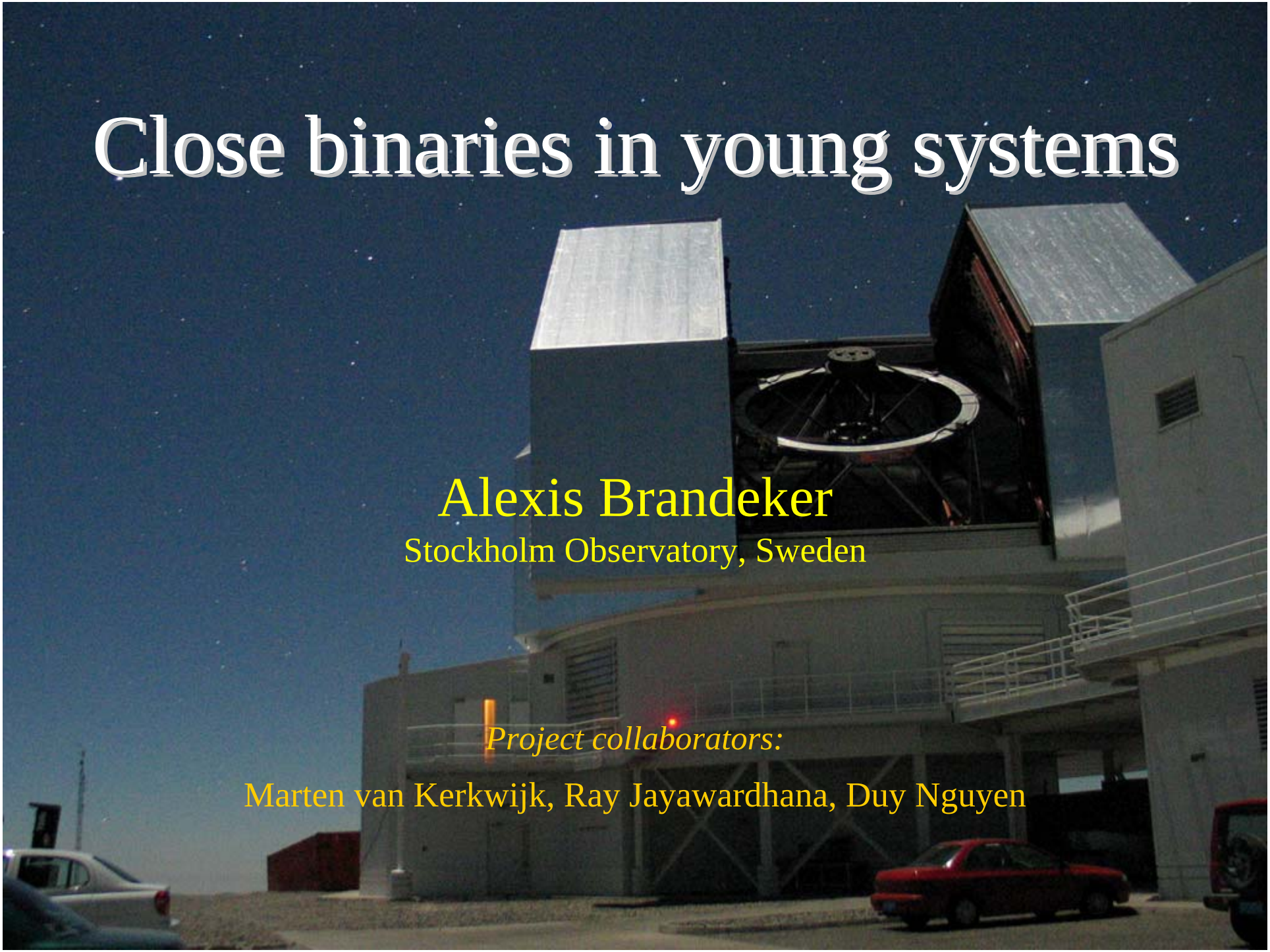
Close binaries in young systems



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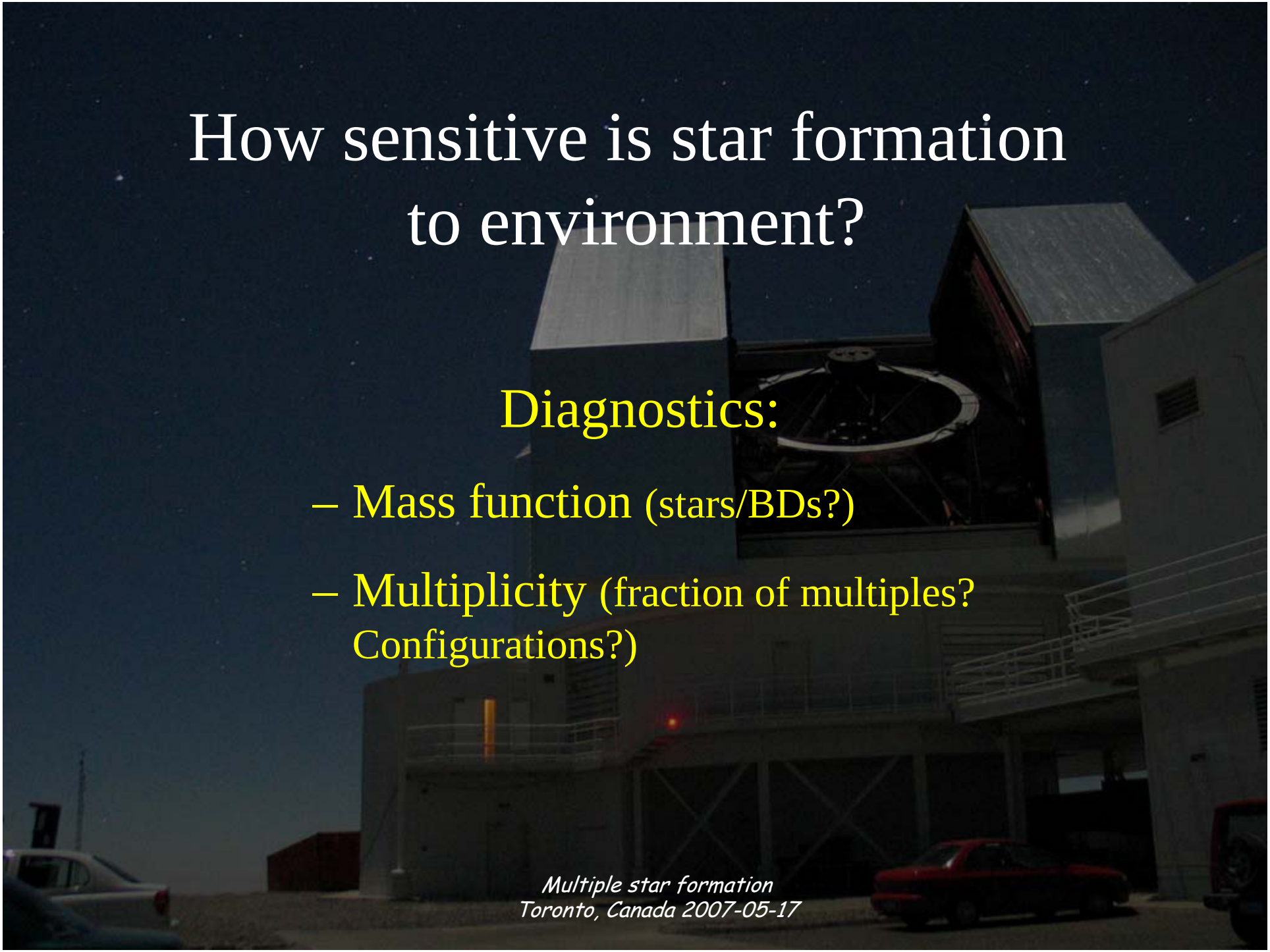


How sensitive is star formation to environment?

Diagnostics:

- Mass function (stars/BDs?)
- Multiplicity (fraction of multiples? Configurations?)

Determining multiplicity

- Adaptive optics surveys down to ~60 mas
- Optical interferometry: ~1 mas
- Radial velocity surveys: period~years (depending on patience)

- Completeness? @ 150 pc, 60 mas ~ 27 yr
  @ 50 pc, 60 mas ~ 5 yr!

Close companion programme

Radial velocity survey of 141 stars in young (< 100 Myr), nearby (< 100 pc) groups:

η Cha	~8 Myr	97 pc
TWA	~8 Myr	20-100 pc
BPMG	10-20 Myr	10-40 pc
TucHor	20-30 Myr	40-60 pc
AB Dor	50-100 Myr	20-50 pc

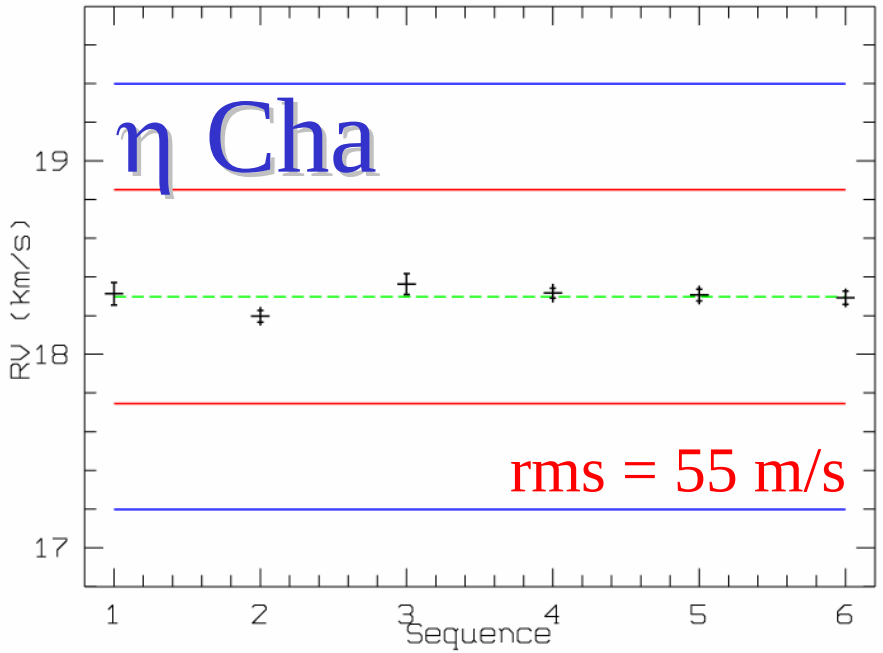
Close companion programme

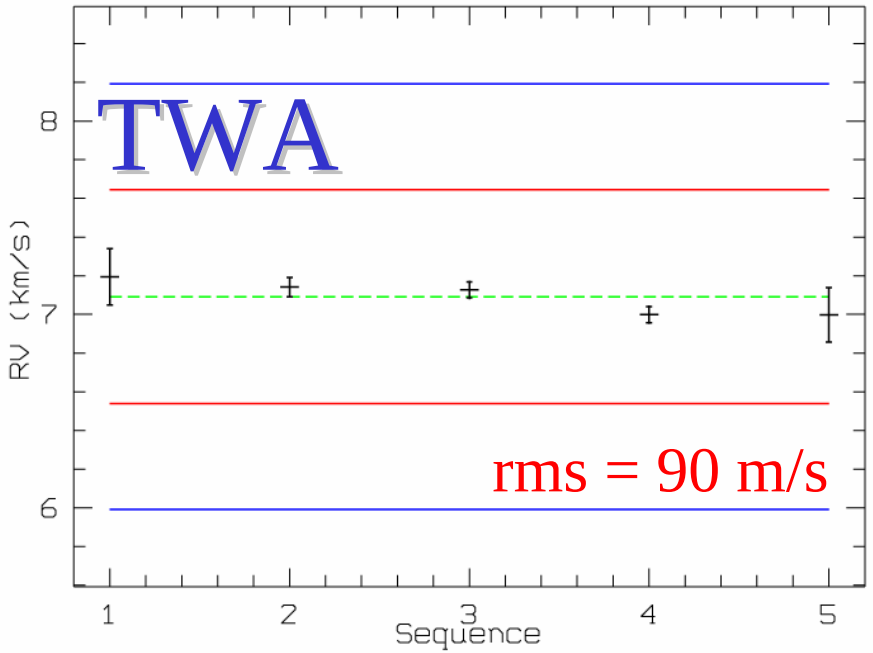
Target selection:

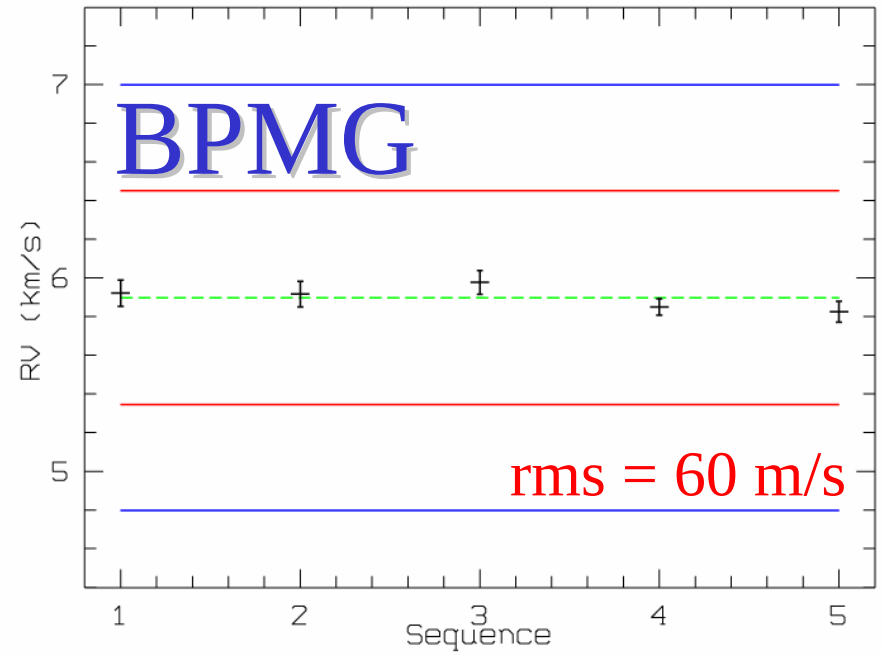
- All known members of SpT later than F5 (< 2 M_{Sun})
- Visible from Las Campanas ($\delta < +30°$).
- Brighter than R=14 (earlier than M5)

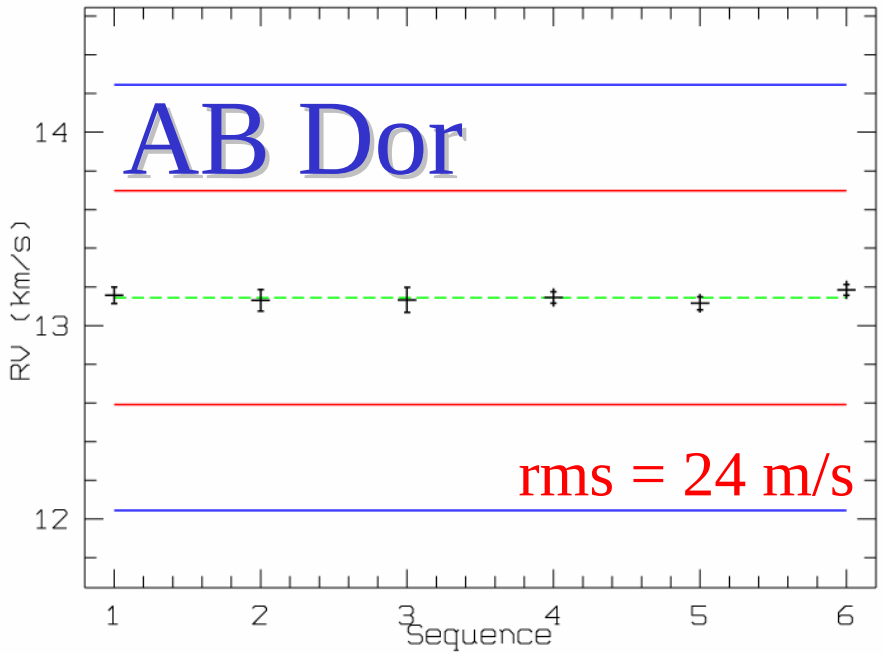
Close companion programme

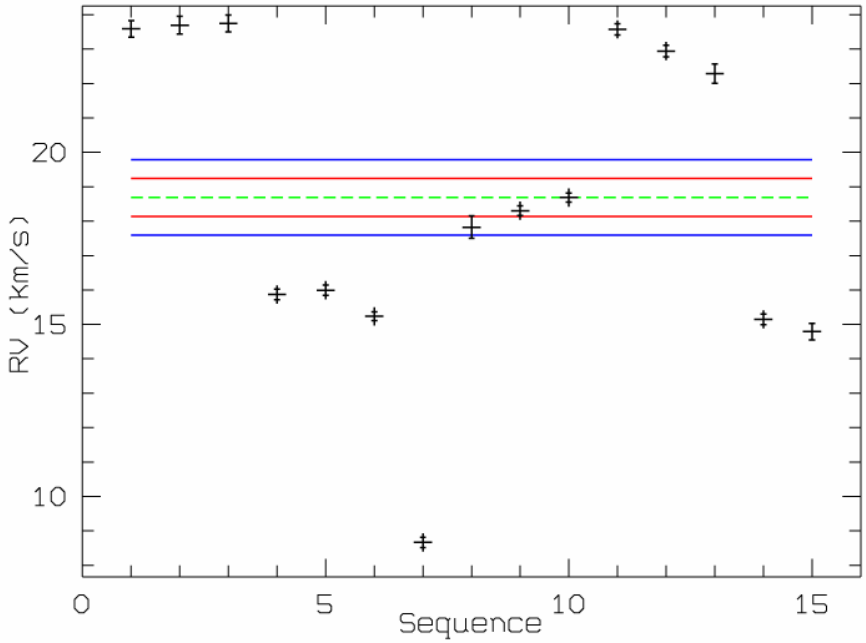
- Telescope:
  Clay/Magellan 6.5m at Las Campanas, Chile
- Instrument:
  MIKE, High resolution echelle spectrograph (R~55000)
- 30 bright nights distributed over 2 years
- ~2200 spectra obtained

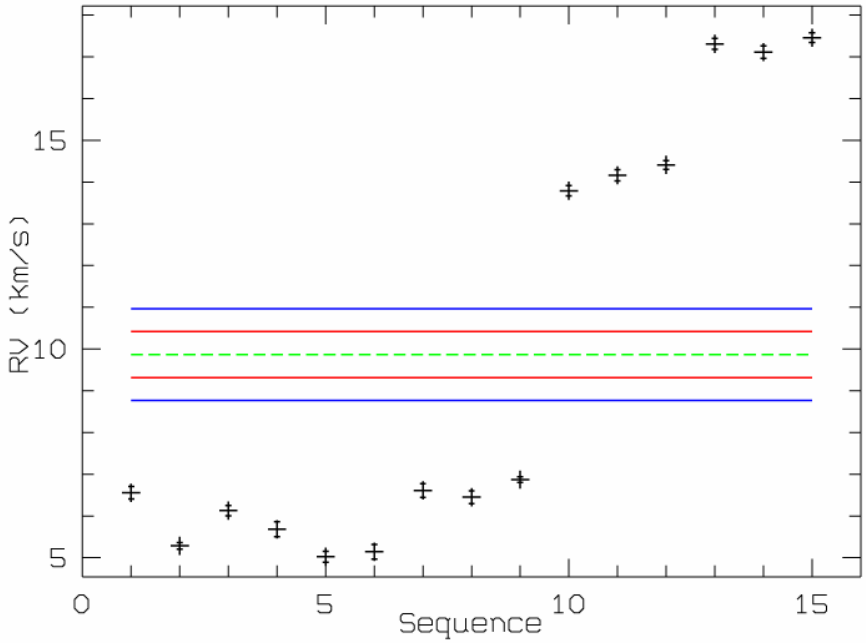

η Cha
RV (Km/s)
19
18
17
rms = 55 m/s
1
2
3
4
5
6
Sequence

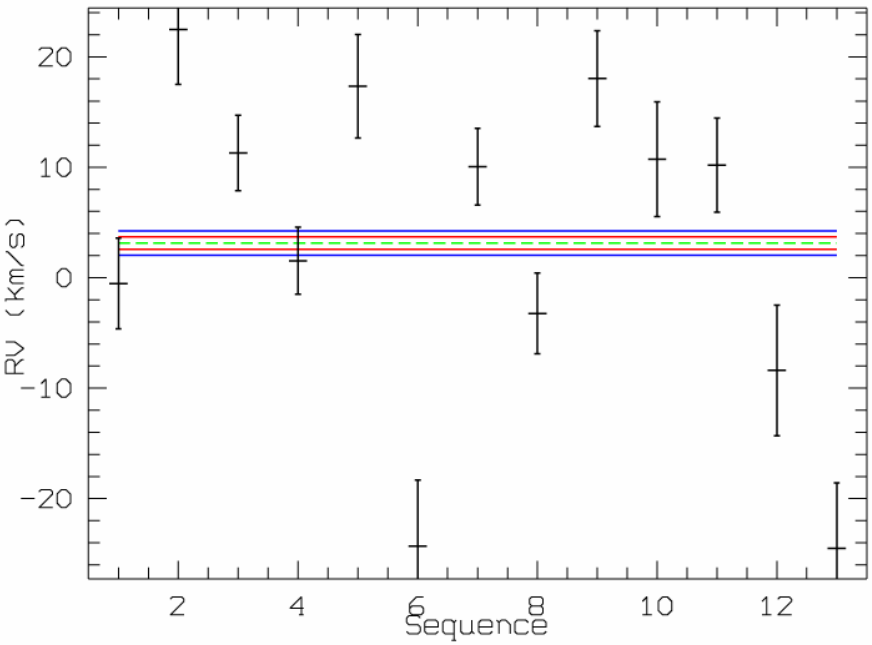

TWA
RV (Km/s)
8
7
6
rms = 90 m/s
1
2
3
4
5
Sequence

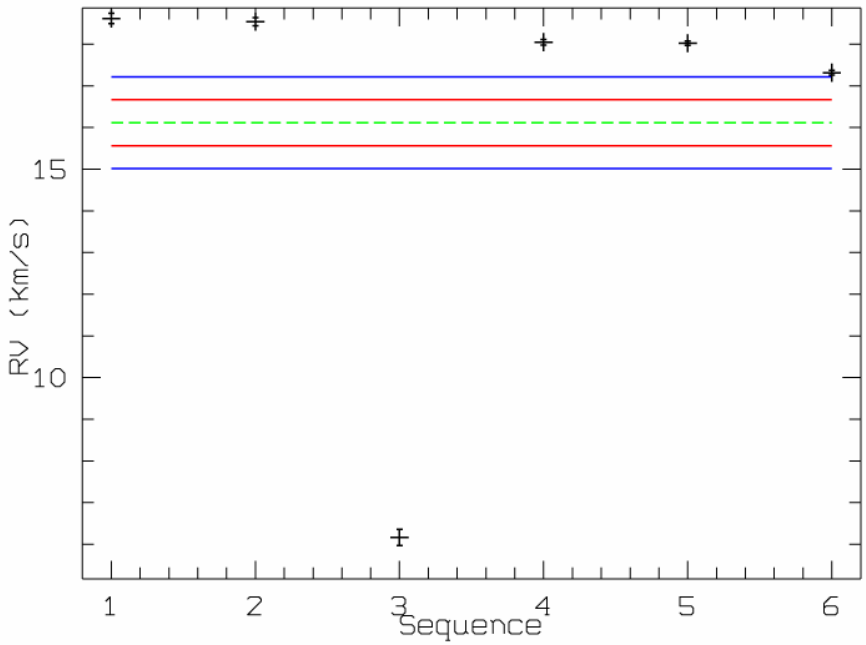

BPMG
RV (Km/s)
7
6
5
rms = 60 m/s
1
2
3
4
5
Sequence


AB Dor
RV (Km/s)
14
13
12
rms = 24 m/s
1
2
3
4
5
6
Sequence


RV (km/s)
Sequence
20
15
10
0
5
10
15

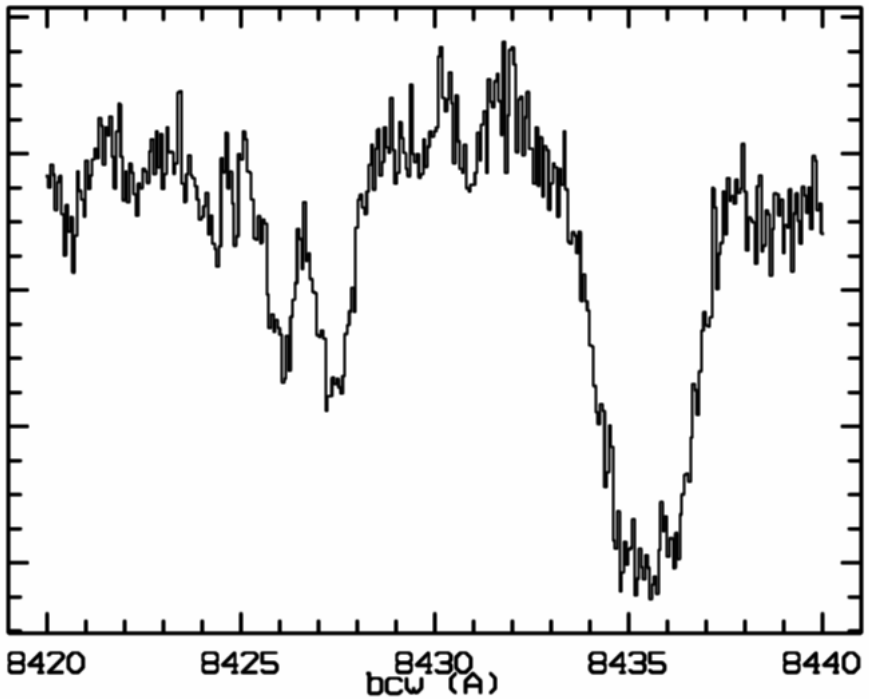

RV (km/s)
Sequence
15
10
5
0
5
10
15


RV (km/s)
Sequence
20
10
0
−10
−20
2
4
6
8
10
12

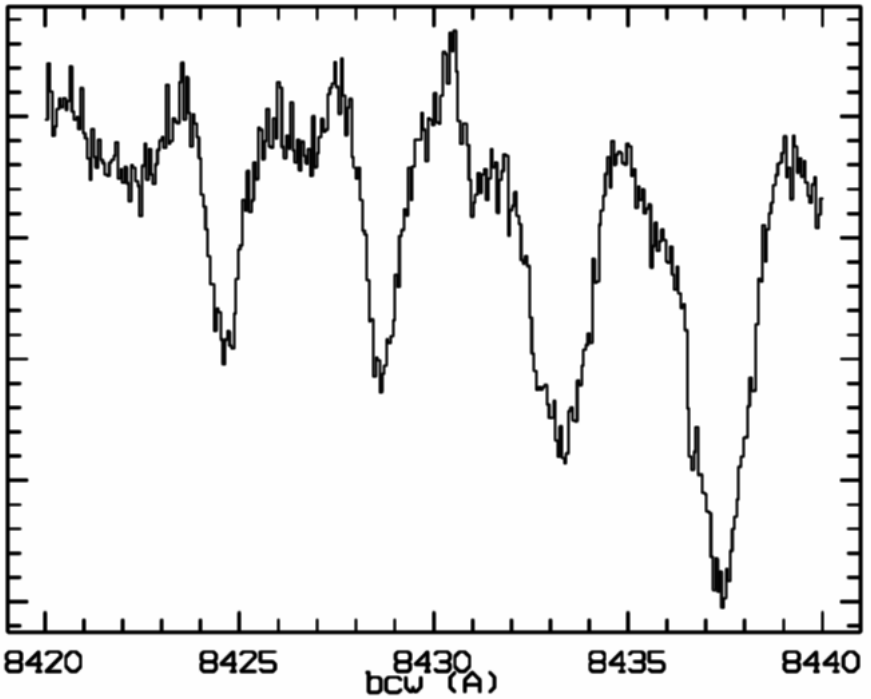

RV (km/s)
Sequence
15
10
1
2
3
4
5
6

Example:
TWA 22

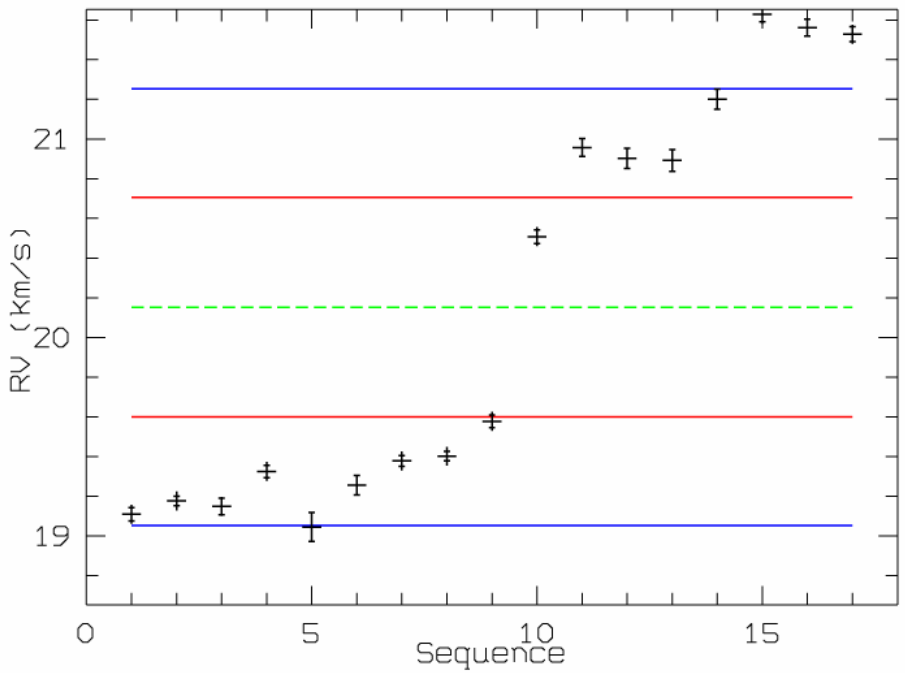
Epoch 1



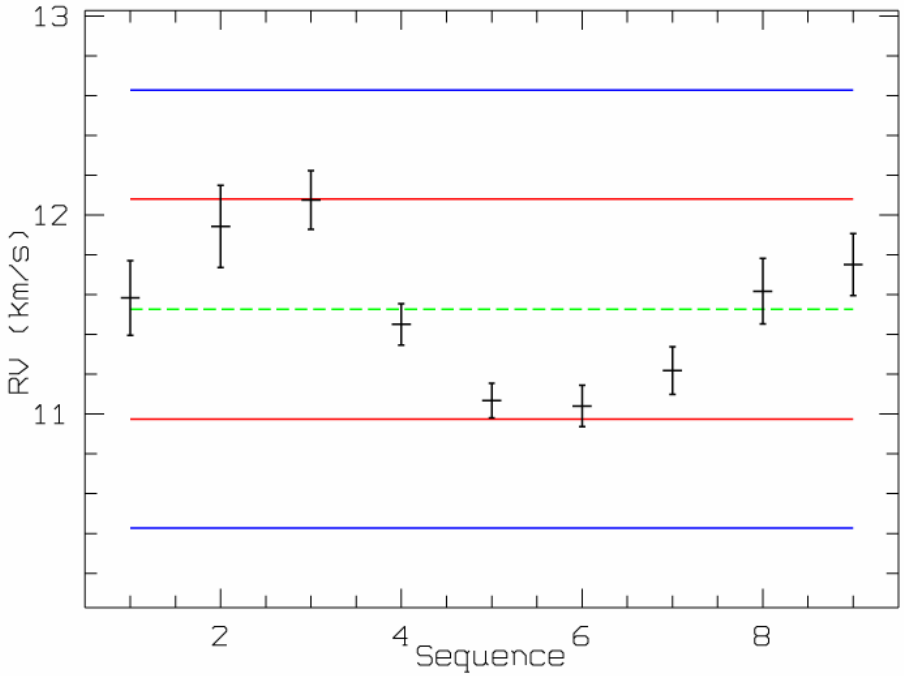
Epoch 2



BD candidate (P~4 yr)



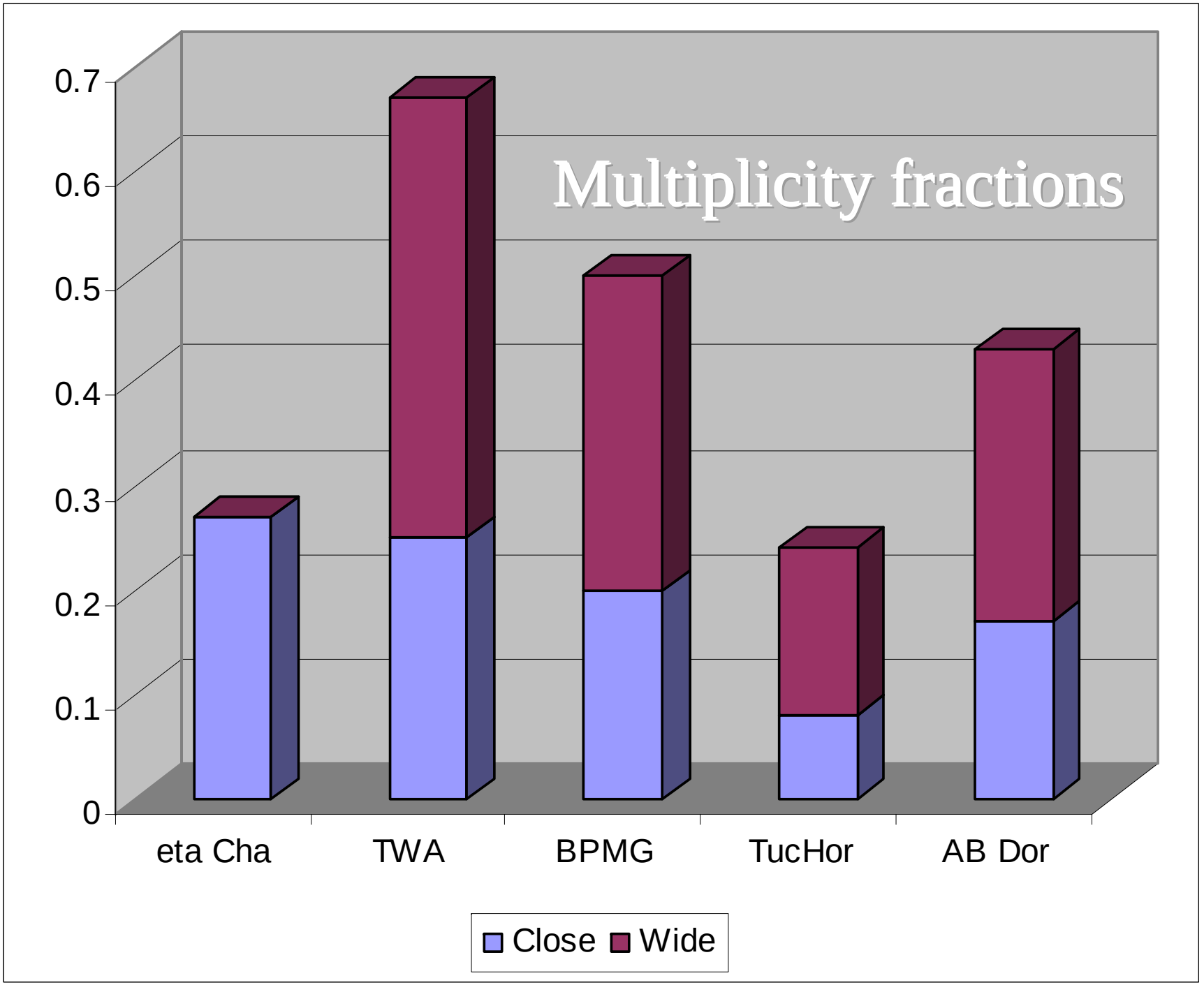
Planet candidate (5 M_J)

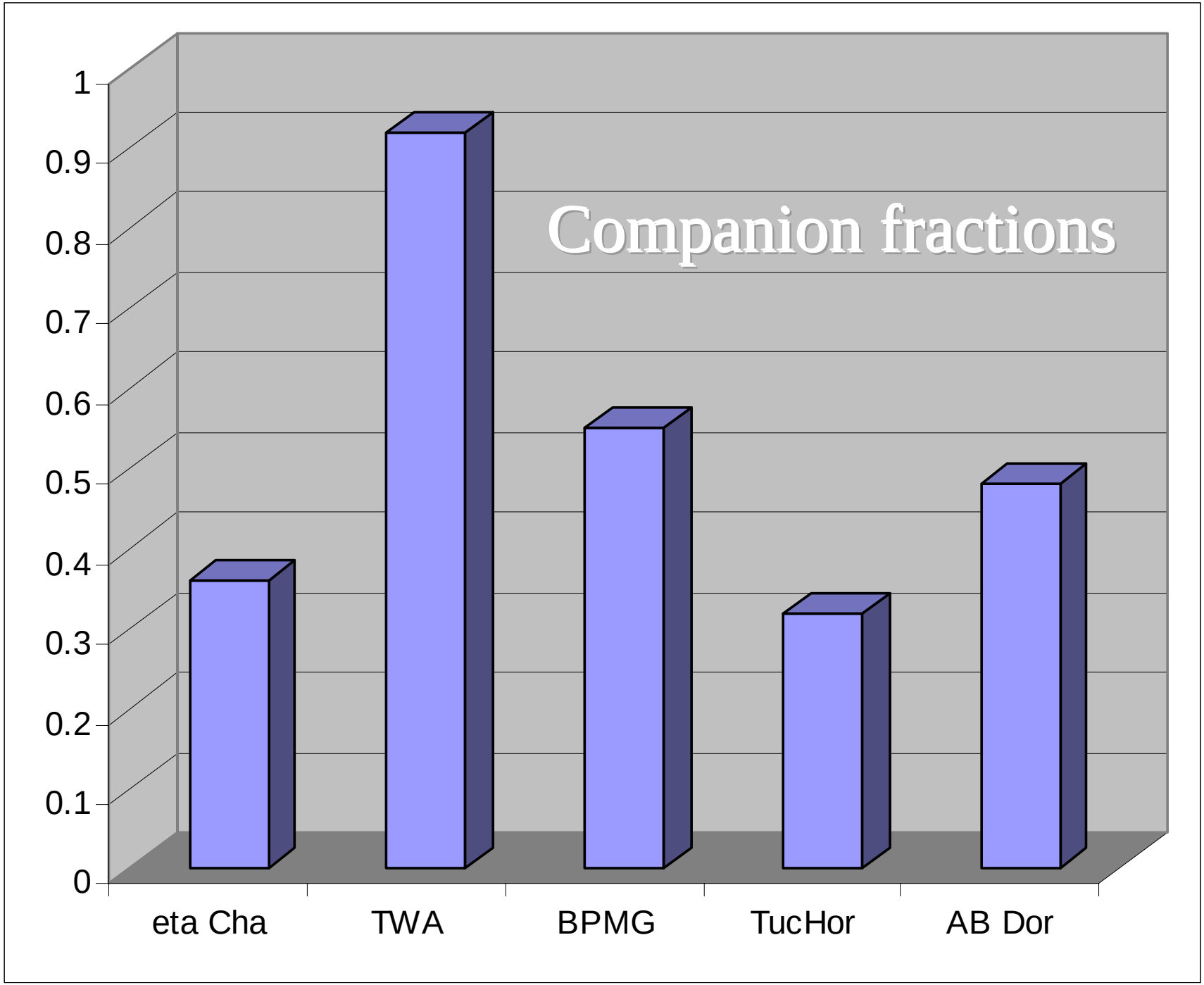


Combined result

$$MSF = (42 \pm 5)\ \%$$

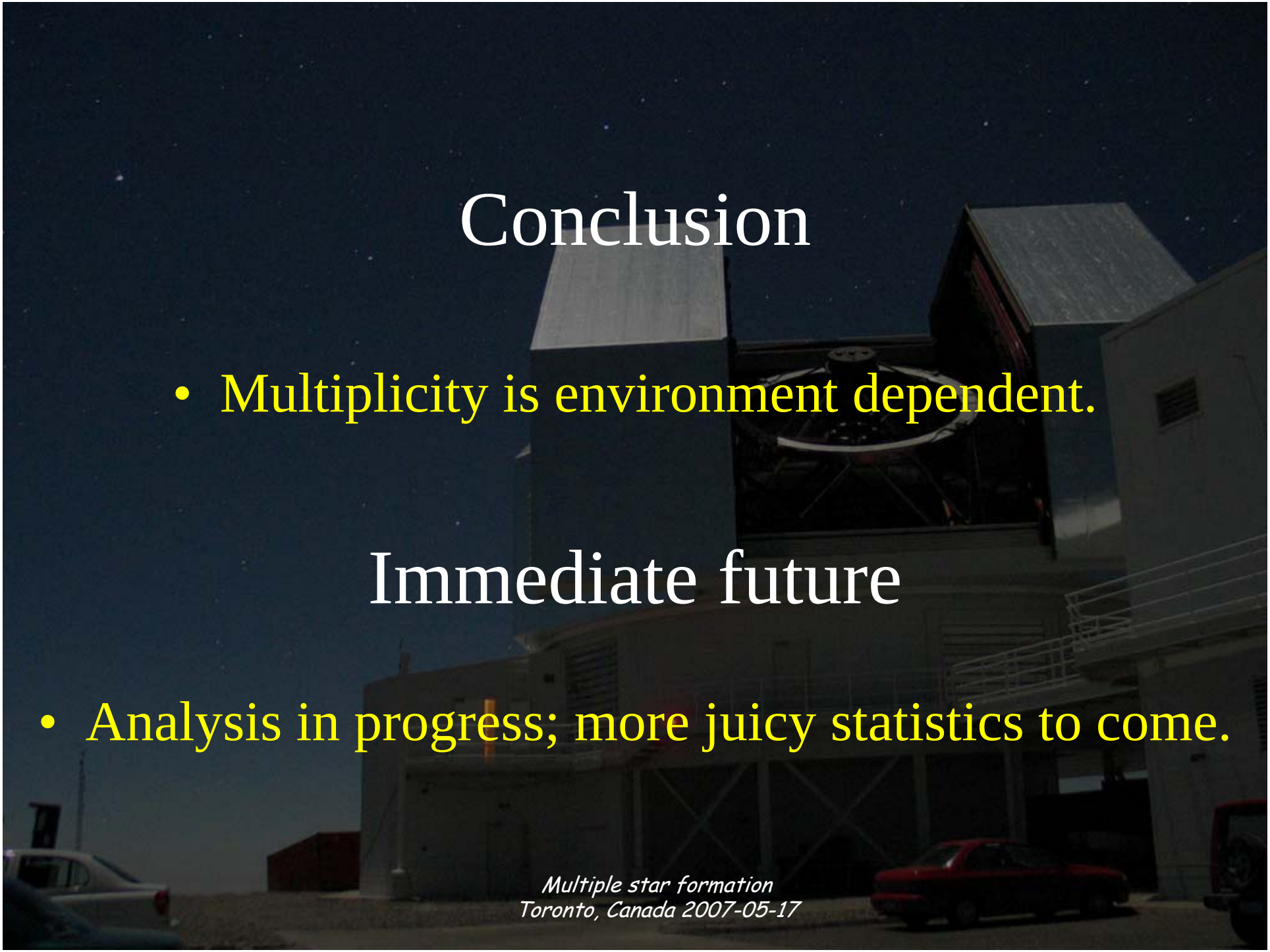
$$CSF = (52 \pm 4)\ \%$$


Multiplicity fractions
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
eta Cha
TWA
BPMG
TucHor
AB Dor
Close
Wide


Companion fractions
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
eta Cha
TWA
BPMG
TucHor
AB Dor

Other results

- Lithium dating (Mentuch et al., in prep)
- Rotation-accretion connection (Jayawardhana et al. 2006)
- Rotation-activity connection (Scholz et al. 2007)
- Dynamics (N/A)



Conclusion

- Multiplicity is environment dependent.

Immediate future

- Analysis in progress; more juicy statistics to come.