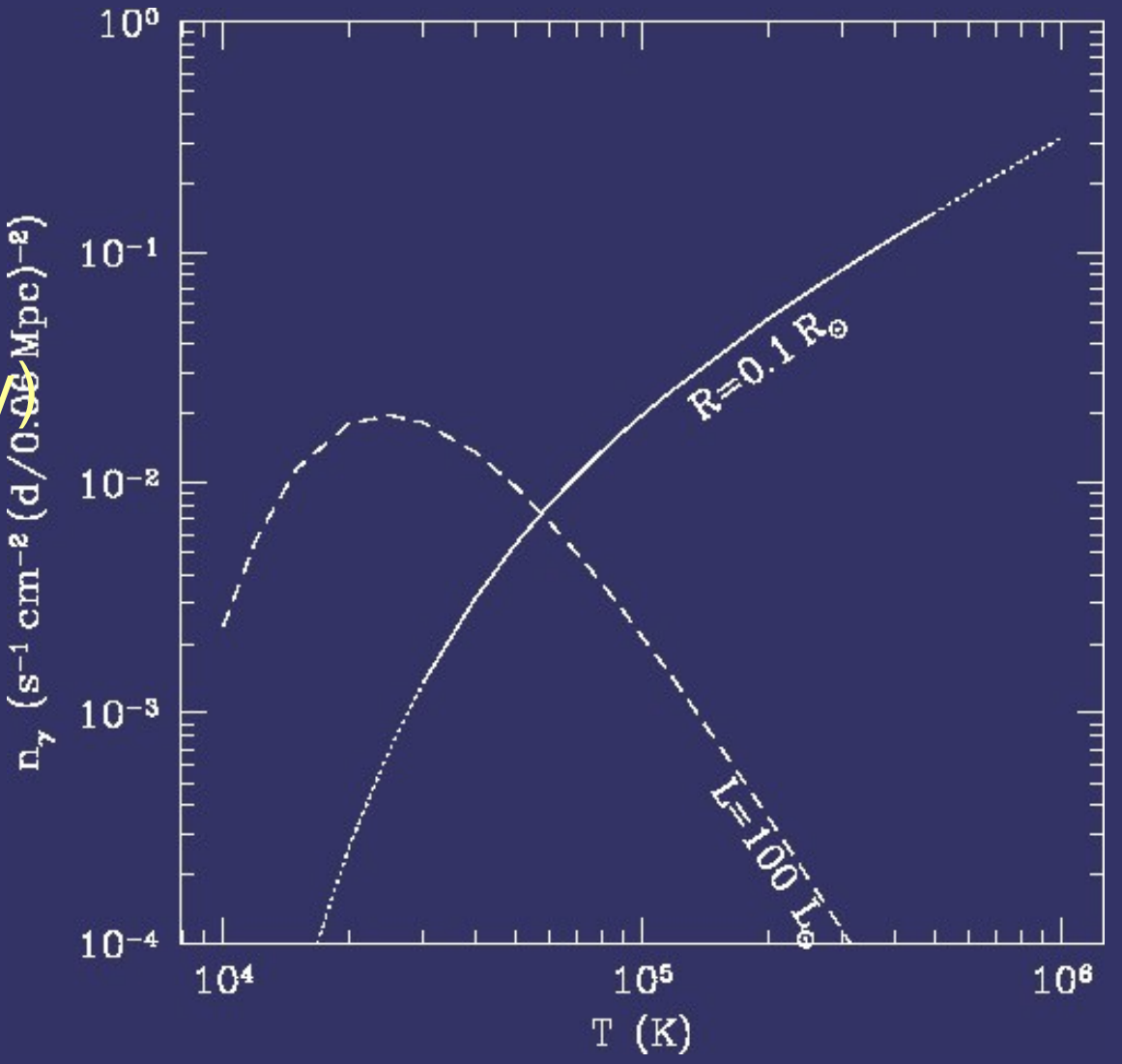
Ultraviolet monitoring of stars (in a Magellanic cloud?)

SMC in FUV
from HUT

Marten van Kerkwijk

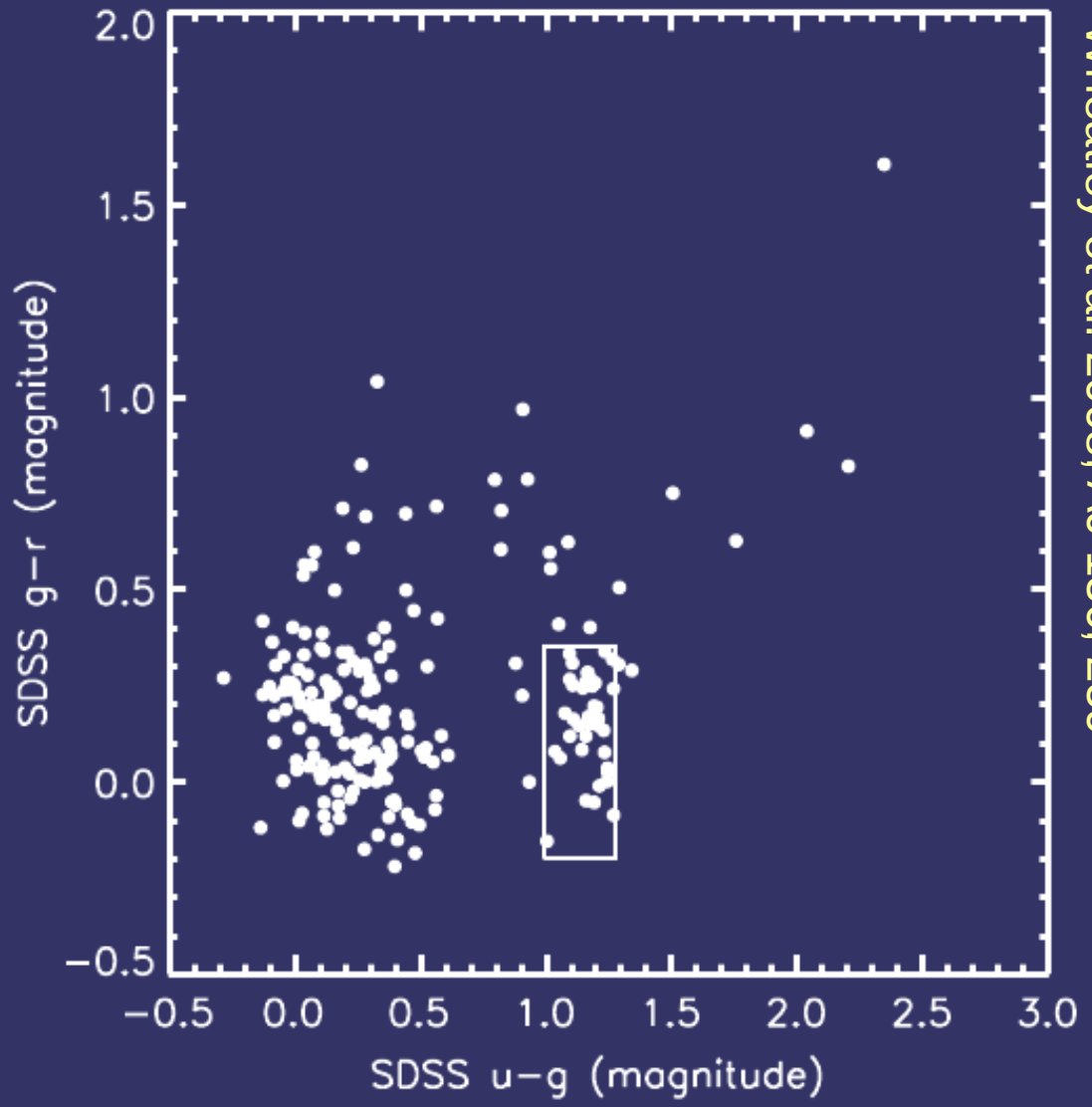
Ultraviolet

* 30,000 < T < 500,000
  (RJ in opt; faint in X-ray)
* Hot stars
  OB
  He *: WR, sdOB
  C *: ?
  WD
* Accretion
  Direct impact on MS
  Disks around WD
* Shocks with v~100 km/s
  colliding winds



Ultraviolet variables & transients

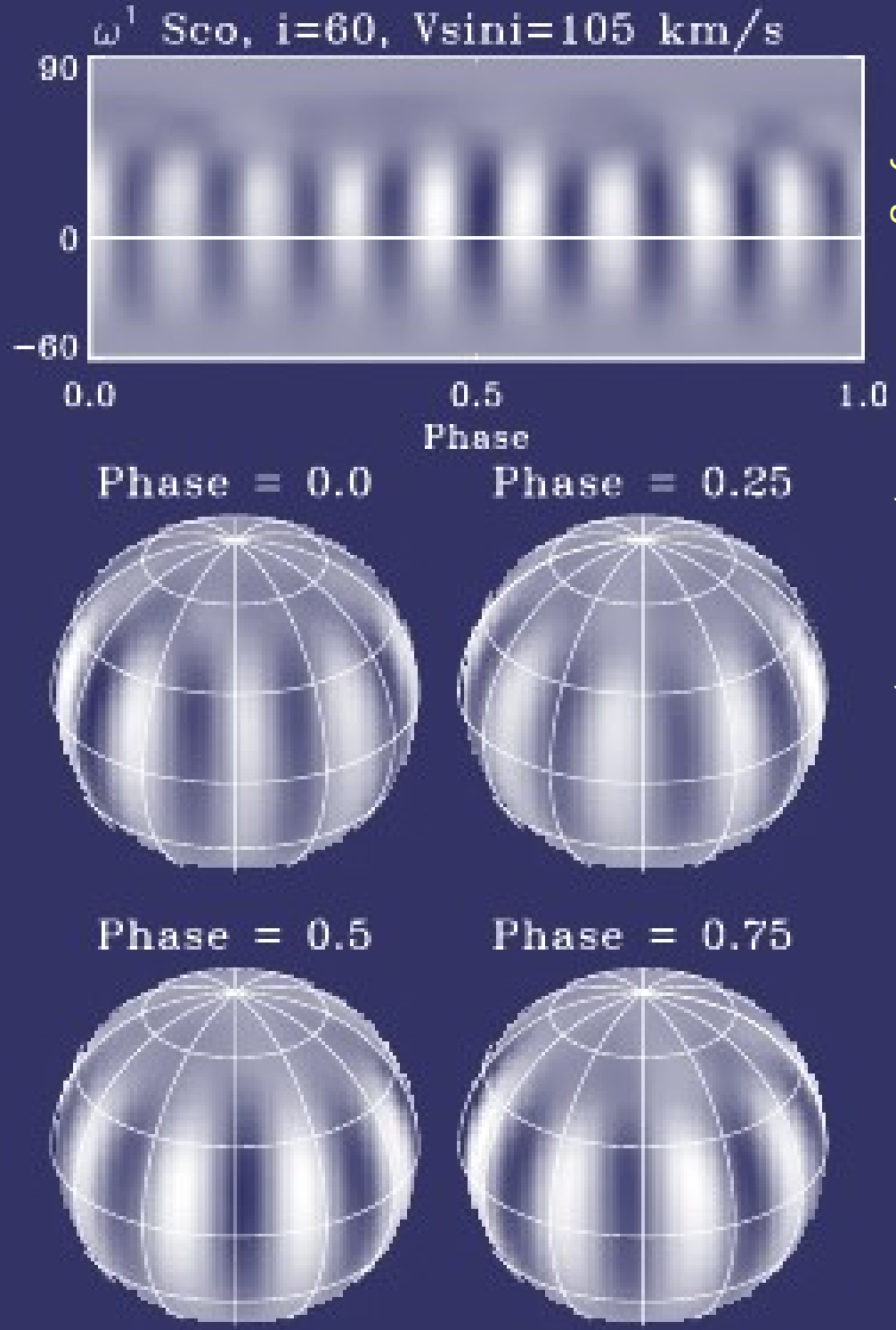
* Galex variables
  QSOs
  RR Lyrae
  Dwarf novae
* Galex transients
  M * flares
  Dwarf novae



Wheatley et al. 2008, AJ 136, 259

Pulsations Rotation

- OB, sdOB, etc.
  Pulsations stronger in UV, hence easier to detect.
  (Goal of BRITE, on <100 brightest stars)
- Young stars
  Rotation periods

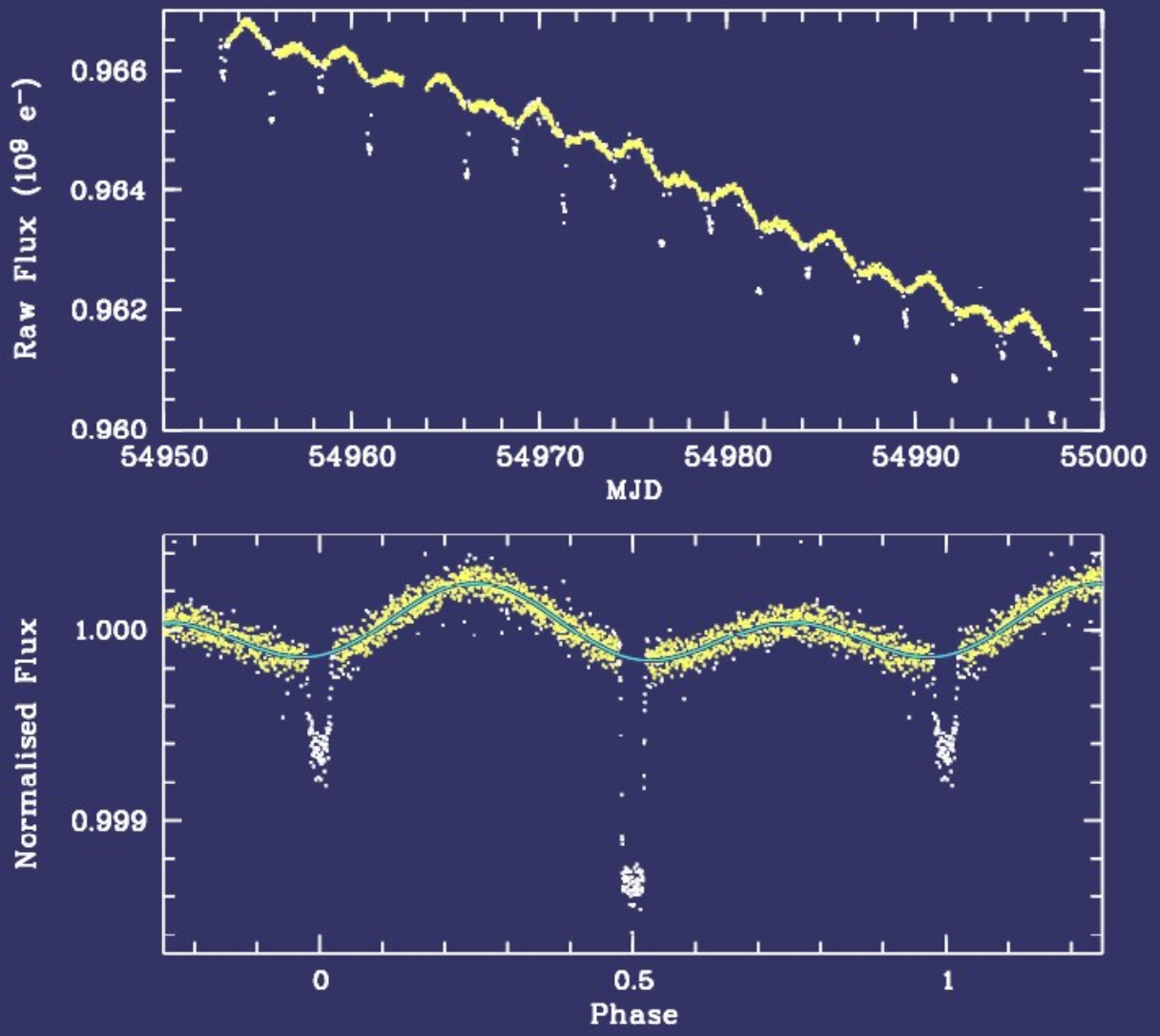


Berdyugina et al. 2003, A&A 406, 281

Eclipsing Binaries

* OB+OB
  M, R, L
  (better in UV)
* OB+AFG...
  Companion MF
* (O)B(e)+sdOB
  (cause of Be phen.)

* sdOB+?
  Companion types
  (WD, MS -> bin. evol.)
  Doppler boosting?

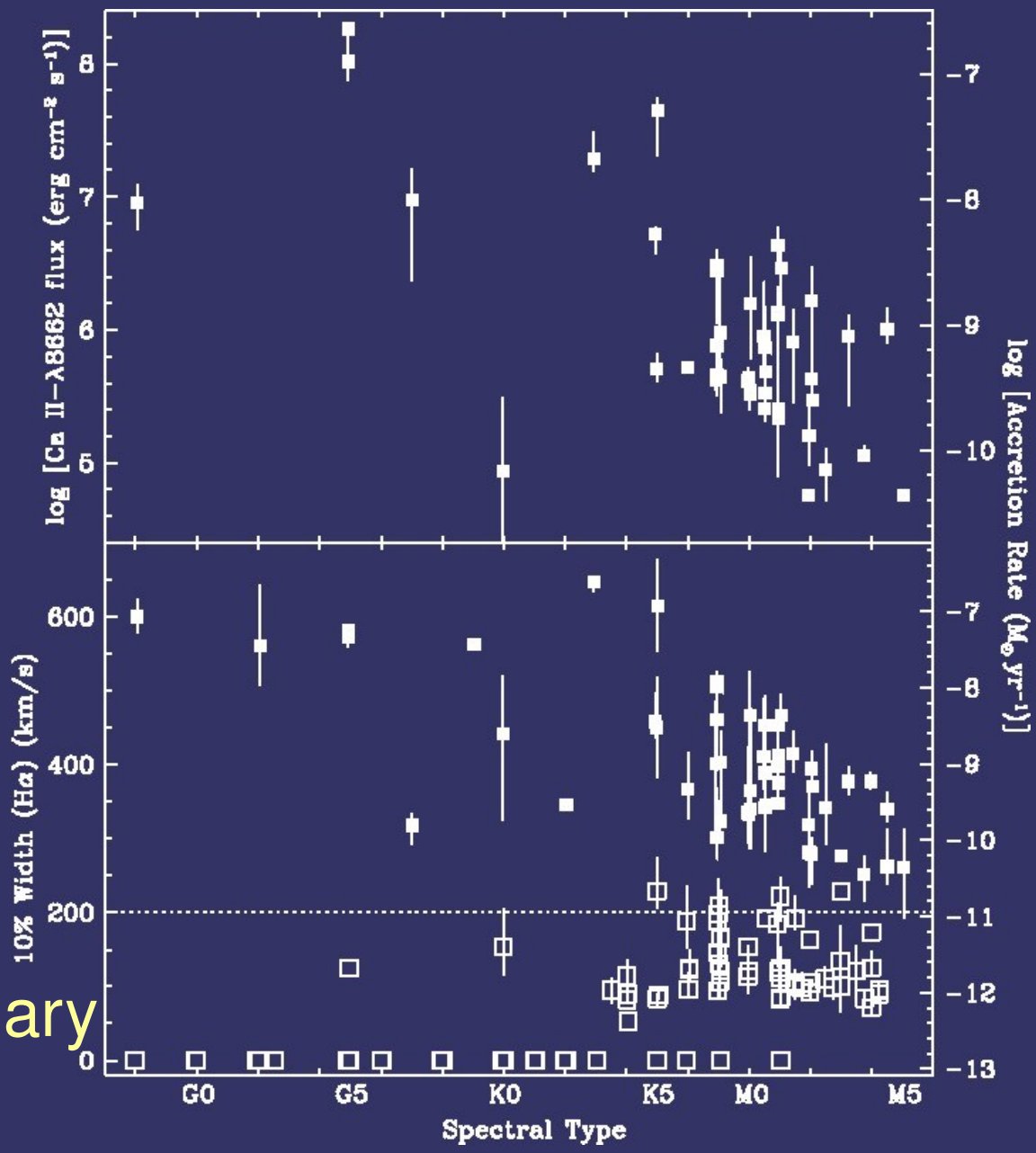


* Also nice lightcurves of known systems such as SMC X-1

Accretion, Interaction

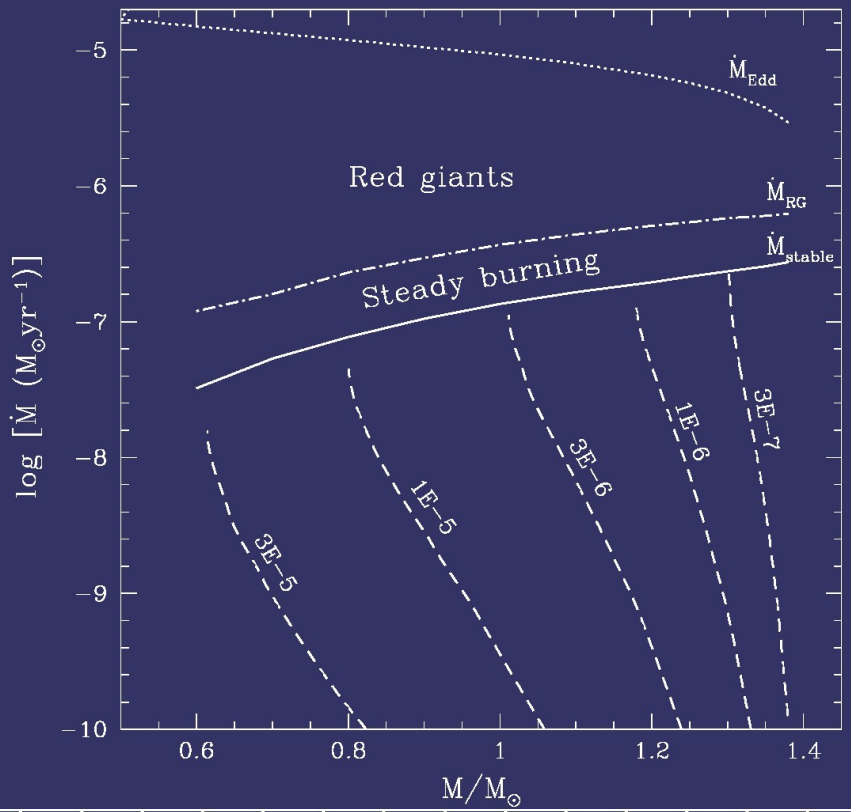
- On young stars
  Get Mdot+variation
  (with time, object)
  Rotational modulation
  FU Ori outbursts
- In binaries
  Disk instability
  Direct impact in MS binary
  Eccentric binaries?
  (Equiv. to Be/X-ray,
  also AGB+WD/MS)

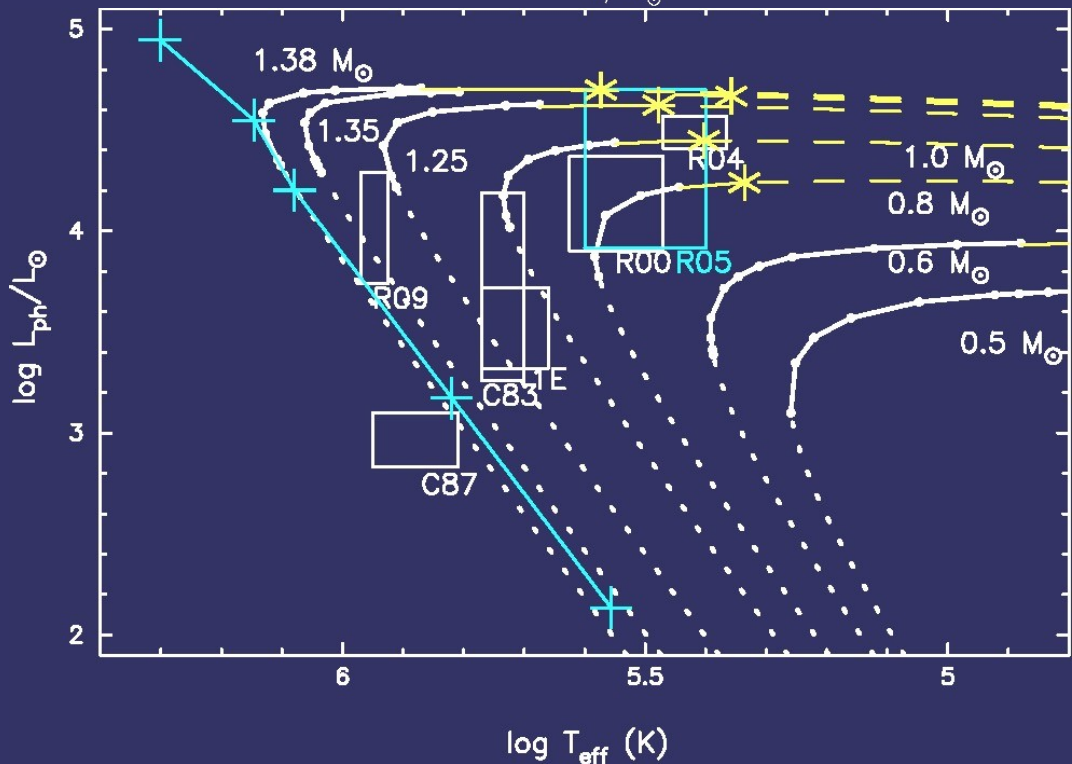
Nguyen et al. 2009, ApJ 649, L153



Accreting White dwarfs

- At low M: novae
  (plus supersoft afterglow?
  Esp. for He WD)
- Intermediate: SSS
- Higher: USS?
  Optically thick wind or
  loss via L2?
  Should exist, but not yet
  known. Easy(?) to find
  in UV.





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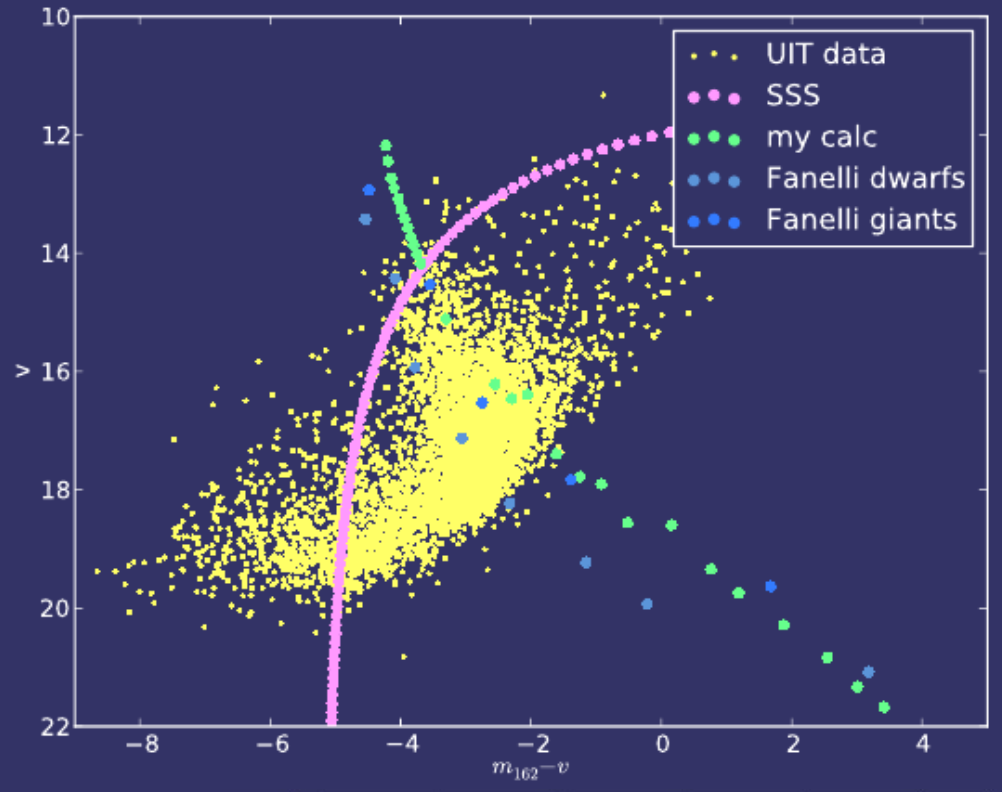
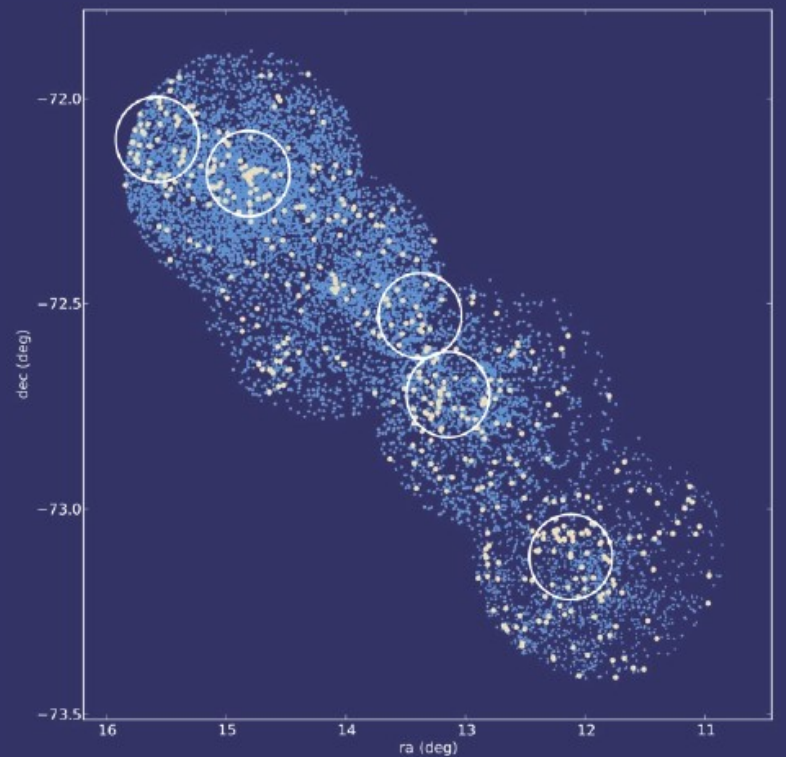
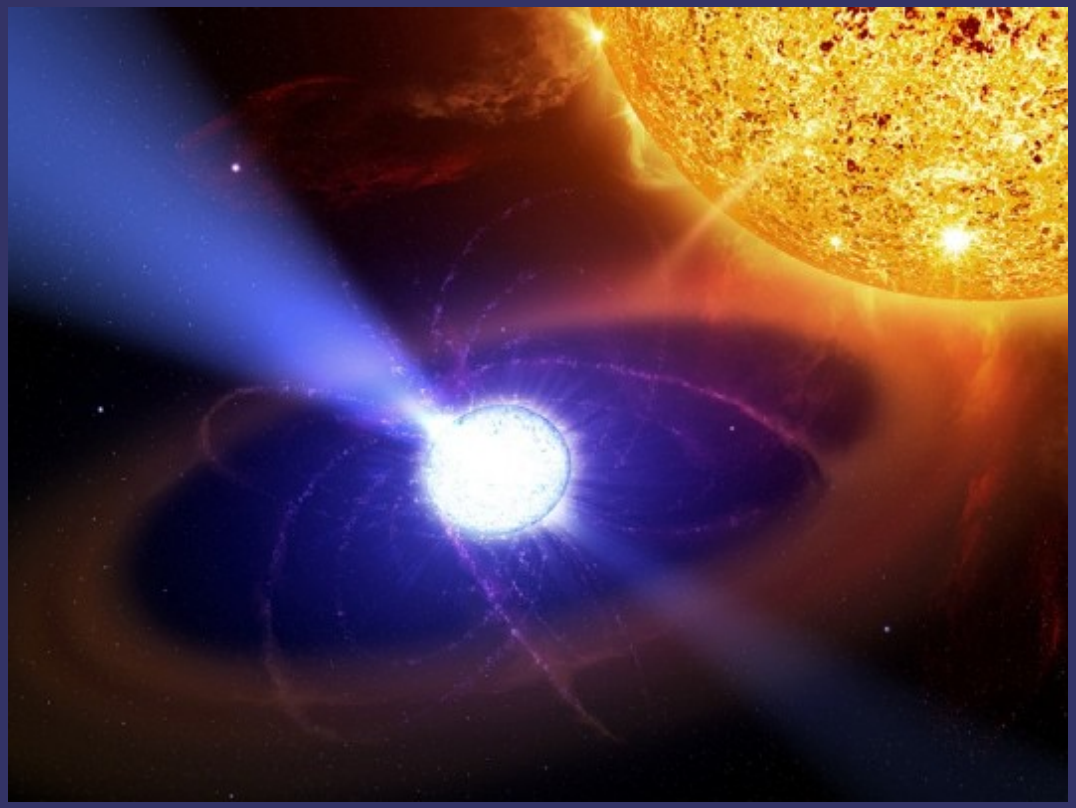




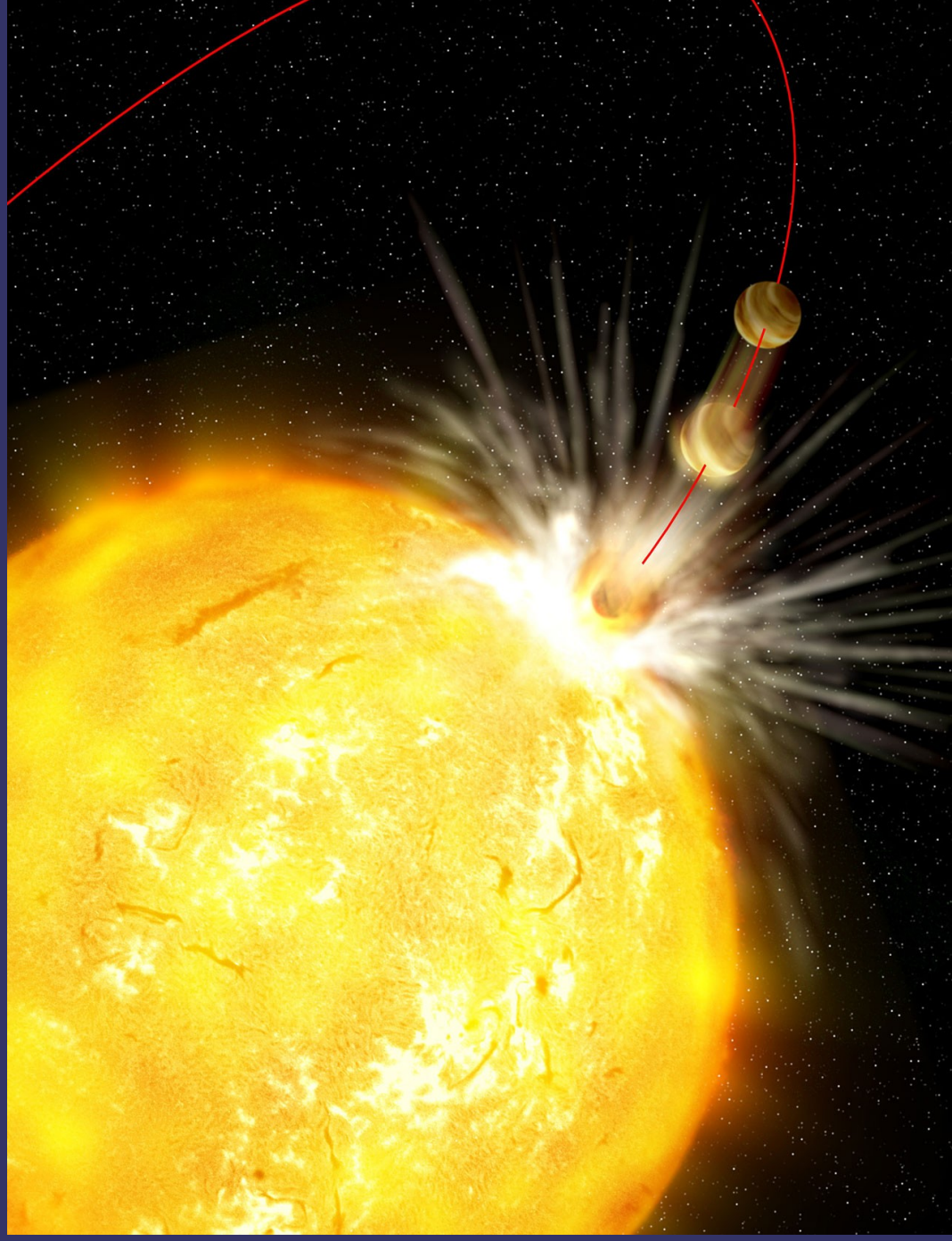
New types of Variables

- Main-sequence “polars” (using, say, Ap star)
- Episodic accretors (of, say, Be star disk or AGB superwind)
- Colliding winds (slower than usual)



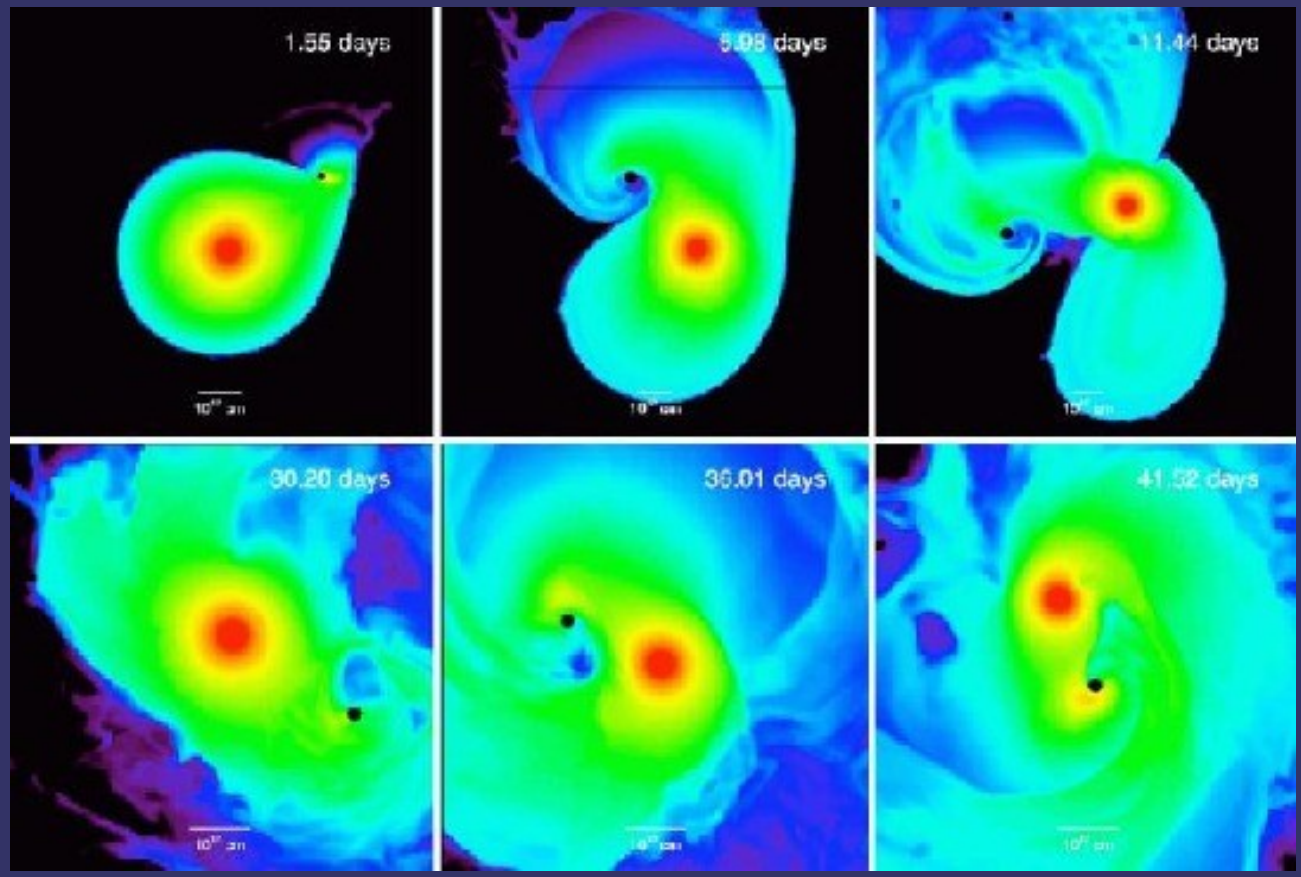
New types of Transients

* He novae
* Young stars swallowing planets (or BD for OB *)
* Stellar collisions in 47 Tuc or star-forming regions (likely too rare)



(Life-ending of -changing events too rare;
need to see those in background).

Common envelope

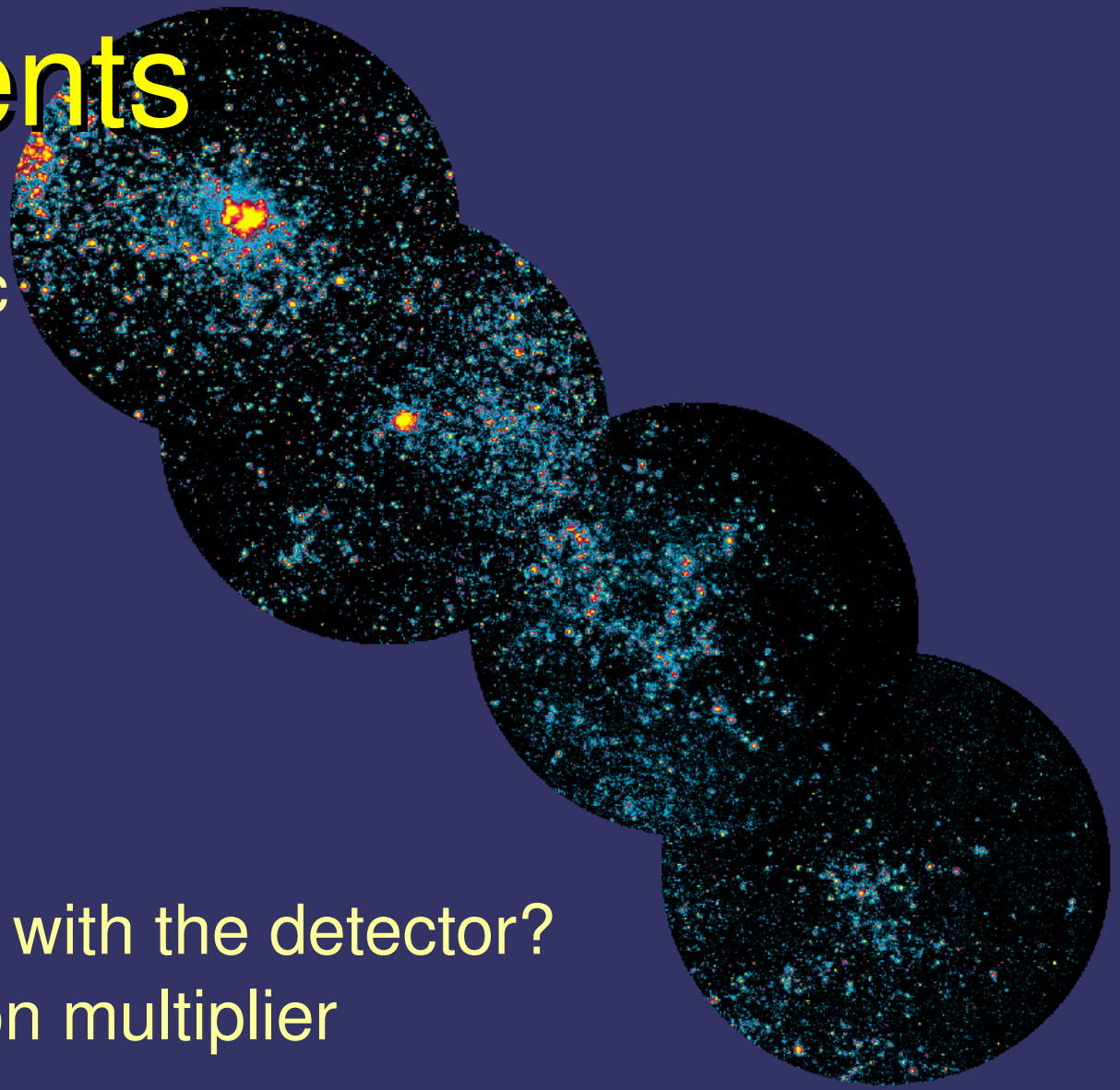


* Process unclear
* Could we find progenitors: eccentric systems with episodic mass transfer (massive systems, unable to circularise)
* Find interesting descendants? (PN cores in binaries)

My picks

- Mass tranfer on the main sequence,
  also before mass ratio reversal
  (direct impact? eccentric?)
- Cause of Be phenomenon:
  Find progenitor mass transfer systems;
  Check for binary companions (He*/sdOB)
- Expected new type: “ultra-soft sources”
  (WD with burning at maximum rate)
- Unexpected new types!

Requirements



- Scale <~ few arcsec
- FOV >~ few sq.deg.
- Eff.A. >~ few cm2
- Integrate >~ 1yr

- Could one do better with the detector?
  Now: usually electron multiplier
  CCD with coating?