EXors and the Stellar Birthline

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Mackenzie Moody

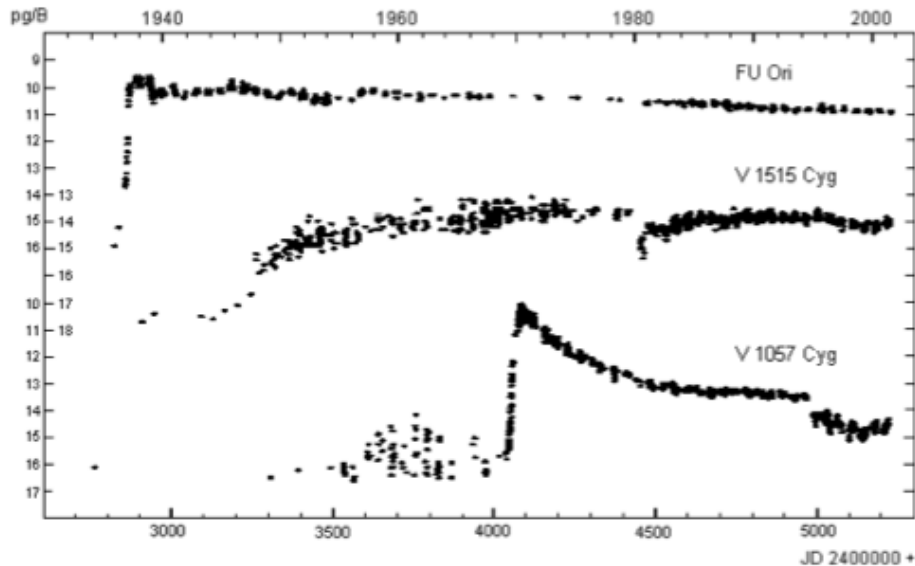# EXors: Periodically Flaring Stars
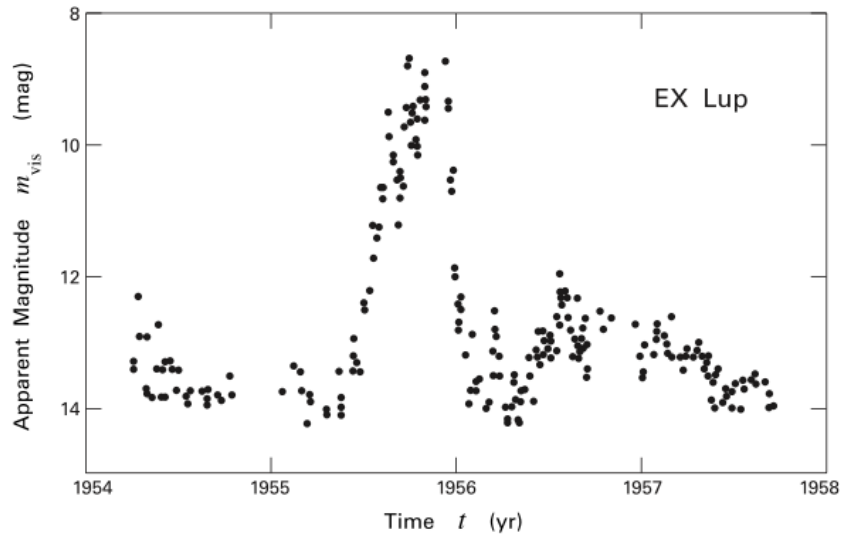
rise and decay

times ~ 1 yr

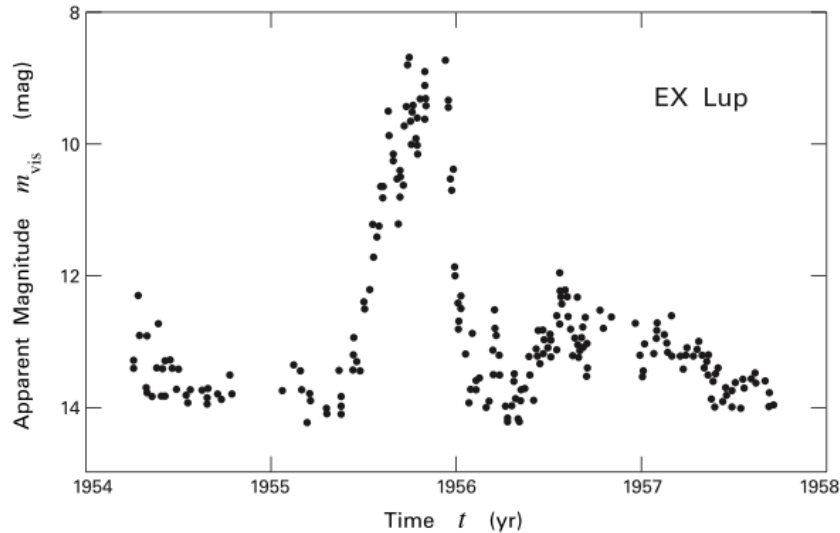**distinct from…**

FUors

rise time ~ 1 yr

decay time ~ 10 yr

EXors: Periodically Flaring Stars

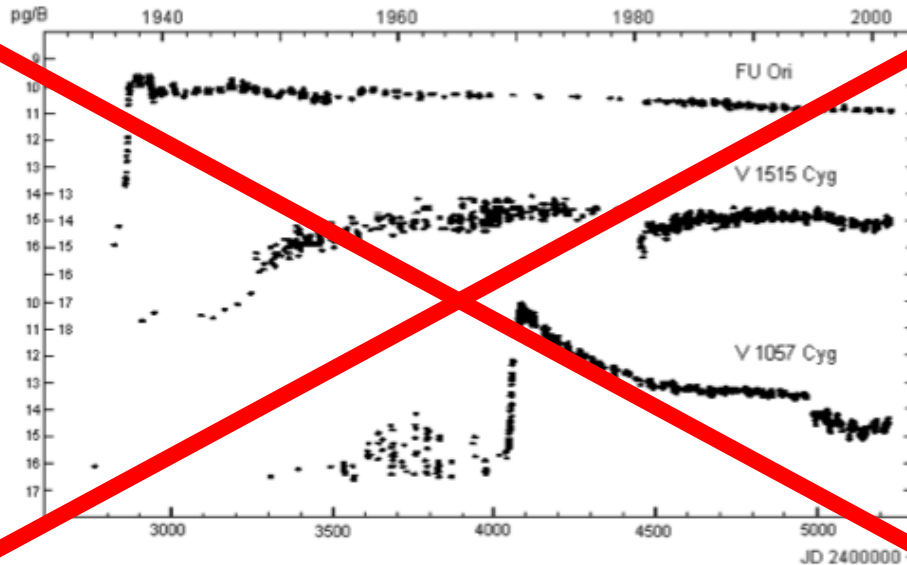rise and decay

times ~ 1 yr

distinct from…

FUors

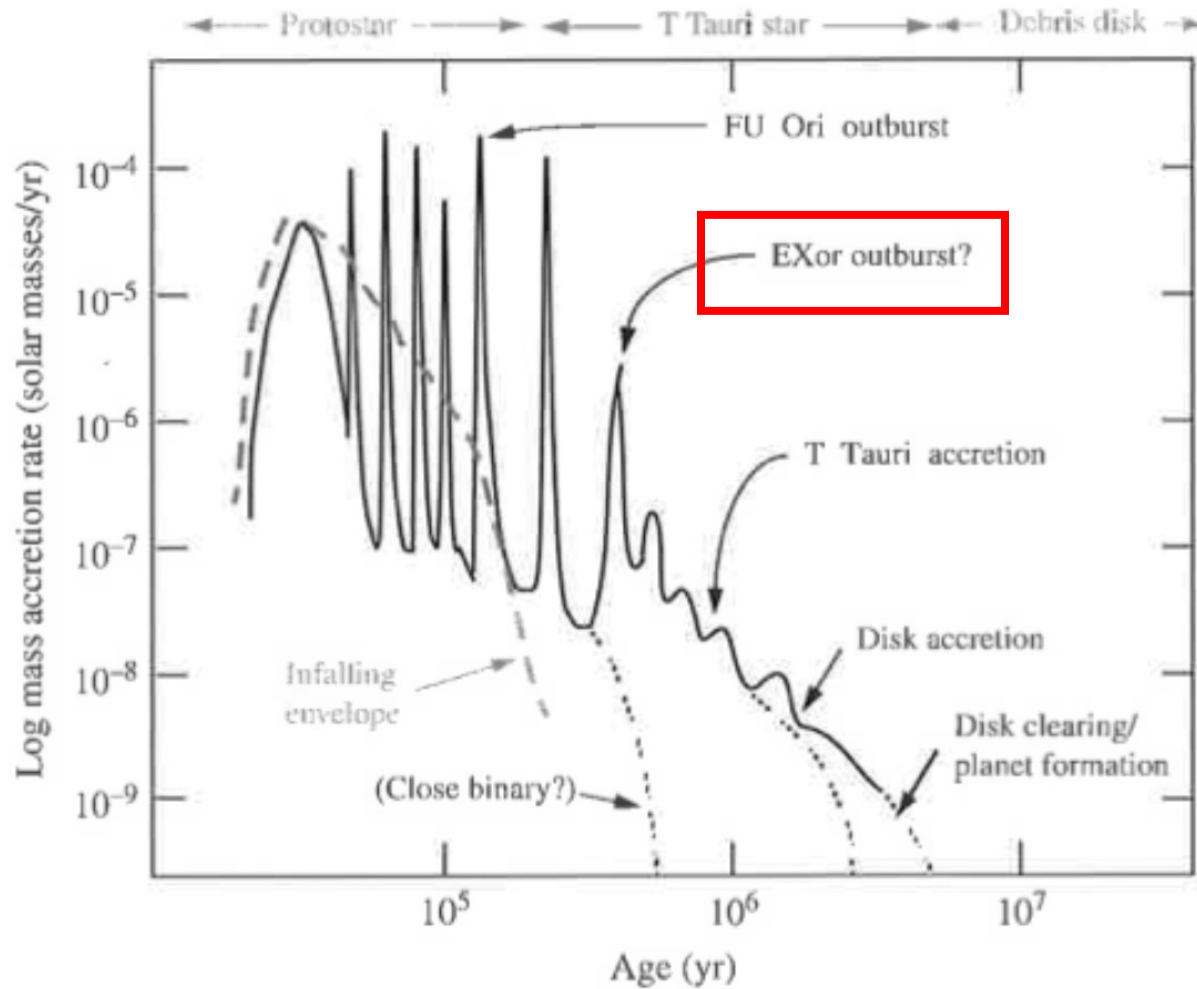**rise time ~ 1 yr**

decay time ~ 10 yr

Q: Are All EXors Very Young?

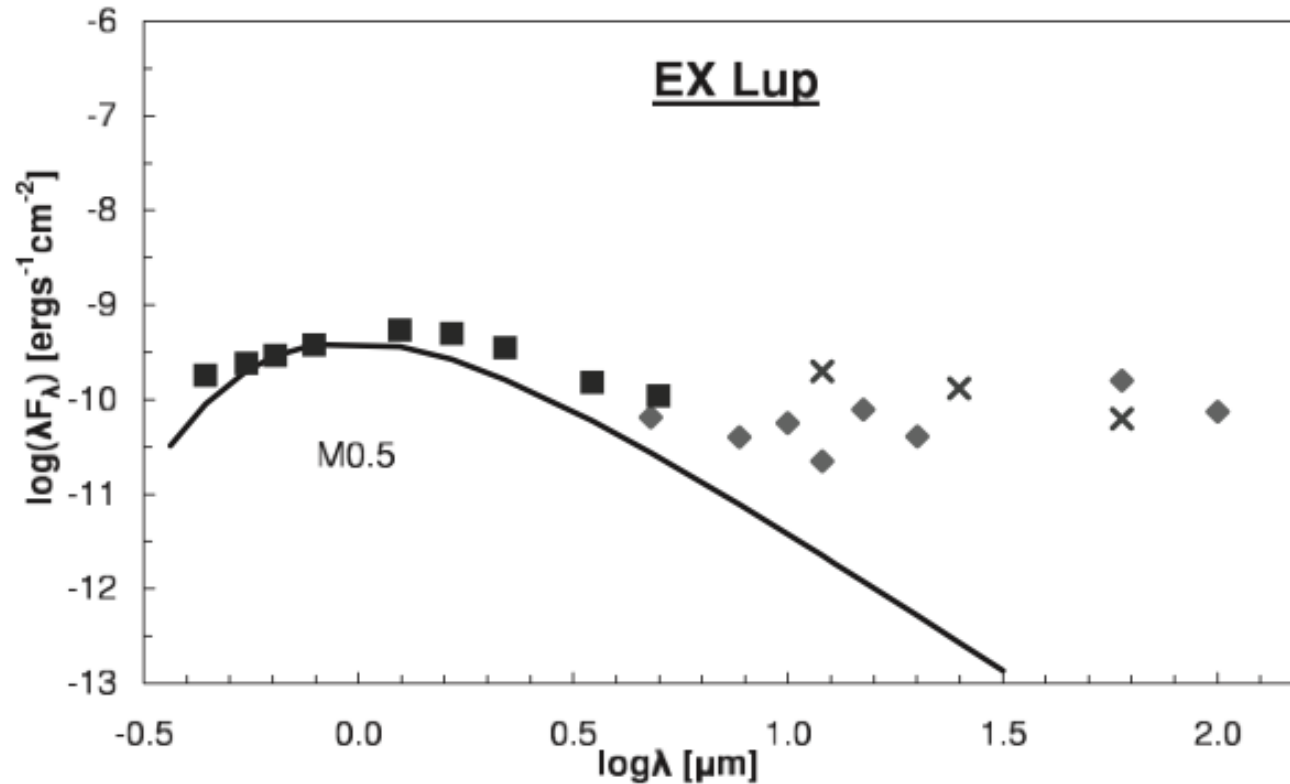Hartmann 2009

A: No! Nor is this a universal phase.

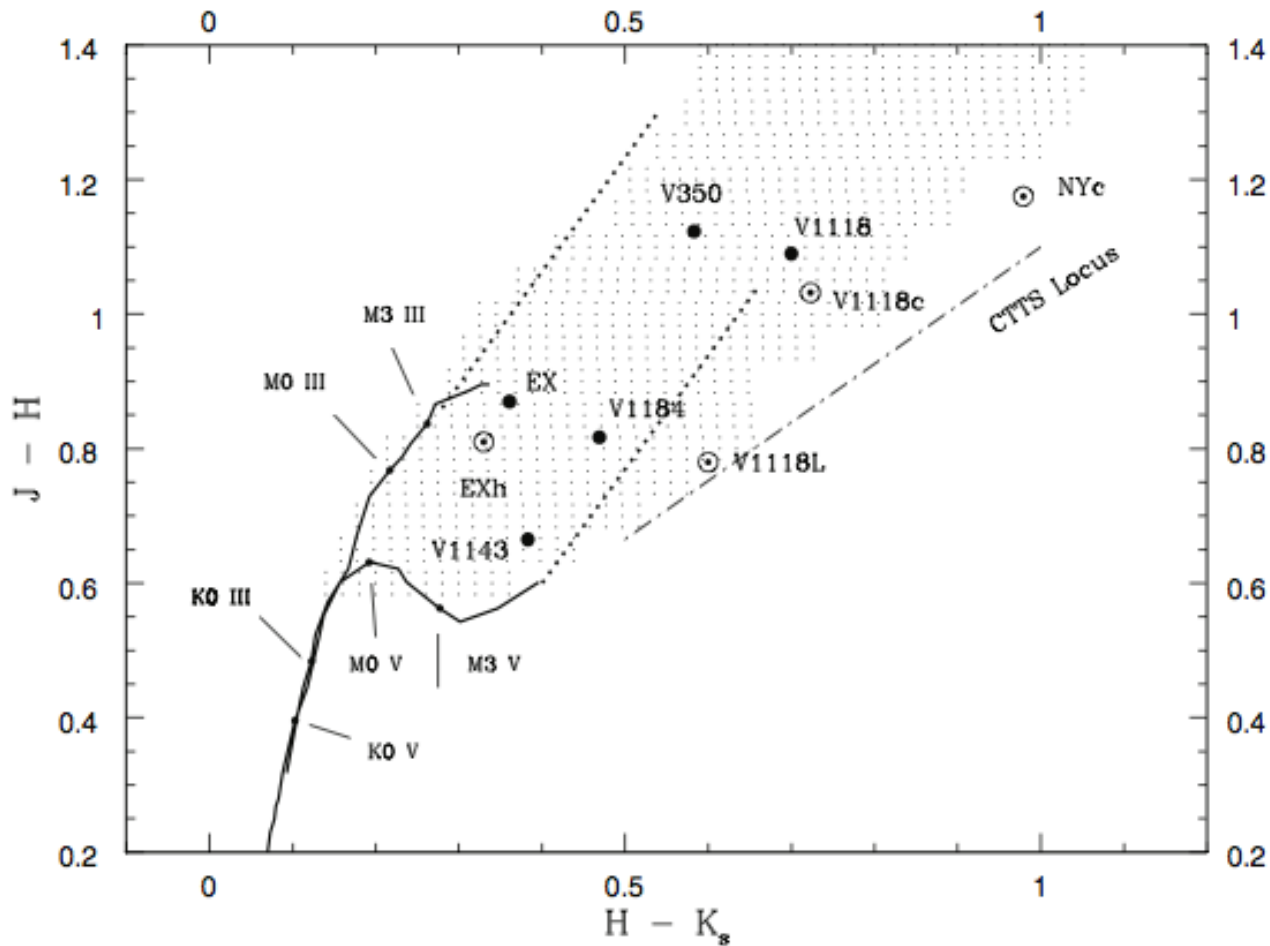# **Classical** EXors: **Visible T Tauri Stars**

Gras-Velazquez
& Ray 2005

Disk accretion
may
cause outburst.

QuickTime™ and a
decompressor
are needed to see this picture.
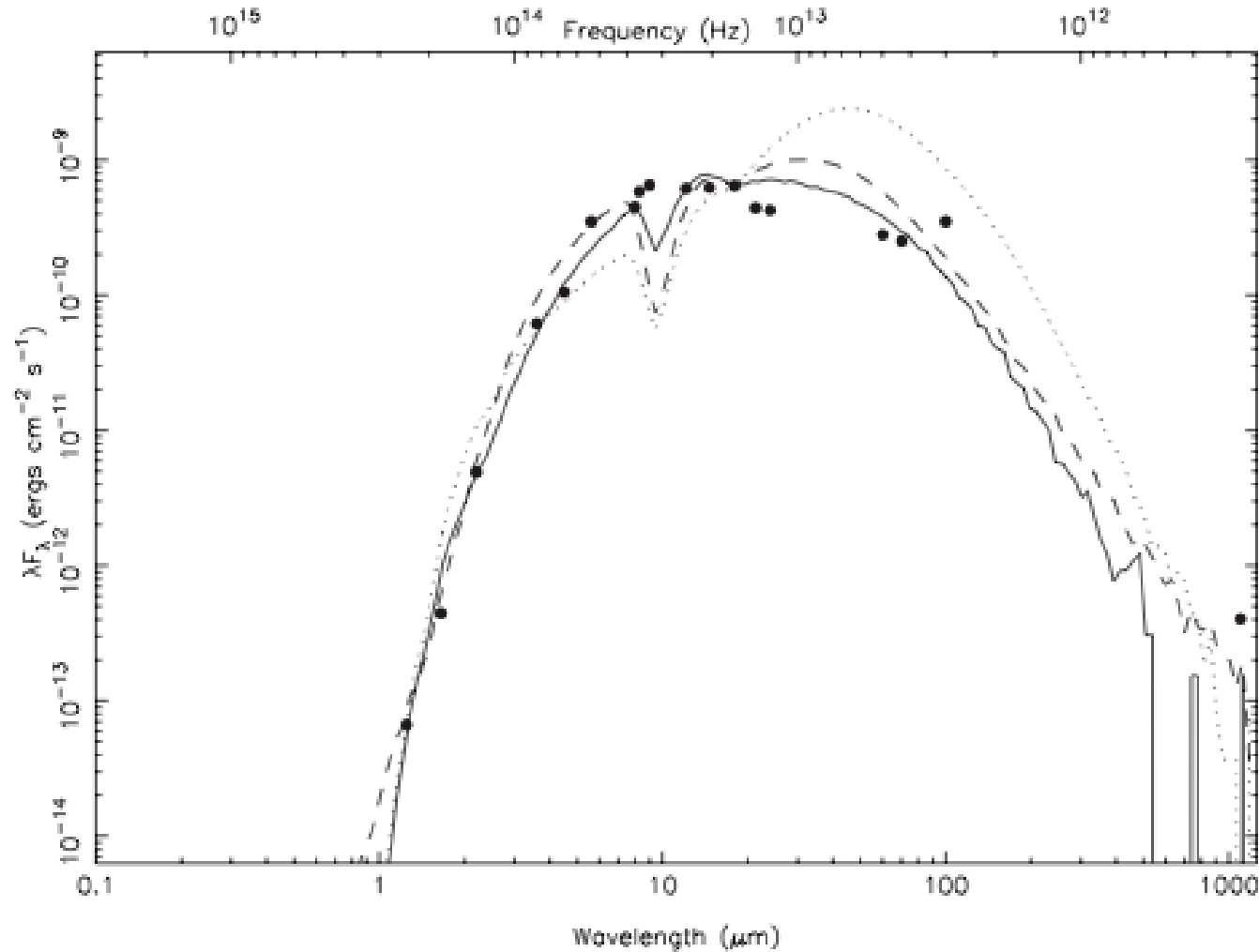
Similar to Other Classical T Tauri Stars

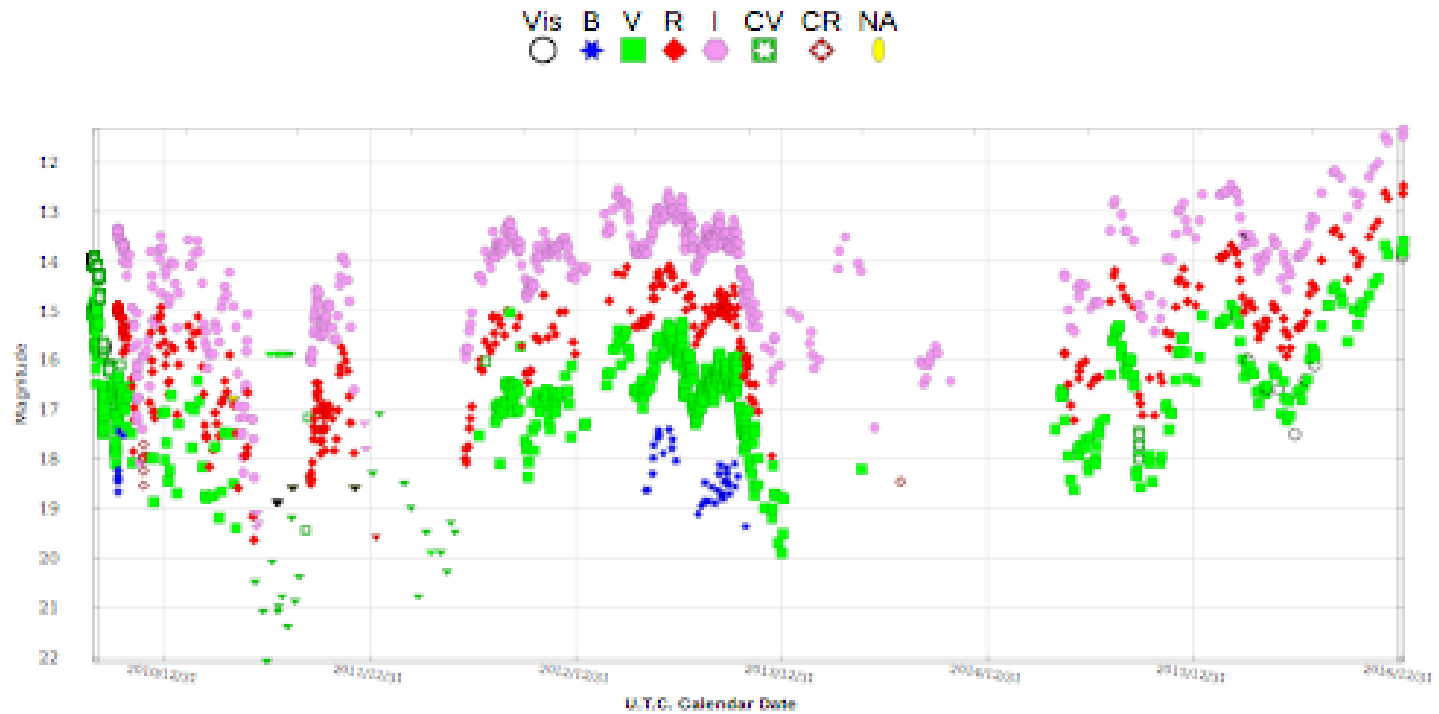Herbig 2008

stippled area: ONC variables

Embedded EXors: Optically Dim

Aspin 2011

V2492 Cyg: A Class I Source

Embedded Exors: Periodic Flaring

V2492 Cyg: 2005 - 2017

Properties of EXors

Source	SED Class	Binary?	L_* $(L_\odot)$	L_{bol} $(L_\odot)$	L_{bol} (out) $(L_\odot)$	T_{eff} (K)	R
EX Lupi	II	yes (s)	0.47	0.73	2.53	3800	0.15
V1118 Ori	II	yes (v)	0.25	1.40	7.40	3700	0.8
DR Tau	II	no	0.85	–	14.0	3920	7.9
VY Tau	II	yes (v)	0.40	0.72	–	3917	0.2
V1143 Ori	II	–	0.20	–	–	3500	0.67
UZ Tau E	–	yes (s)	0.63	1.70	–	3700	1.6
EC 53	I	yes (v)	0.40	–	–	3400	>0.02
V2493 Cyg	II	–	2.70	–	–	3875	0.66
XZ Tau	–	yes (v)	0.31	0.31	–	3500	18.6
PV Cep	I	no	17.0	59.3	100	5500	28.5
V1180 Cas	flat	–	0.85	–	–	4300	>66
GM Cha	I	–	–	1.50	–	3500	>100
V2775 Ori	I/flat	–	1.90	2.00	22.0	3200	>11
V2492 Cyg	I	–	–	7.00	–	4000	>194
V1647 Ori	I/flat	–	5.20	9.50	50.0	3800	1145

QuickTime™ and a
decompressor
are needed to see this picture.

EXors in the HR Diagram
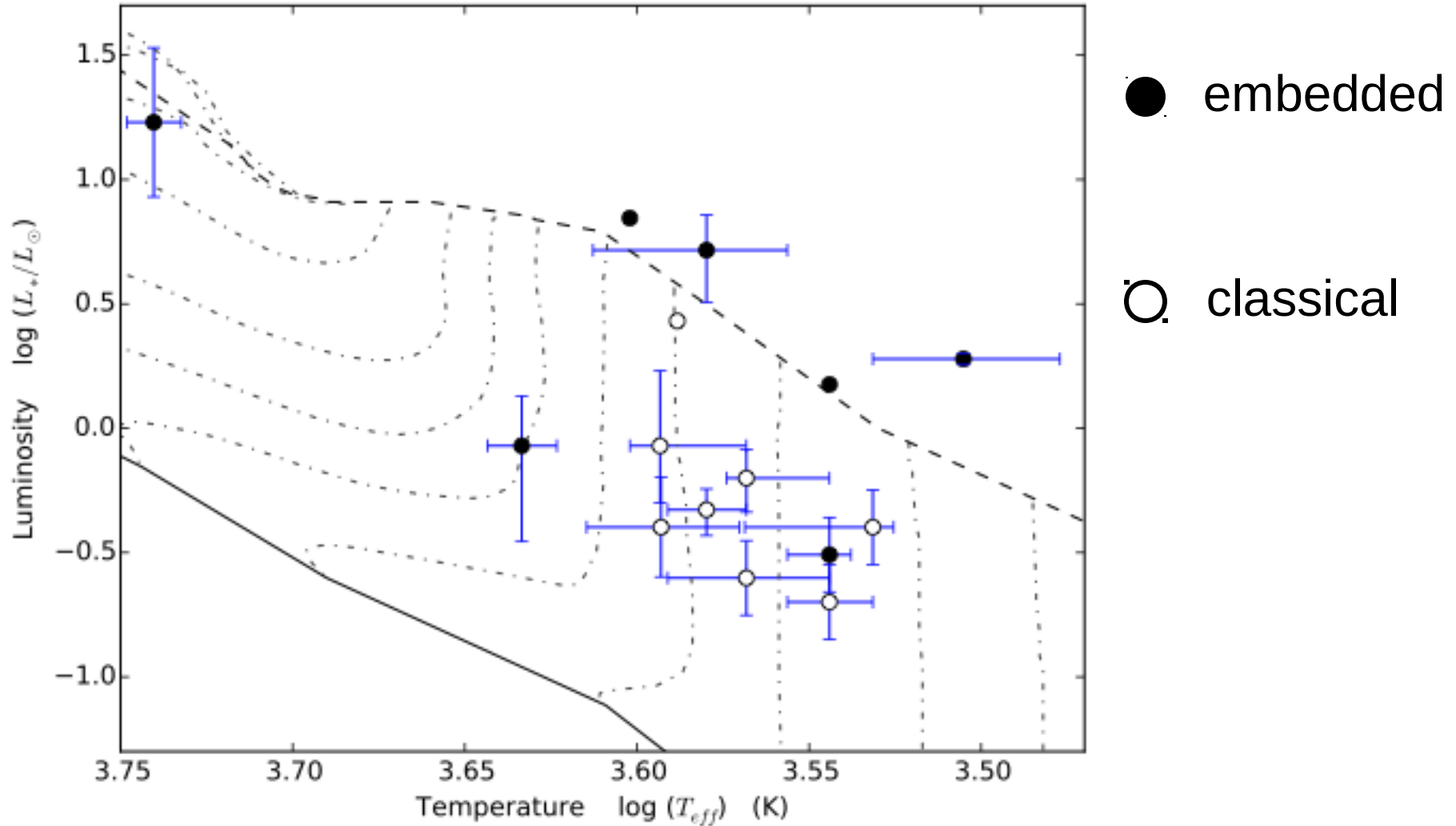
Conclusions

► Only a small fraction of young stars undergo EXor eruptions.

► Embedded EXors are pre-main-sequence objects surrounded by dusty gas.

► Classical EXors have the same ages as classical T Tauri stars.

► At least some Class I sources are not true protostars.