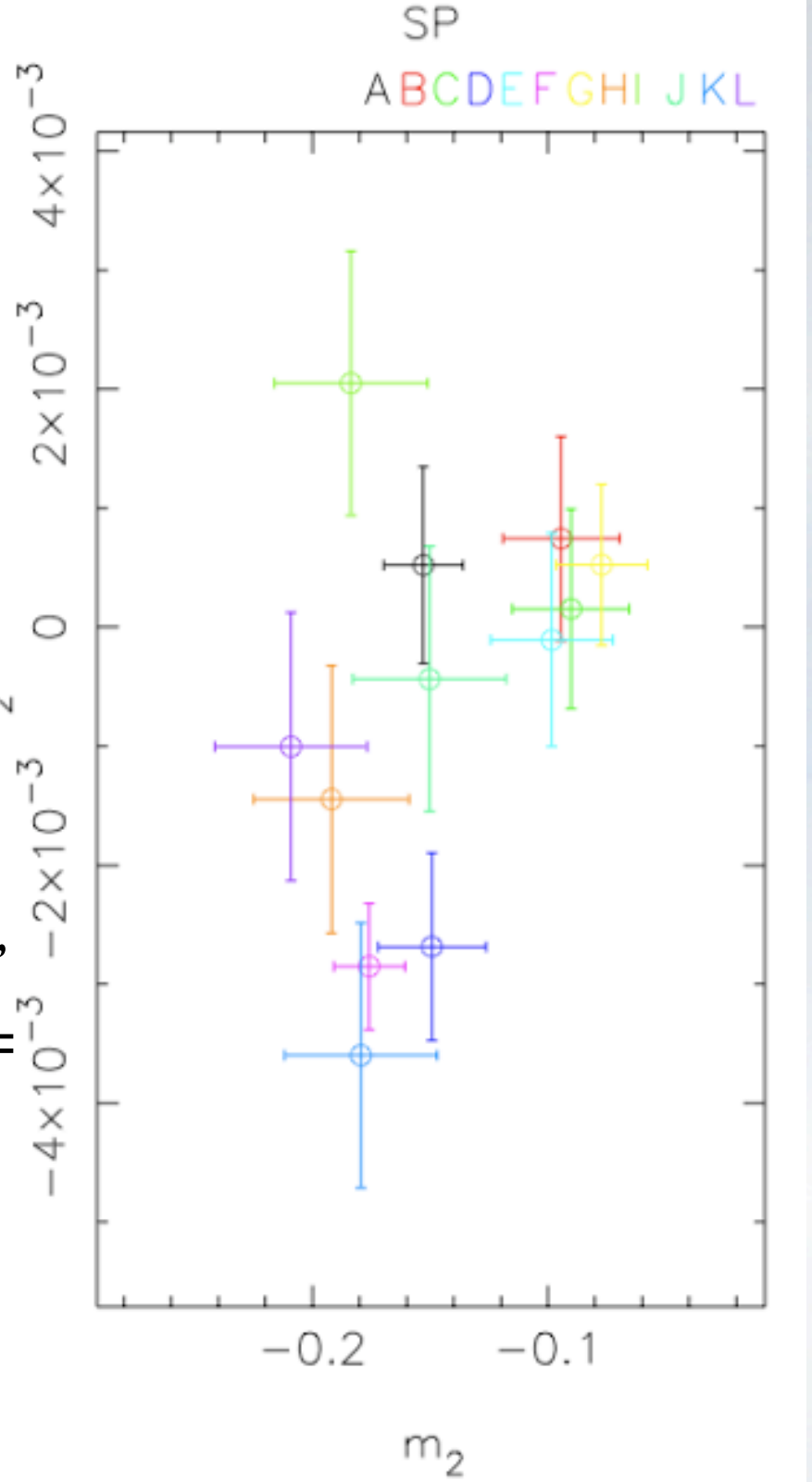


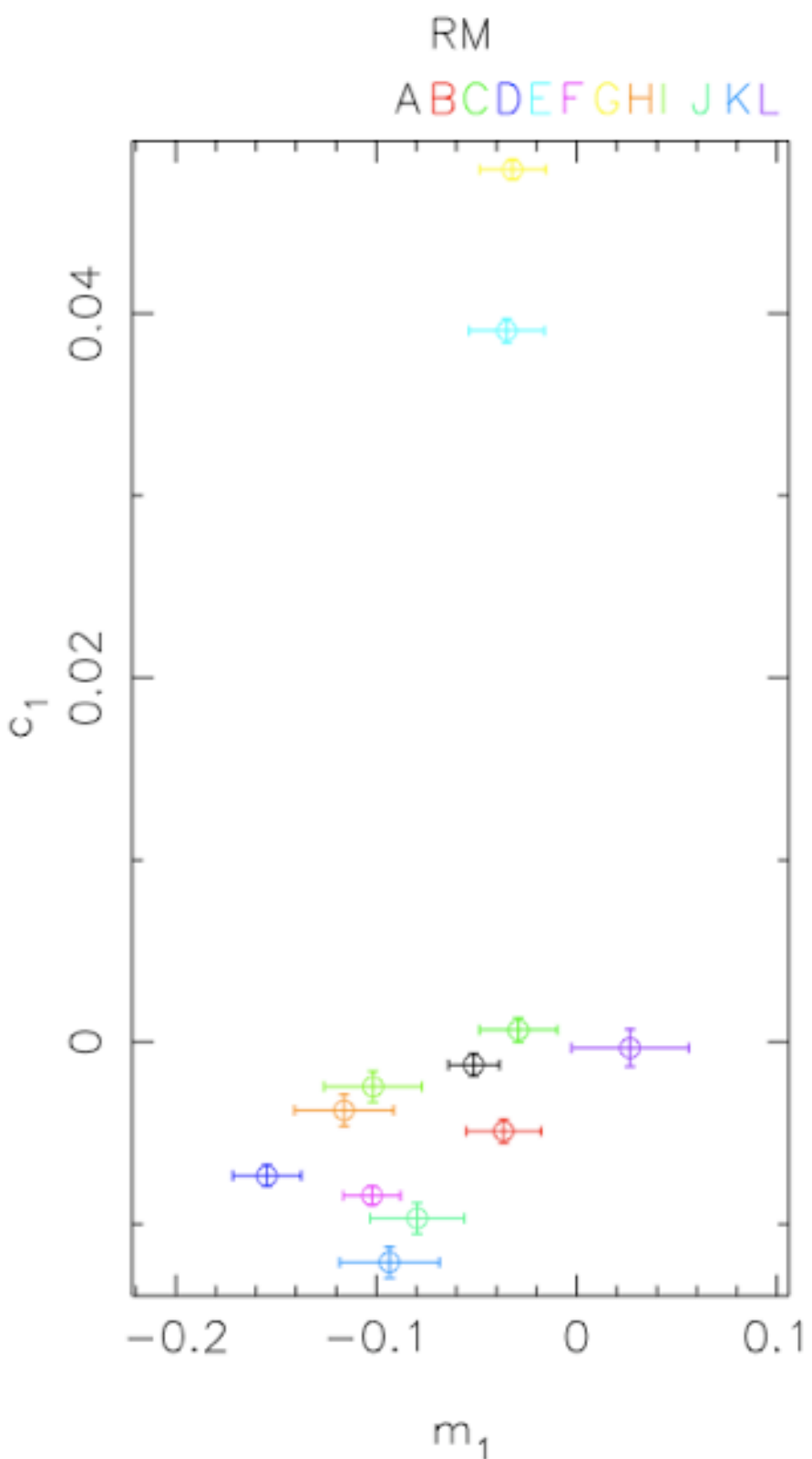
Jason Rhodes,
RRG,
low res PSF



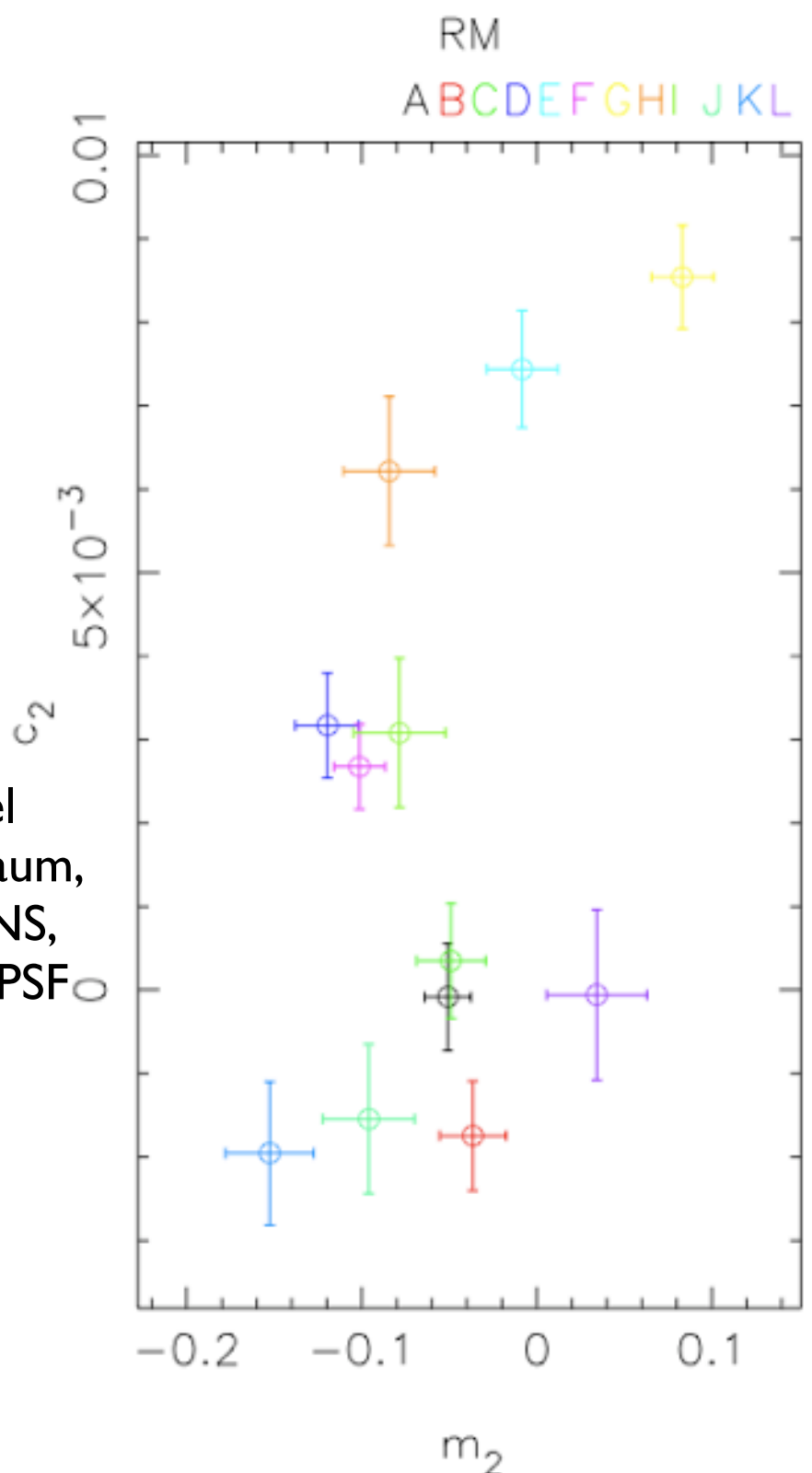


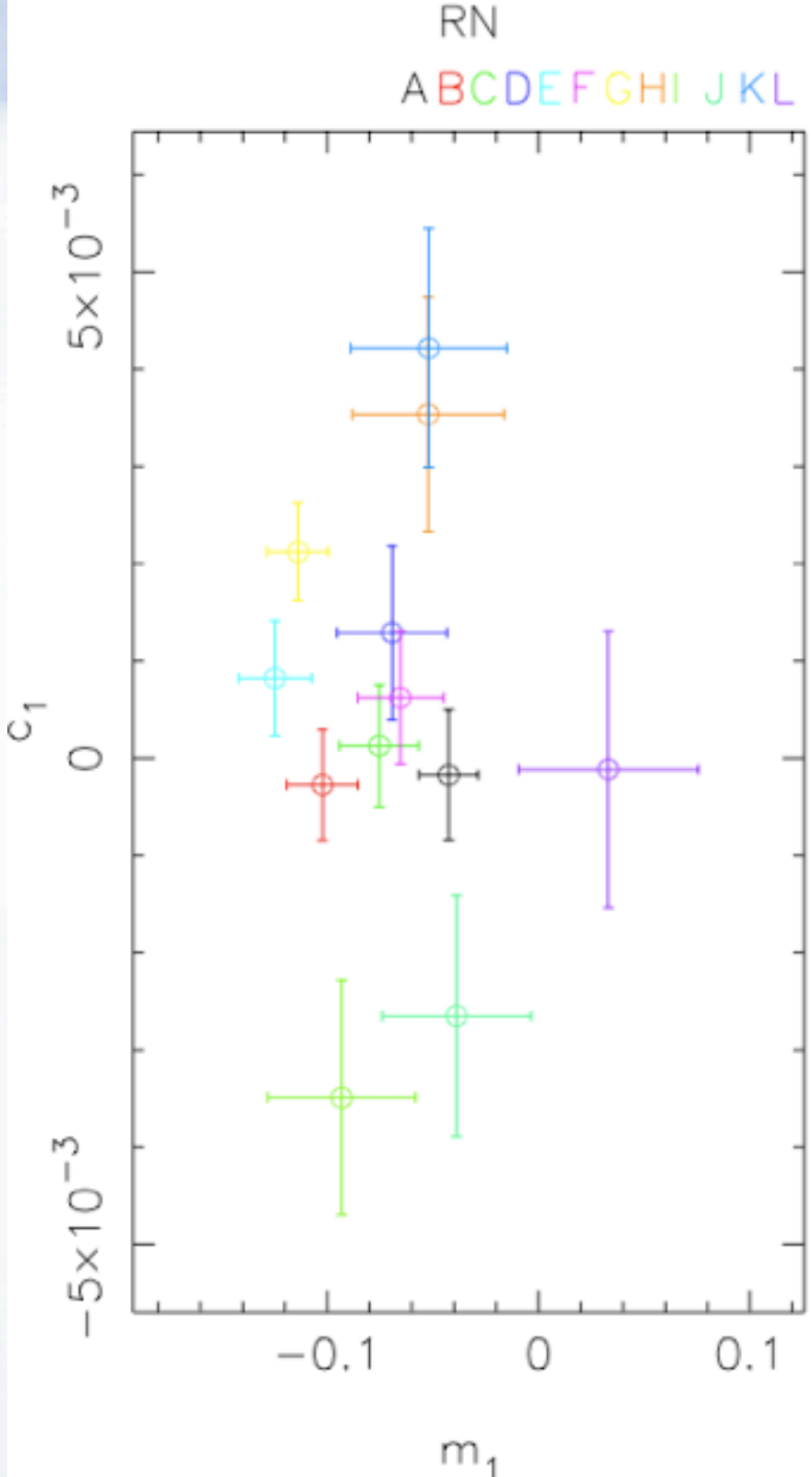
Stephane Paulin-Henrikson, KSB, low res PSF



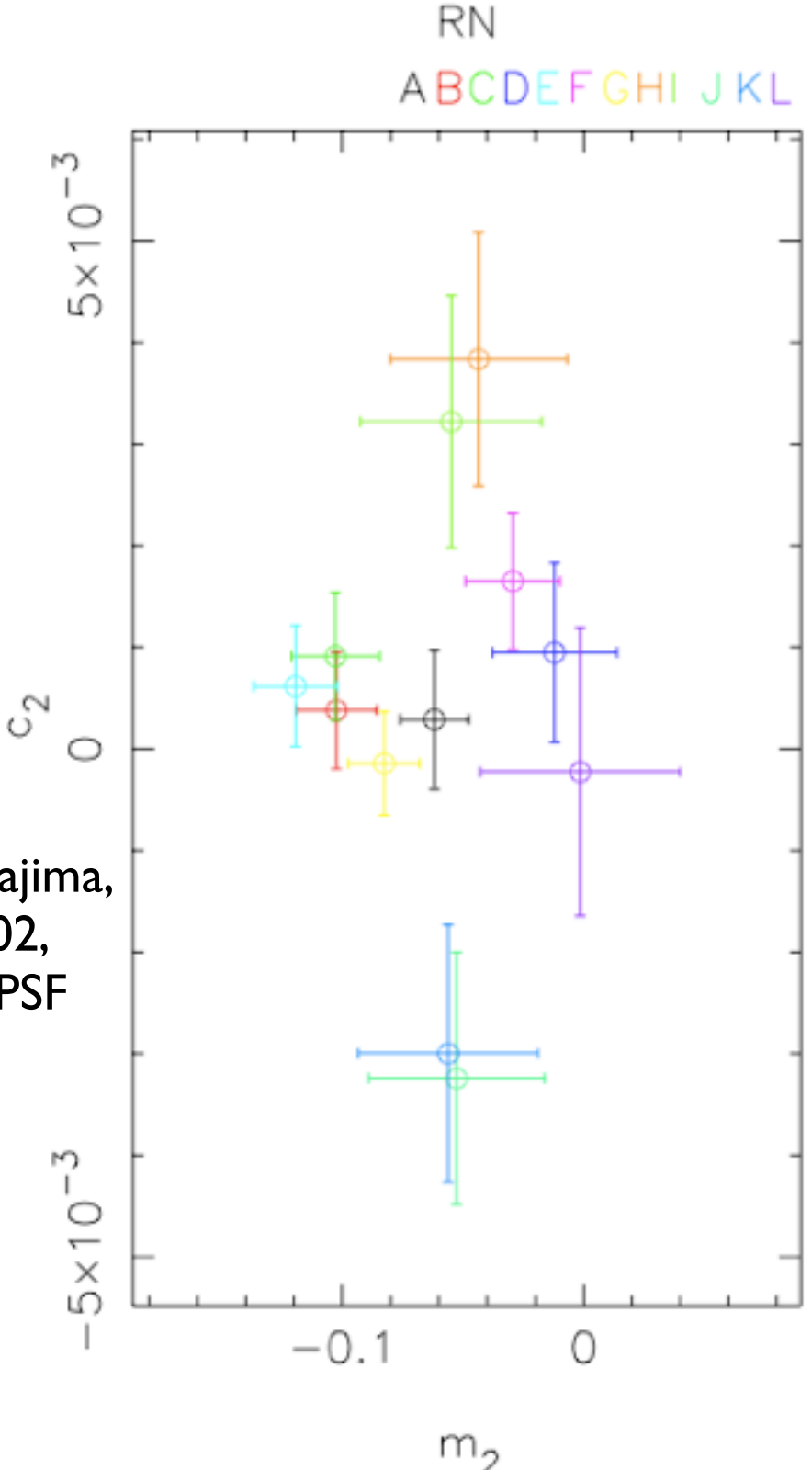


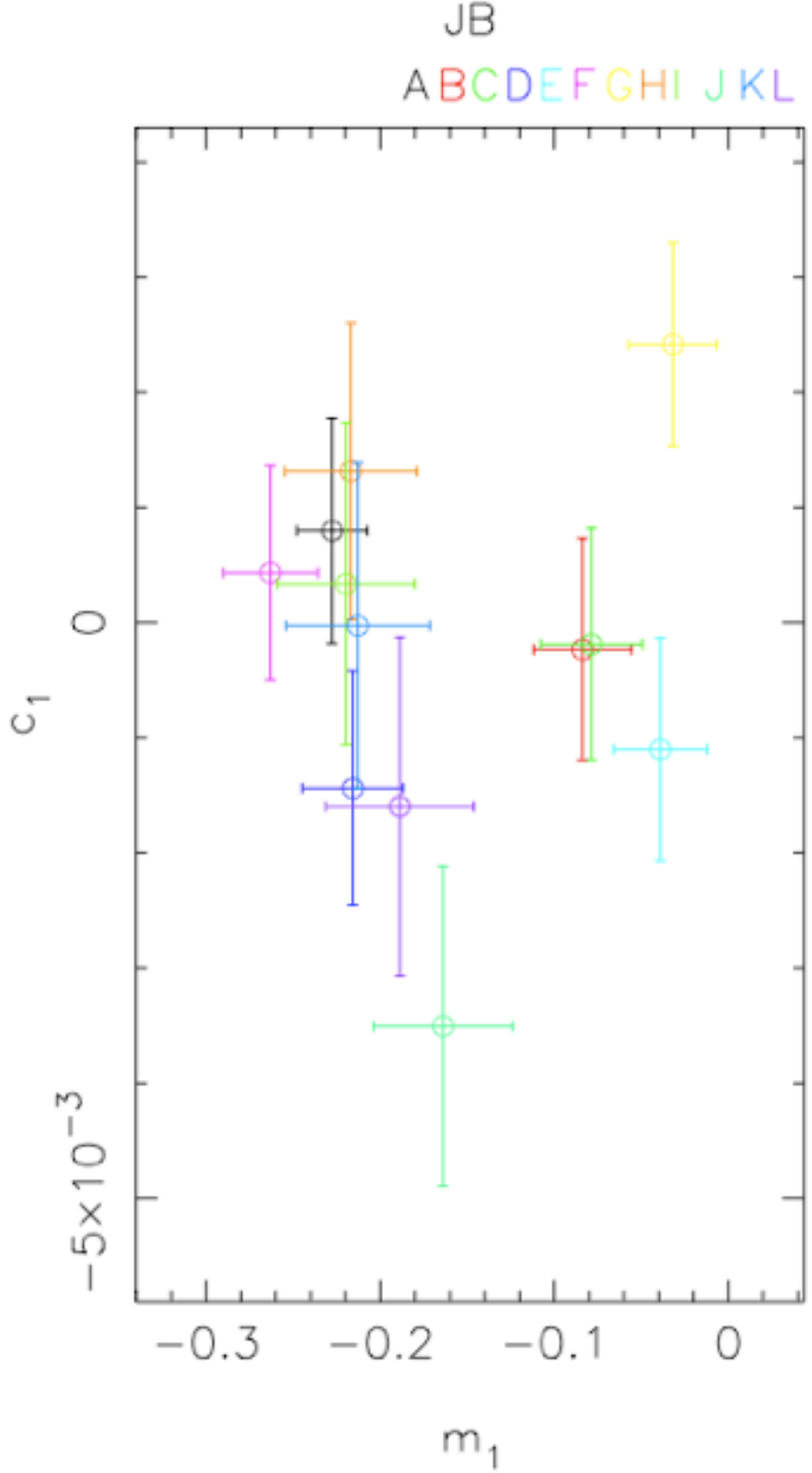
Rachel Mandelbaum, REGLENS, low res PSF



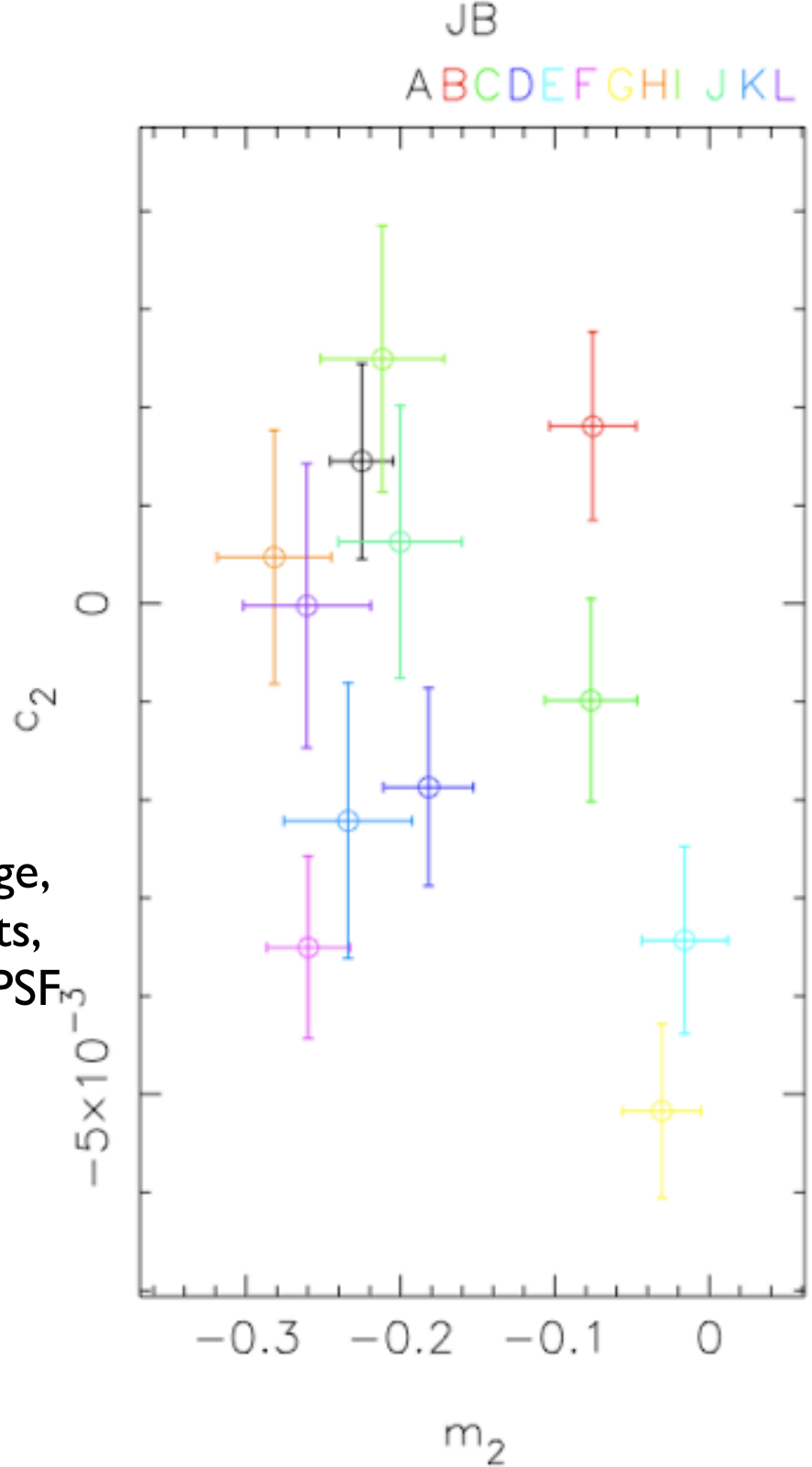


Reiko Nakajima,
EGL/BJ02,
low res PSF





Joel Berge,
Shapelets,
low res PSF



Trends?

Some methods are better for;

Blank = no trend

Method	Pix scale m	Pix scale c	ACS/SNAP m	ACS/SNAP c	Exp/ shapelet m	Exp/ shapelet c
TS						
T2						
RM	large		SNAP			
RN	small			SNAP		
JR					Shapelet	
JB	large				Shapelet	
CH				ACS		
SP						

Methods that have been applied to space-based data fair well

0.04
0.10

Lenser	ngals	m	c	m2	c2
TS	71± 3	-0.01± 0.01	0.001± 0.000	0.01± 0.01	0.001± 0.000
TS	57± 13	0.01± 0.01	0.001± 0.001	0.02± 0.01	0.001± 0.000
T2	71± 3	-0.07± 0.01	0.001± 0.001	-0.06± 0.01	0.001± 0.001
T2	57± 13	-0.06± 0.00	0.001± 0.000	-0.05± 0.01	0.001± 0.000
RM	159± 3	-0.10± 0.01	-0.007± 0.001	-0.10± 0.01	0.002± 0.001
RM	112± 25	-0.04± 0.00	0.018± 0.009	-0.02± 0.02	0.003± 0.002
RN	74± 7	-0.06± 0.01	0.001± 0.001	-0.03± 0.01	0.001± 0.001
RN	106± 25	-0.09± 0.01	0.001± 0.000	-0.09± 0.01	0.000± 0.000
JR	67± 0	0.03± 0.02	0.003± 0.000	-0.02± 0.02	-0.002± 0.001
JR	46± 9	0.07± 0.02	0.003± 0.001	0.00± 0.01	0.000± 0.000
JB	175± 7	-0.22± 0.01	-0.001± 0.001	-0.23± 0.01	-0.001± 0.001
JB	132± 28	-0.11± 0.03	0.000± 0.000	-0.10± 0.04	-0.001± 0.001
CH	105± 4	-0.05± 0.01	0.001± 0.000	-0.06± 0.01	0.000± 0.000
CH	101± 24	-0.02± 0.01	0.000± 0.000	-0.03± 0.01	0.000± 0.000
SP	64± 2	-0.19± 0.01	0.001± 0.000	-0.17± 0.01	-0.002± 0.001
SP	46± 7	-0.10± 0.01	0.000± 0.001	-0.11± 0.01	0.000± 0.000

On average methods are more accurate with the larger pixel scale, except for the JR and RN analysis

Summary

- Methods that have been applied to space-based data fair well (within 5% accuracy).
- Most methods perform the best on the larger pixel scale data.
- STEP3 is the space-based analogue to STEP1.

What next?

- Without rotated images we can't easily investigate mag/size dependence (although see Tims talk next), or PSF/galaxy type dependence.
- The dependence on pixel size is interesting and should be investigated further, (also see Wills talk tomorrow).
- In understanding the reliability of our results we have to consider all the caveats.
- The results are "politically-sticky".