

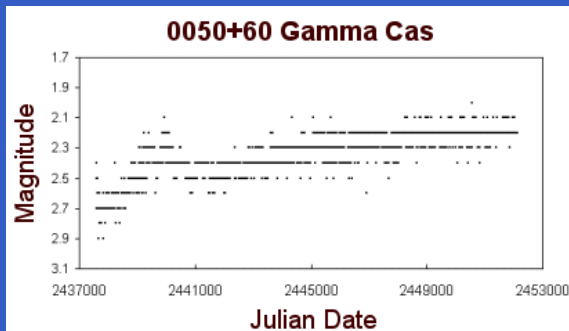
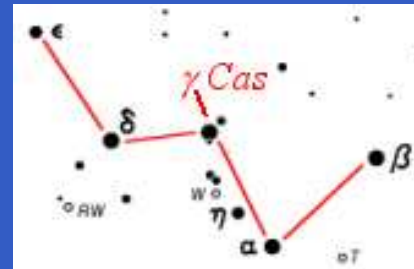
Do γ Cas stars host helium stars?

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2020, A&A, 633, A40

γ Cas

- (first!) Be star (B0)
- $\log(L_X/L_{\text{bol}}) \simeq 5.5$
- hard X-rays
- continuous, variable X-rays
- binary companion
- low eccentricity

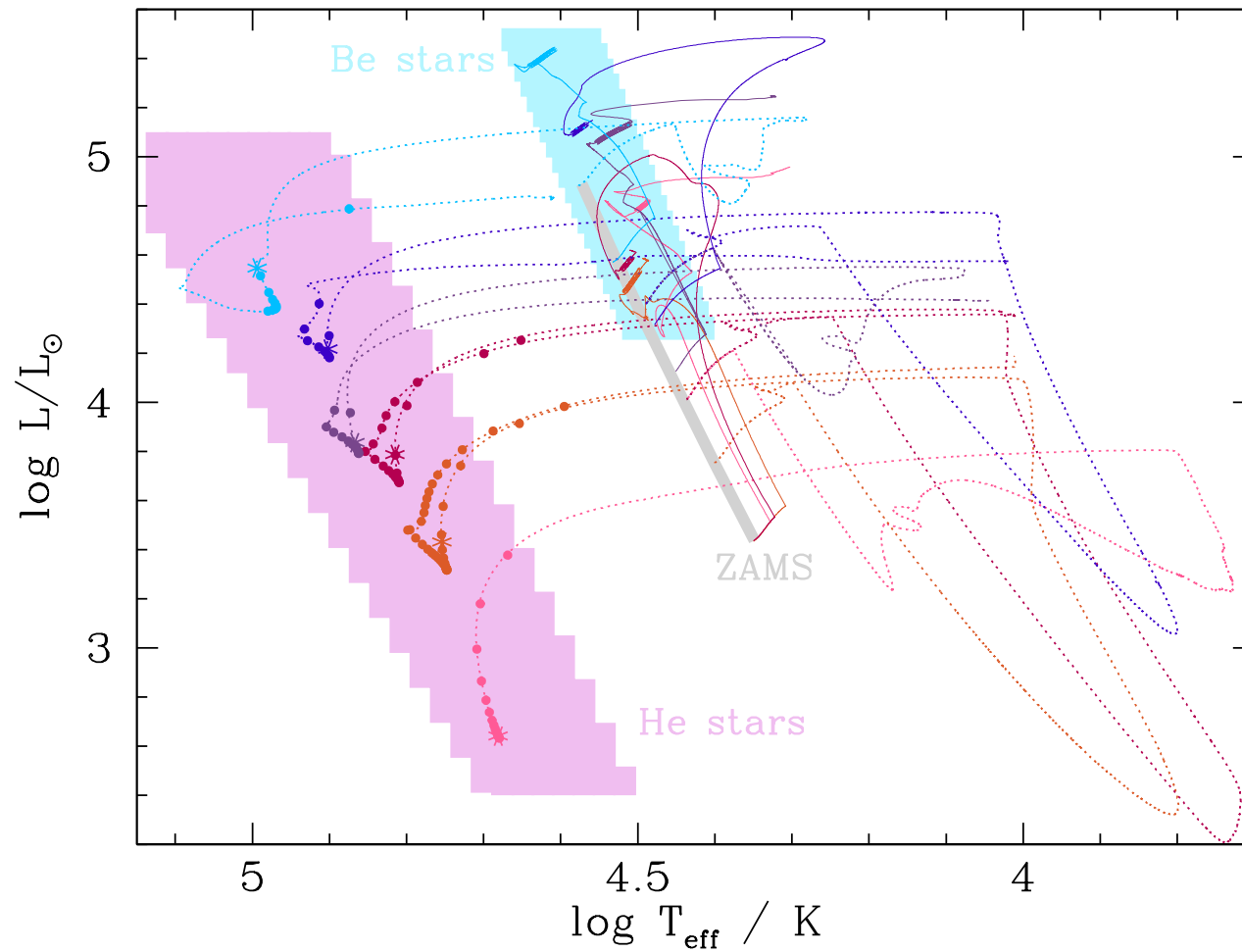


15 γ Cas stars

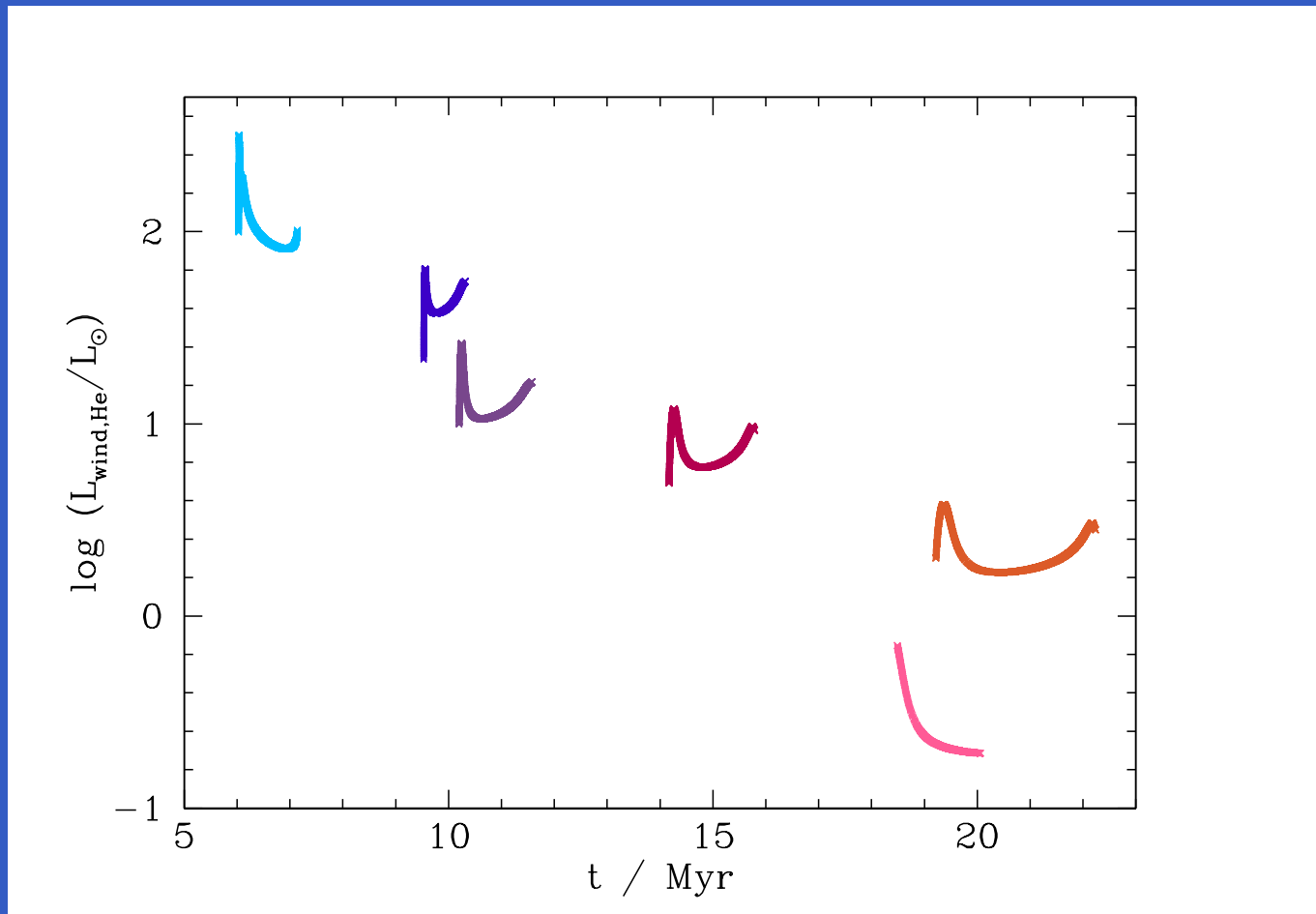
Table 1: Known γ Cas stars (Naze & Motch 2018)

Name	Spectral Type	$\log(L_X/L_{bol})$	L_X 10^{31} erg/s	$L_{X,hard}$ 10^{31} erg/s	hardness ratio	kT keV	$v \sin i$ km/s
γ Cas	B0IV-Vpe	-5.39	85	65	3.3	14-25	295
V782 Cas	B2.5III:[n]e+	-5.25	30	30	63.1	7	
PZ Gem	O9pe	-6.14	9	8	4.3	16	265
HD90563	B2Ve	-5.85	32				
BZ Cru	B0.5IVpe	-5.69	27	20	2.8	13	338
HD119682	B0Ve	-5.63	66	48	2.6	8-17	200
V767 Cen	B2Ve	-5.37	26	17	2.0	6	100
CQ Cir	B1Ve	-4.30	175	147	5.3	9	335
V759 Ara	B2Vne	-5.29	41	32	3.2	10	277
V3892 Sgr	Oe	-5.78	30	21	2.2	7-14	260
V771 Sgr	B3/5ne	-4.64	24	21	6.3	8	
HD316568	B2IVpe	-6.26	4	2	1.6	4-6	
V2156Cyg	B1.5nnpe	-5.30	8	6	6.3	3	
π Aqr	B1Ve	-5.59	7	6	3.6	12	243
V810 Cas	B1npe	-5.14	48	41	5.6	64	422

Binary evolution models

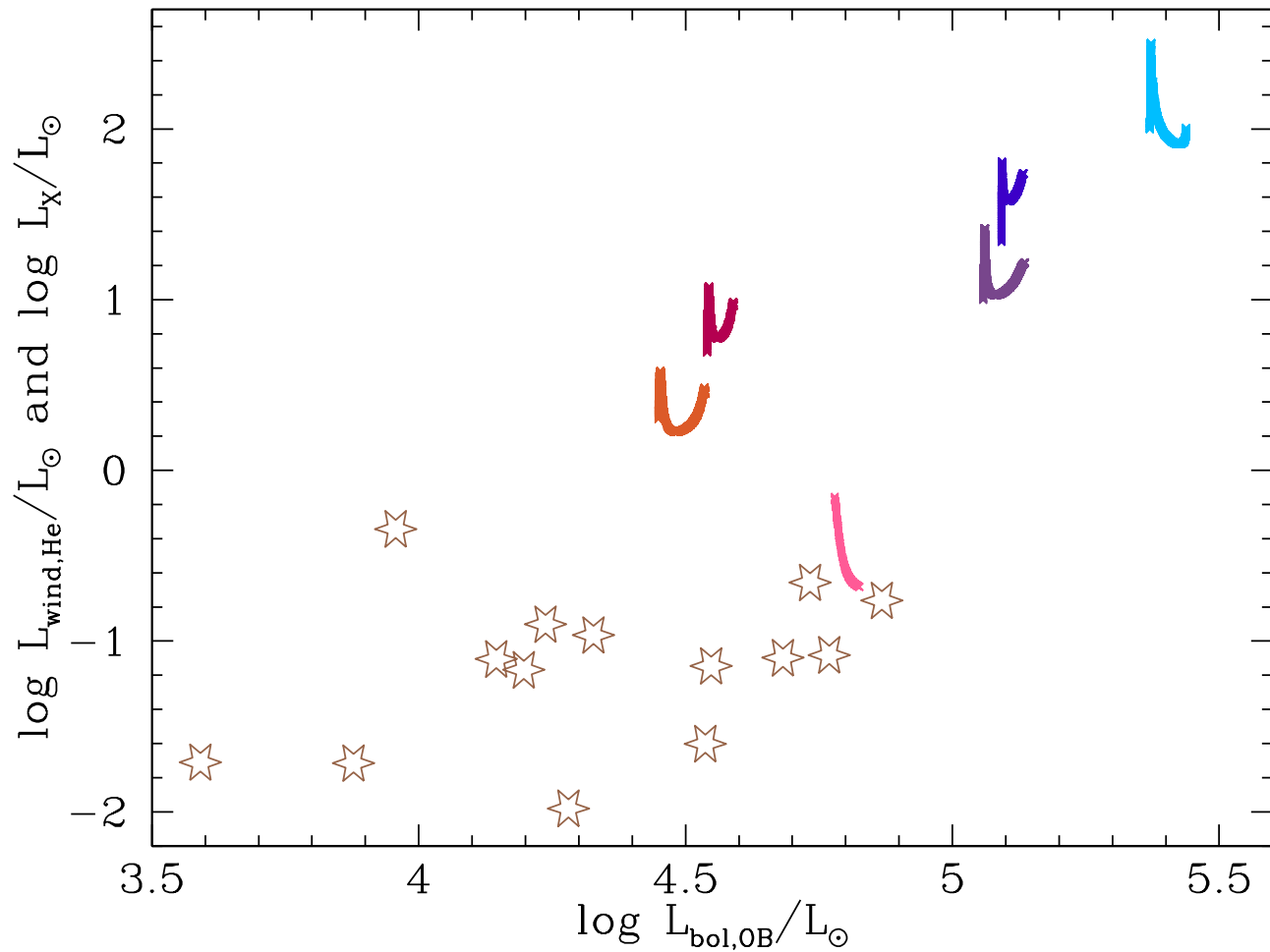


Mechanical wind luminosity



$$L_{\text{wind,He}} = \frac{3}{2} \dot{M}_{\text{He}} v_{\text{escape,He}}^2 + \text{Be disk} = \text{X-rays?}$$

$L_{X\text{-rays}}$ vs $L_{\text{bolometric}}$



Pros & Cons

- explains low eccentricities (e.g. in γ Cas)
- explains persistent & hard X-ray emission
- provides a missing link
OB+OB \rightarrow OBe+He \rightarrow OBe+NS
OB+WR(BH) $>$ OBe+He(NS) $>$ Be+sdO(WD)
- no detailed hydro models available
- X-ray variability=?
- is ϕ Per a counter example?