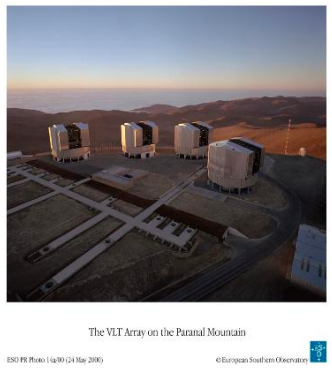
CYCLOPS MODELING OF POLARS: EV UMA

Karleyne Silva – Operation Staff Astronomer - ESO Santiago
CO-I: C. V. Rodrigues, E. Bartlett, I. Lima and J. E. R. Costa



POLARS ARE MAGNETIC CATACLYSMIC VARIABLES - AM HER OBJECTS

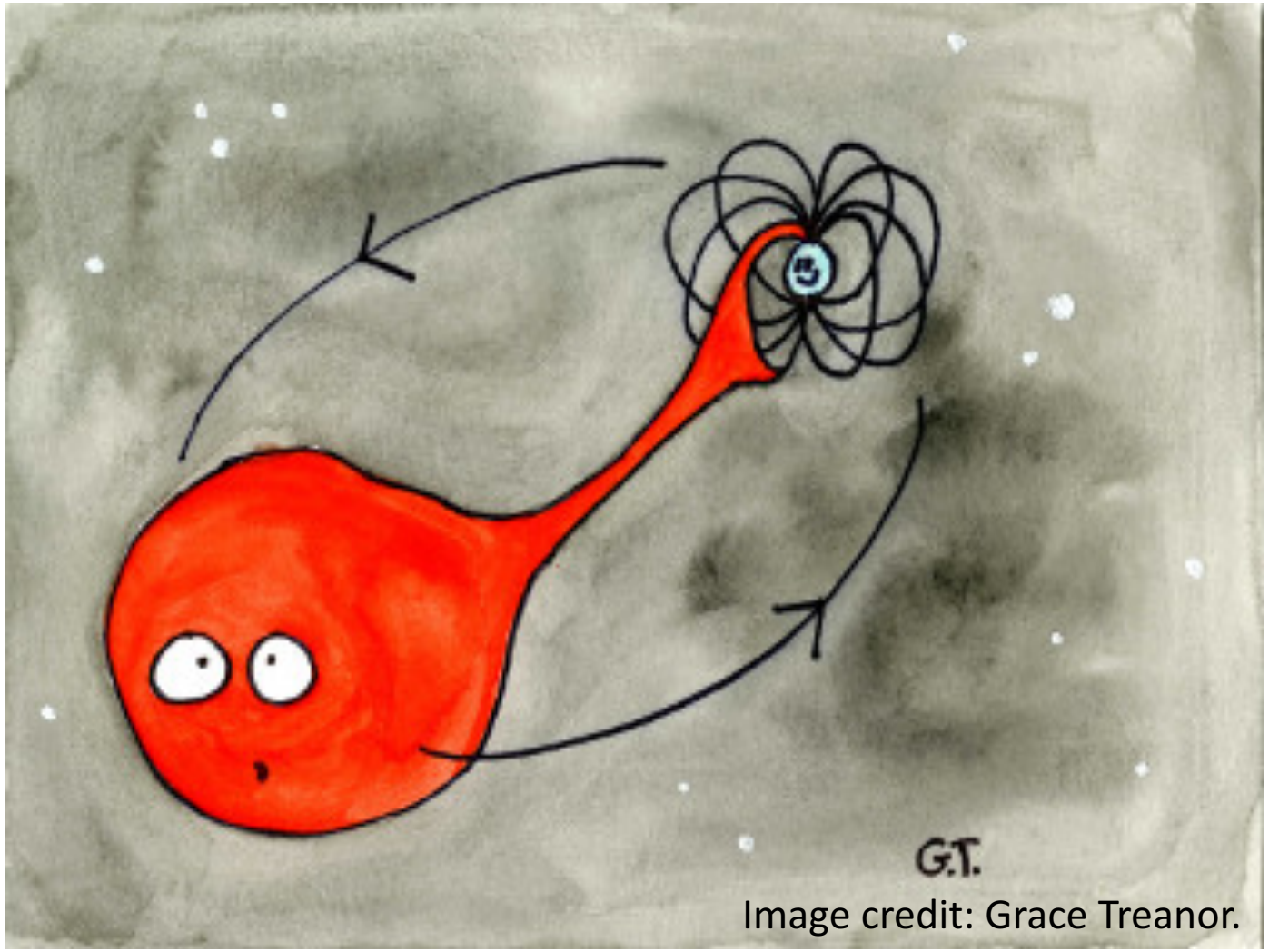
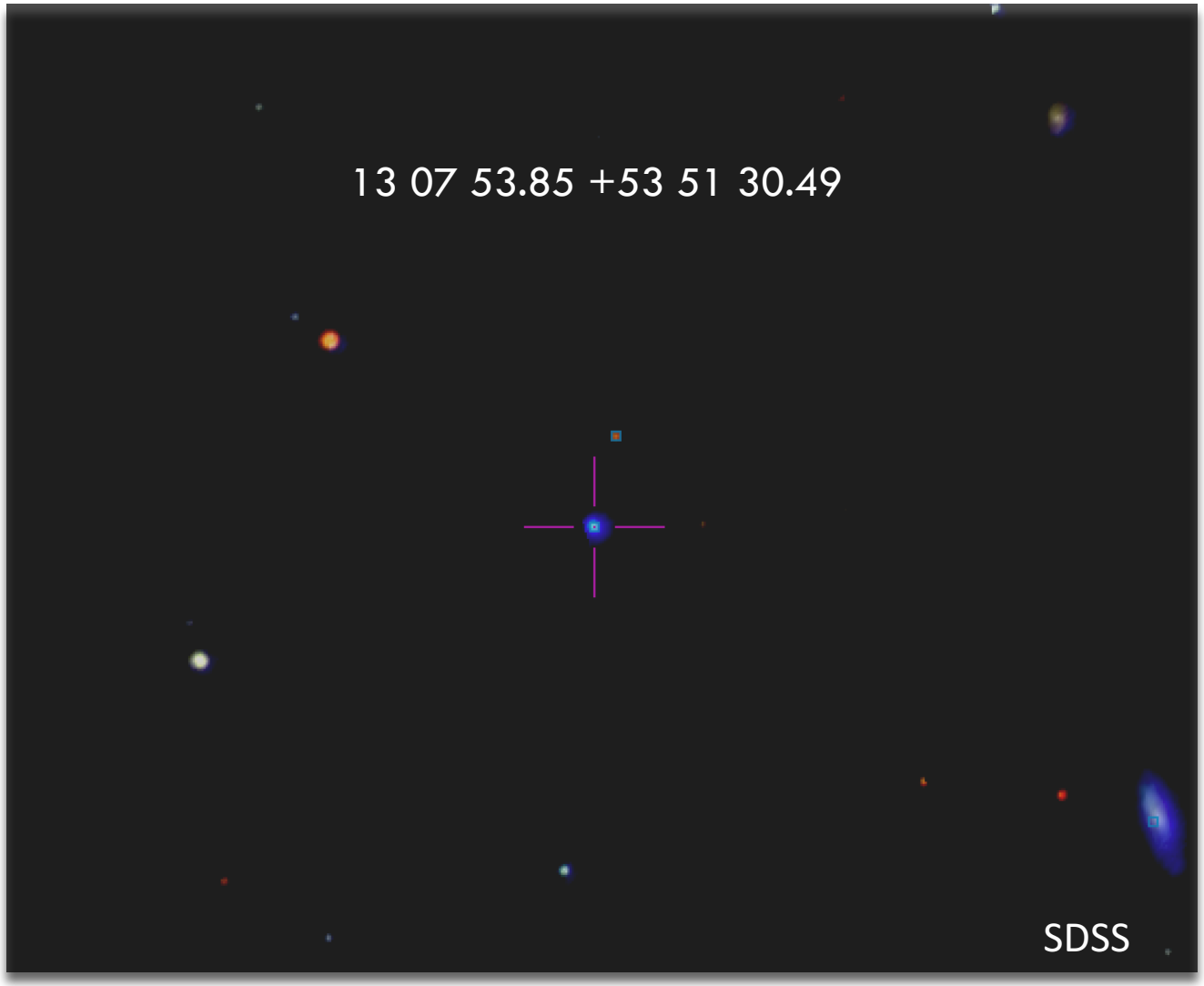
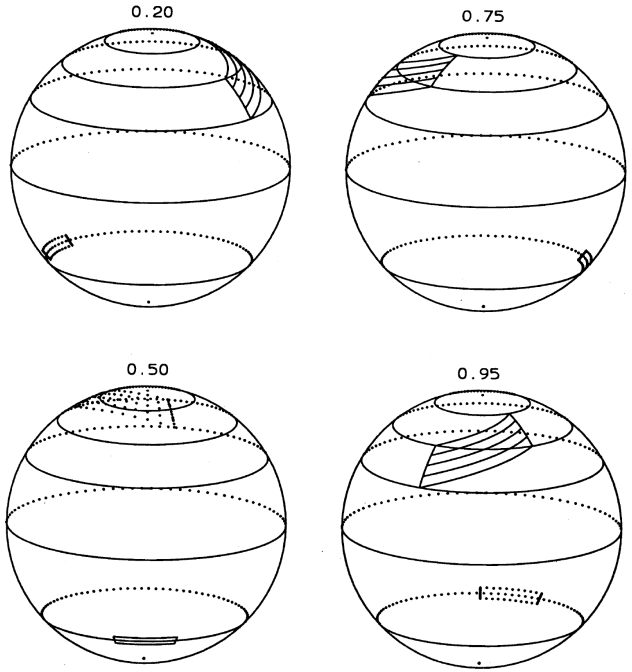


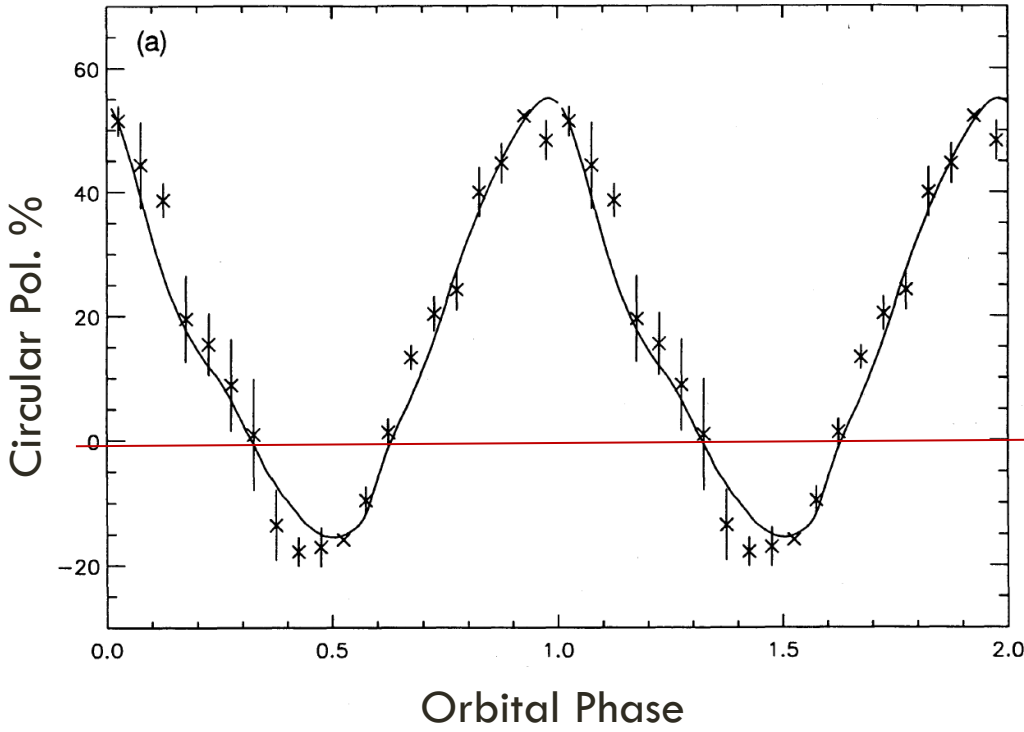
Image credit: Grace Treanor.

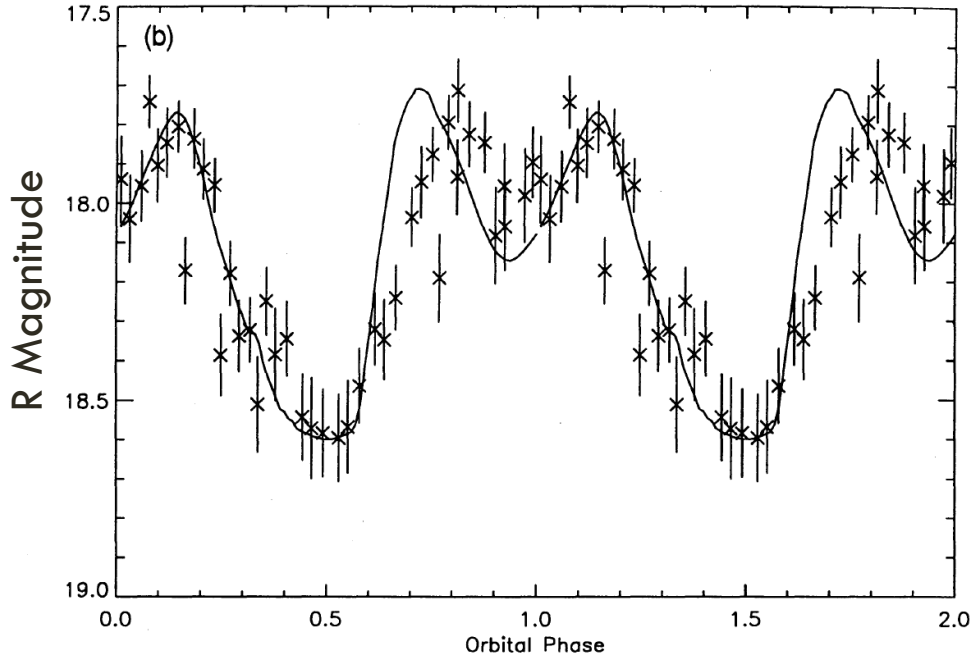
EV UMA WAS DISCOVERED BY ROSAT (OSBORNE ET AL. 1994)



HIGH DEGREES OF POLARIZATION DETECTED (HAKALA ET AL. (1994), H94), **UP TO 50%!**

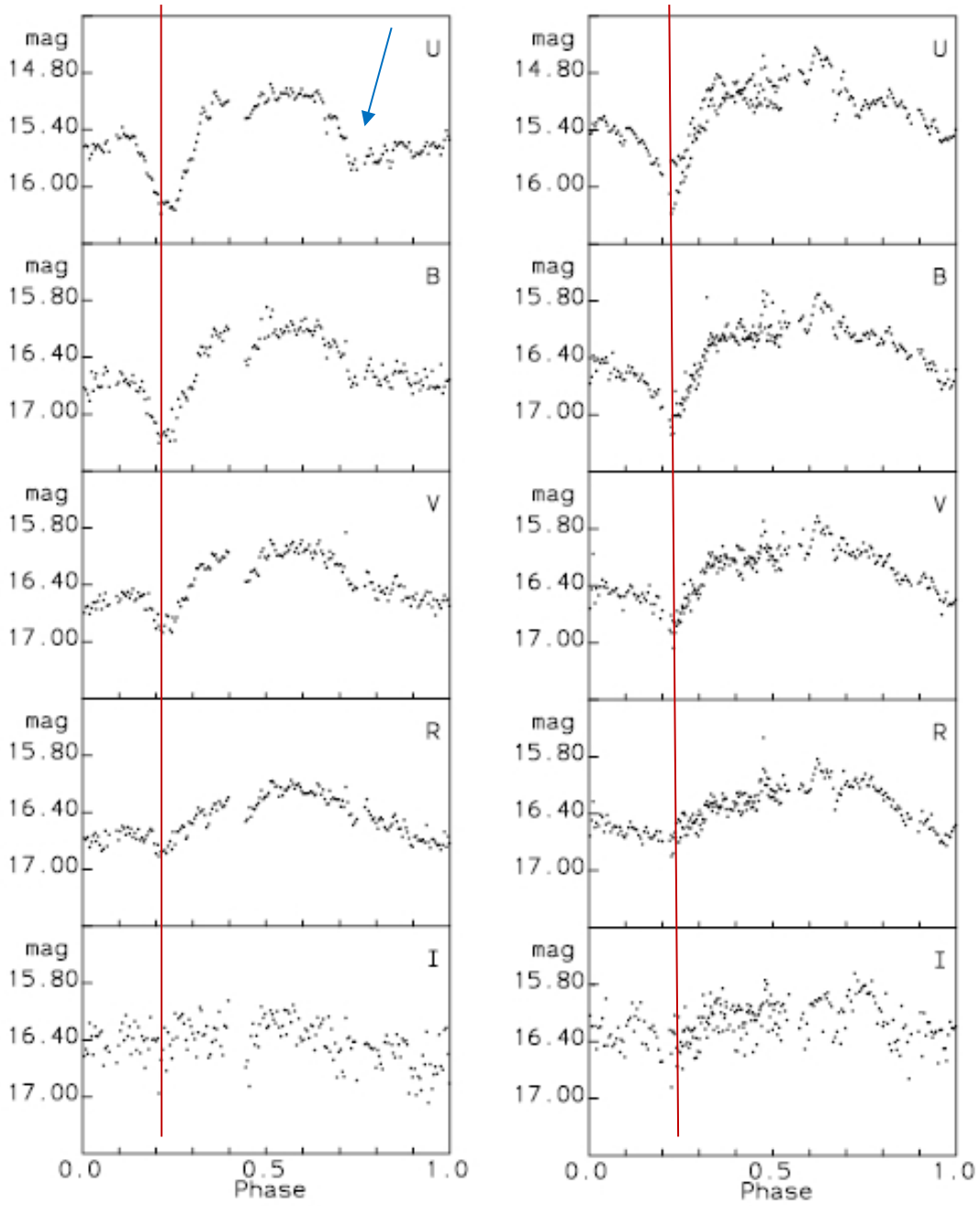


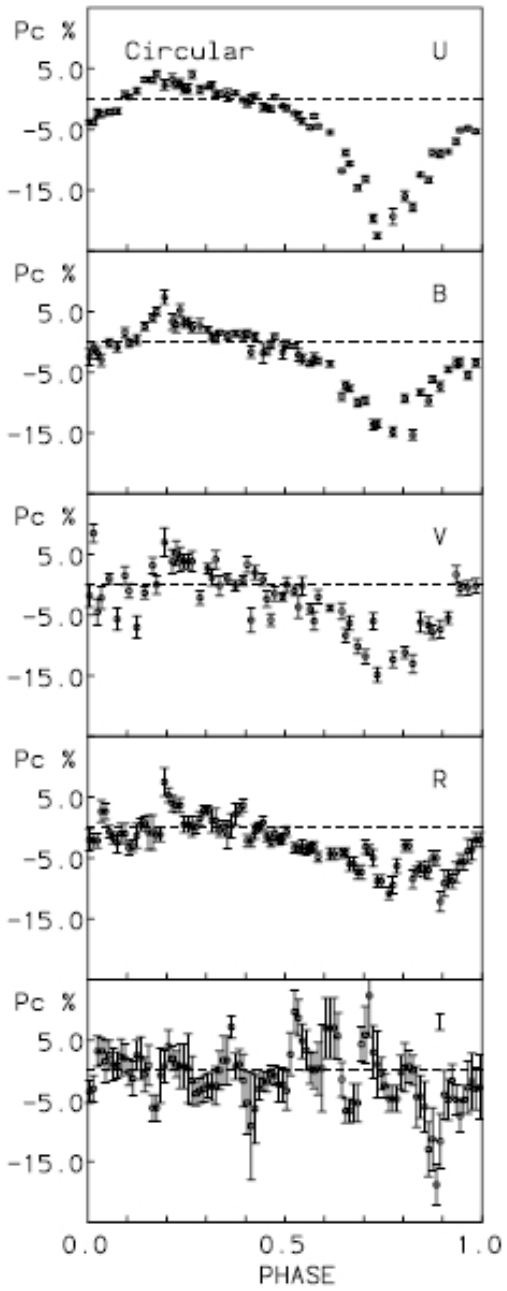


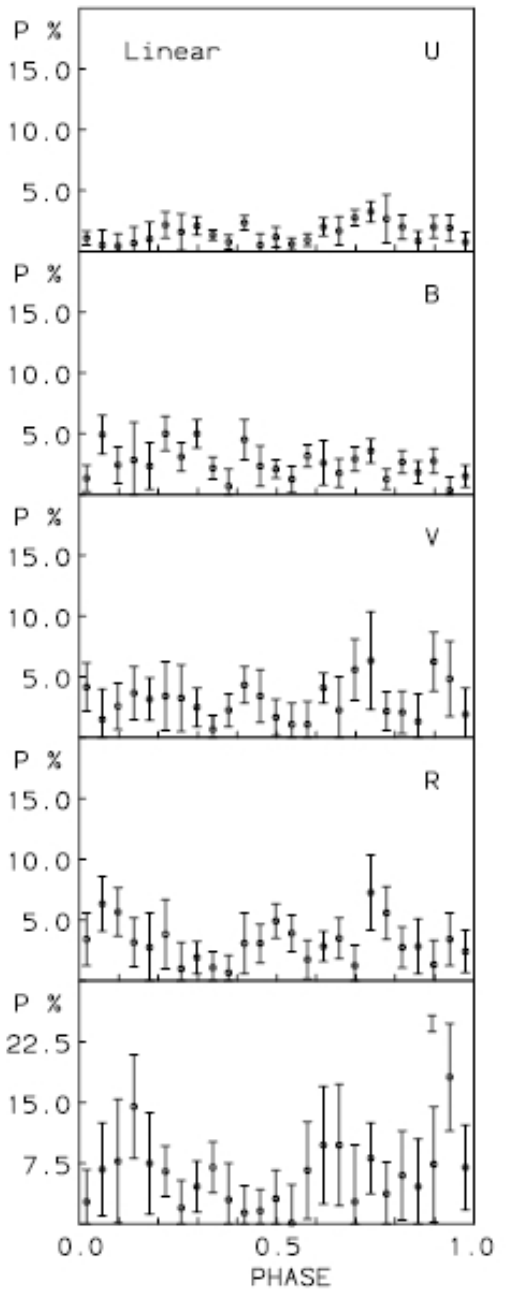


OPTICAL AND X-RAY OBSERVATIONS WHERE REPEATED IN THE 1999 AND 2000…

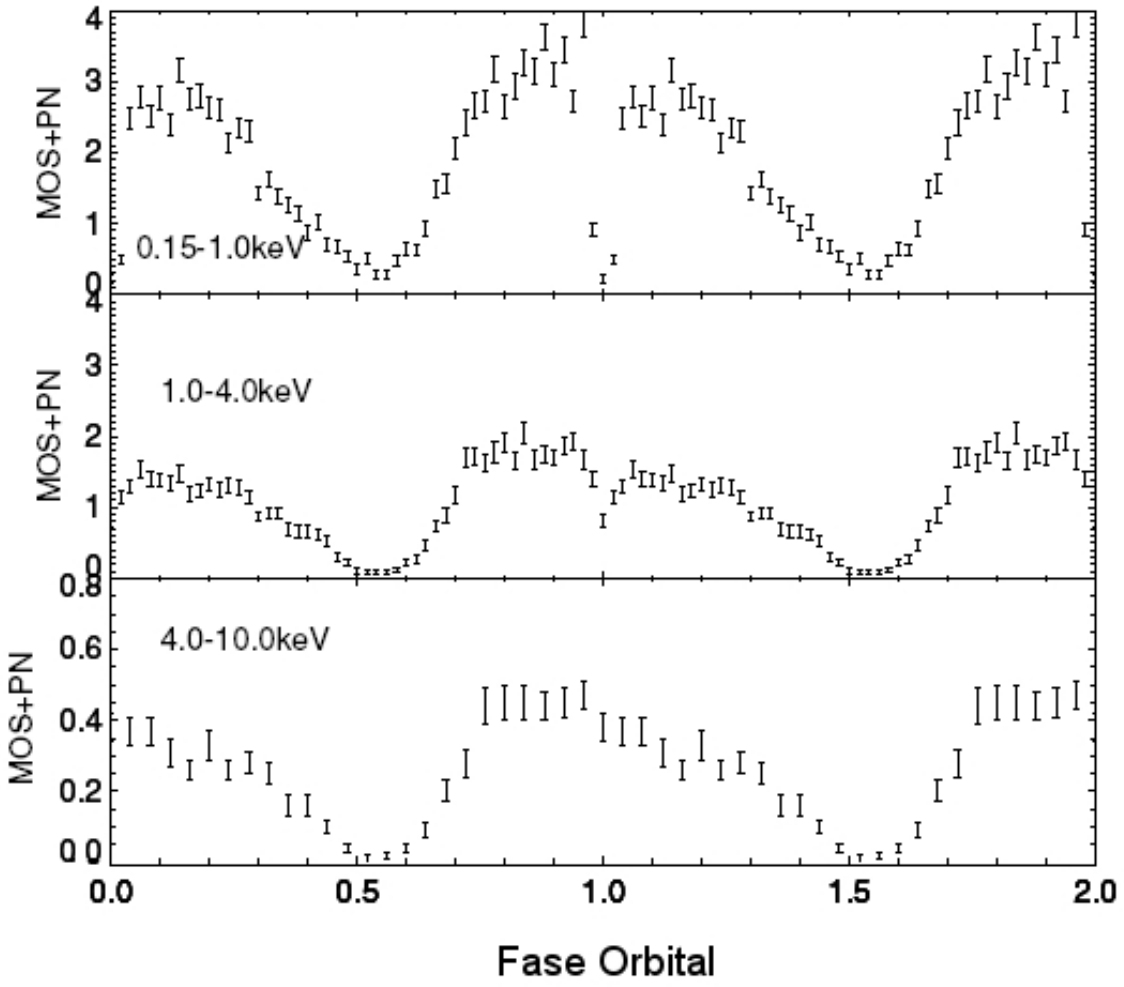
UBVRI OPTICAL PHOTO-POLARIMETRY - FEB 1999 (KATAJAINEN ET ALL 2000 , K00)

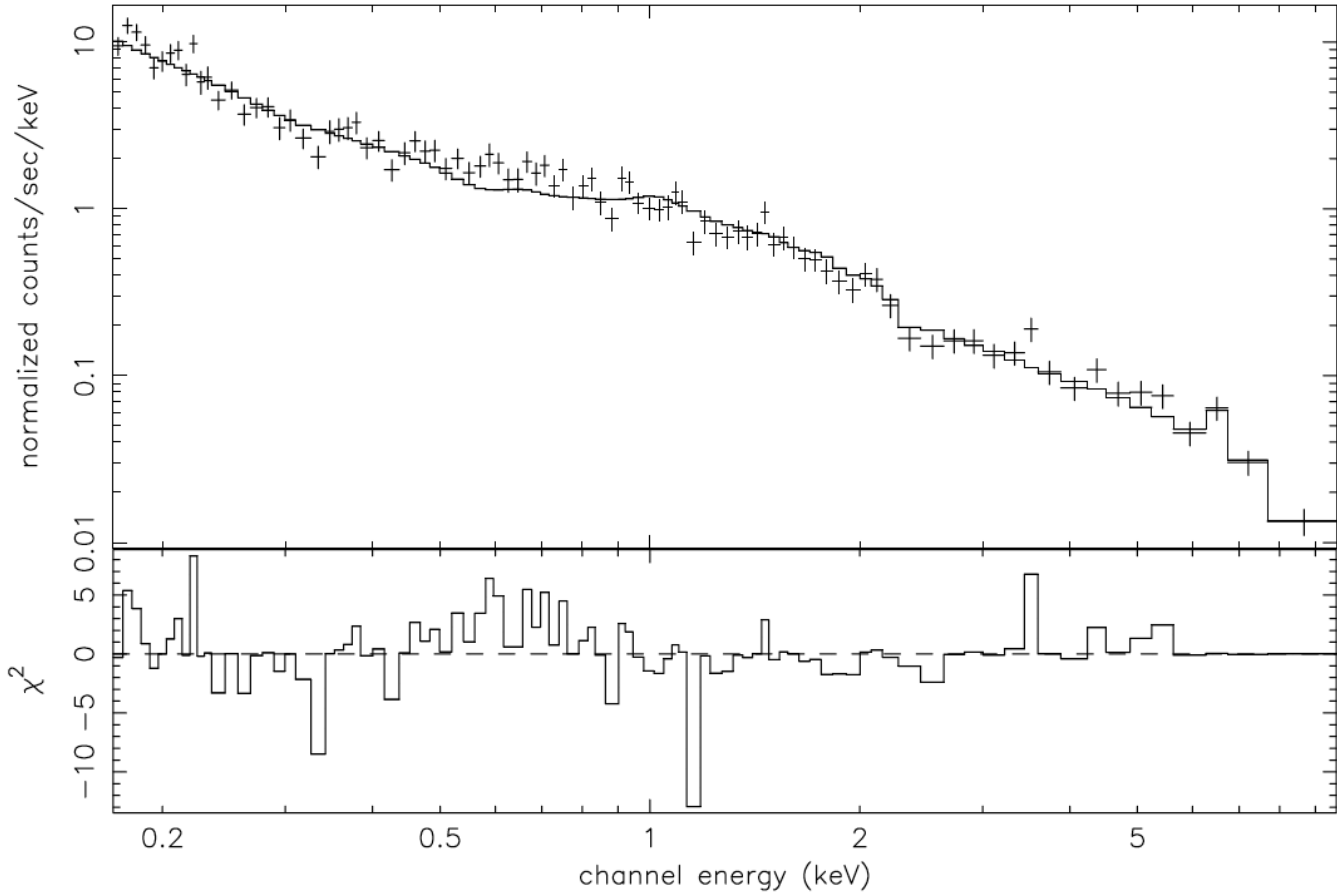






XMM-NEWTON X-RAY OBSERVATIONS – DEC 2001 (RAMSAY ET AL. 2003, R03)





OPEN QUESTIONS

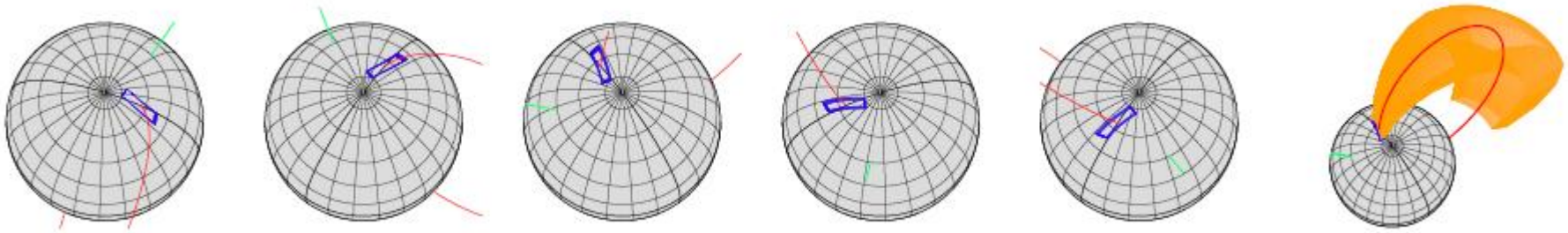
Does the system has one or two accretion regions?

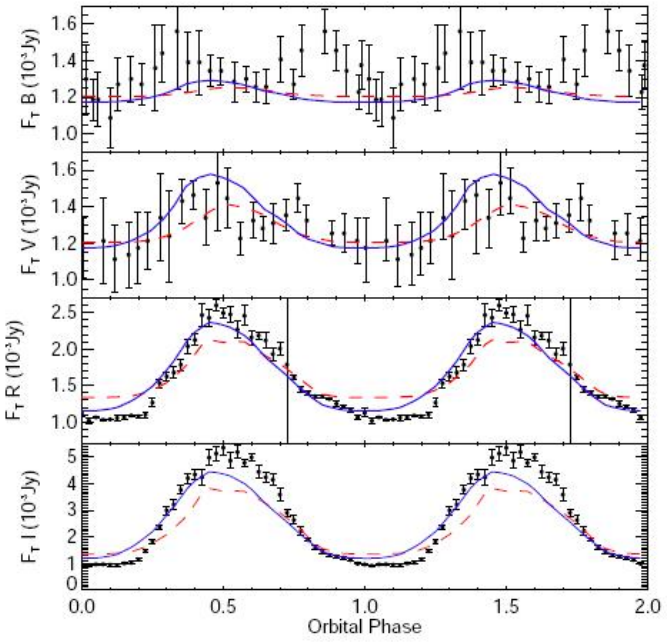
Did the system geometry change from 1990, 1999 to 2000, so the dip position do not coincide?

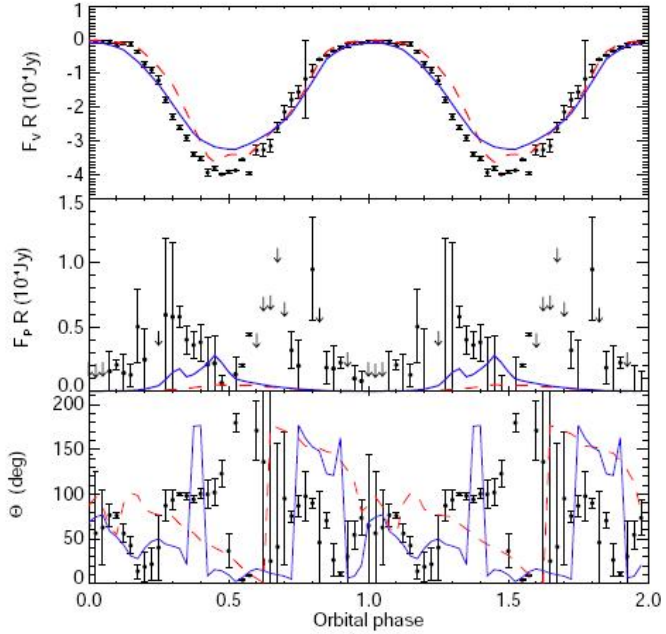
What is the modeling result of K00? Does it agree with H94 or with R03?

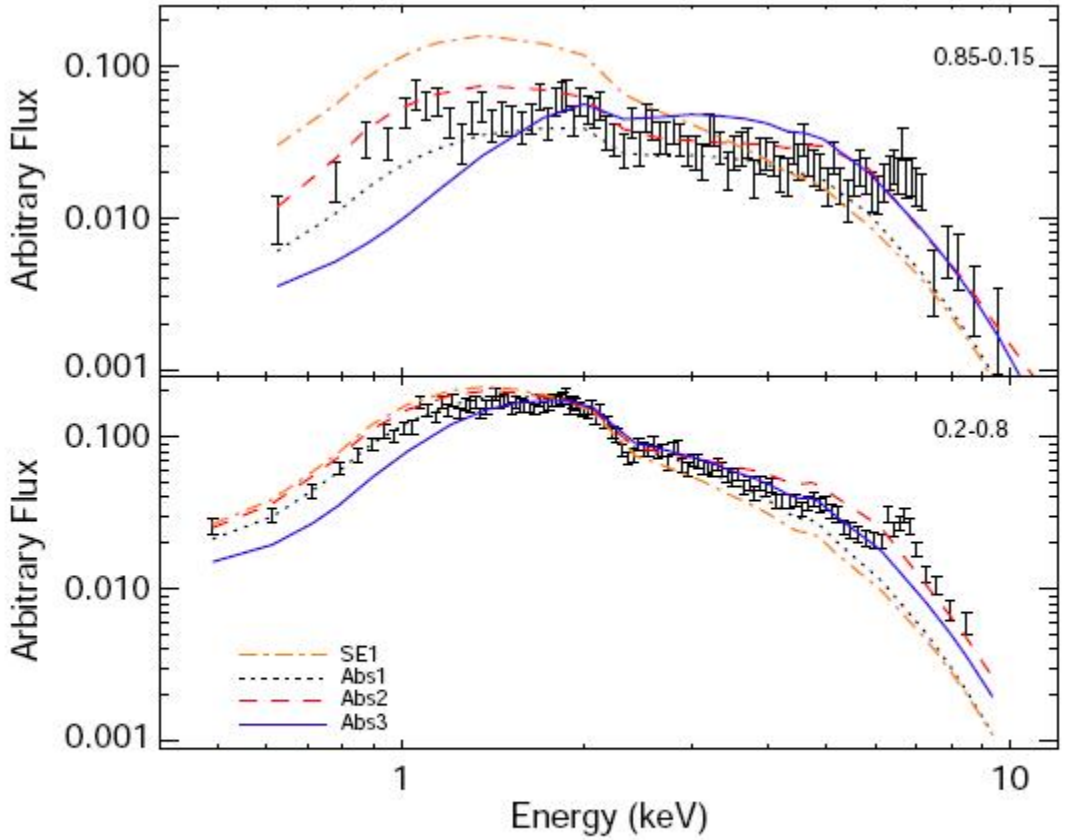
What is the global picture considering the optical and X-ray data? Can both be explained by the same model?

CYCLOPS MODELING OF CP TUC – SILVA ET AL. 2013

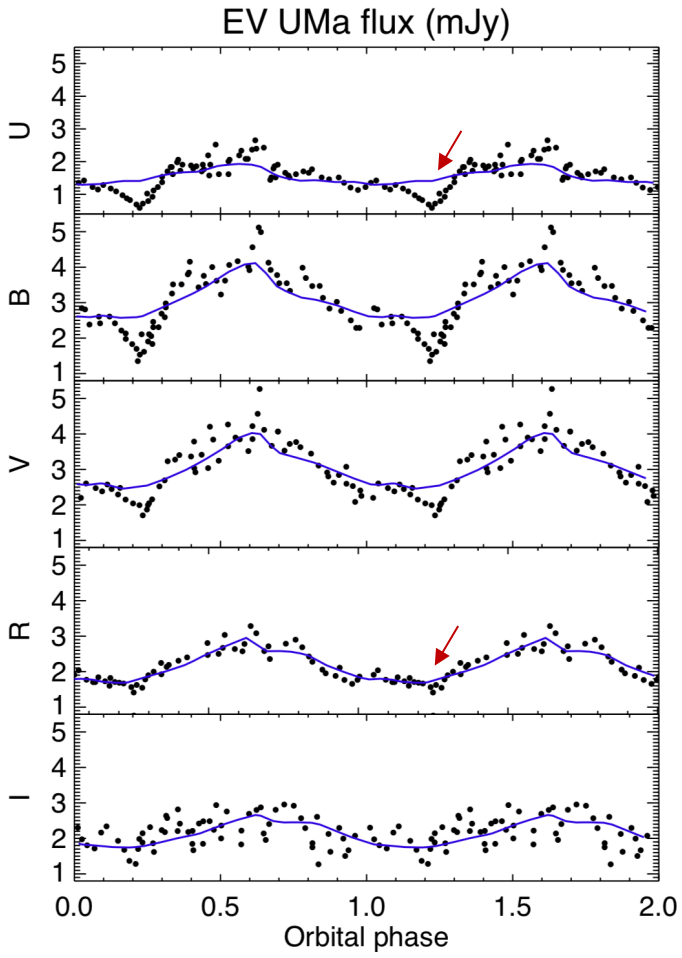


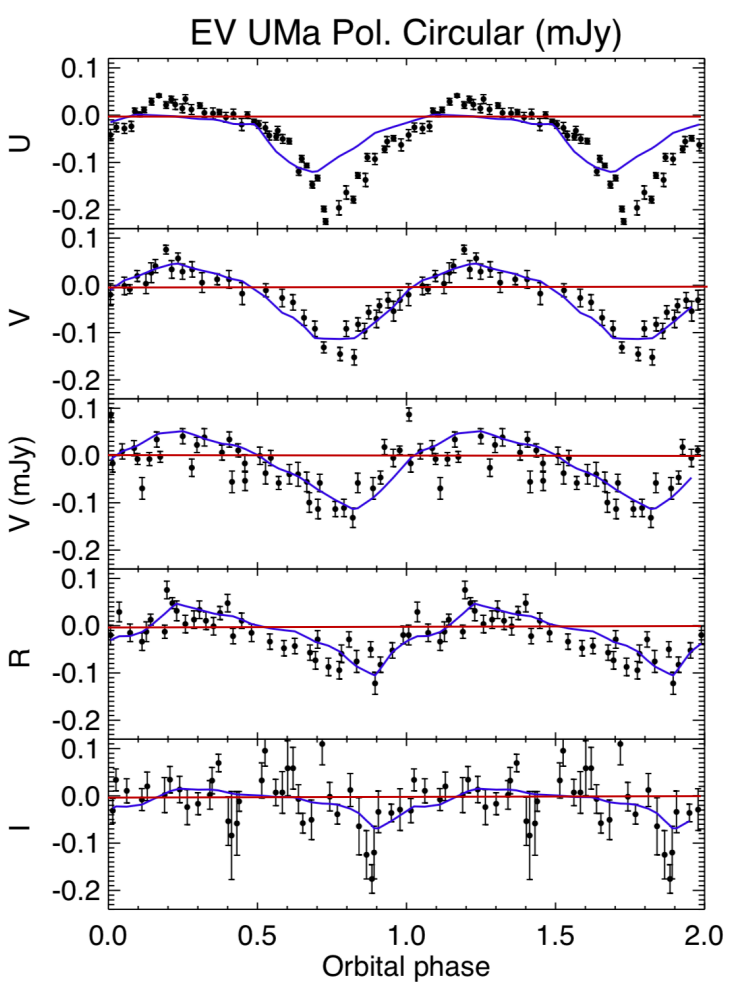


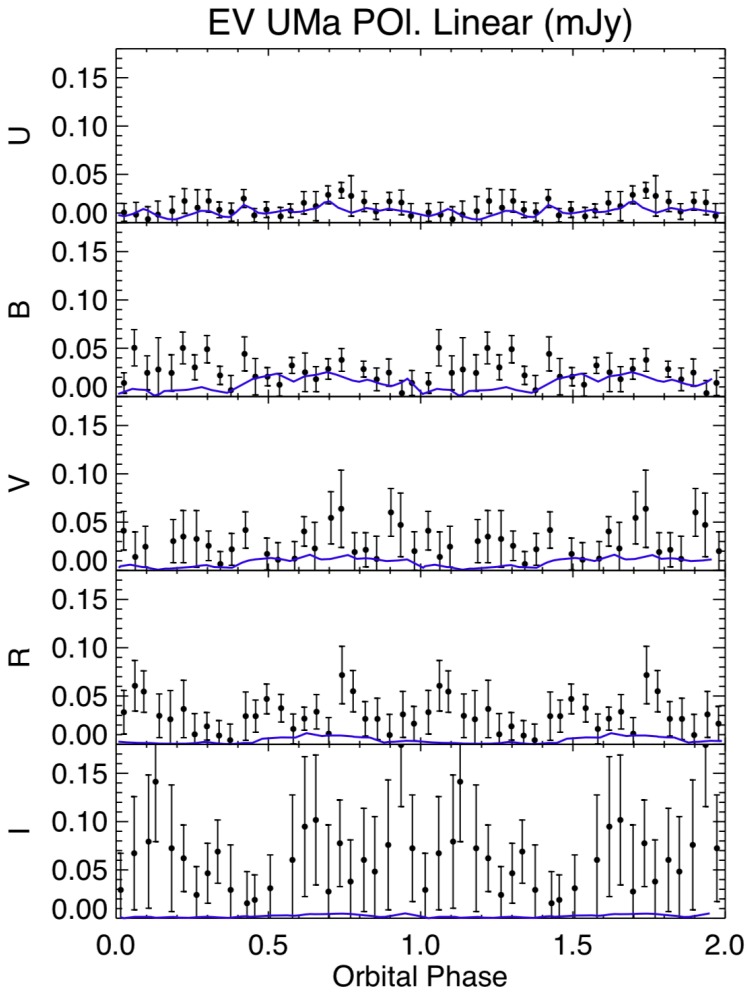




EV UMA OPTICAL MODELING







MODEL RESULTS

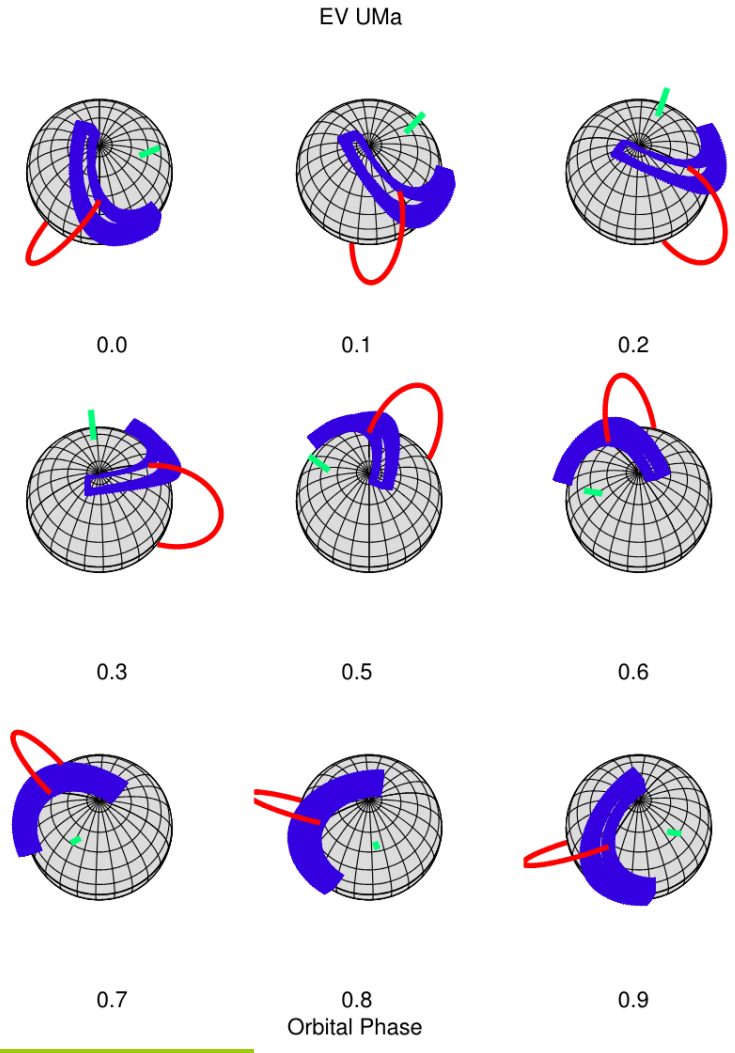
Cyclops input parameters	Fitted values
i	22.1°
β	45.1°
Δ_{long}	56.0°
Δ_R	0.191
h	0.21 R_{WD}
f_l	0.5
B_{pole}	26 MG
B_{lat}	56°
B_{long}	80°
T_{max}	57.0 keV
$N_{e\ max}$	15.0 cm^{-3}
Model results	**Values**
B_{reg}	8-22 MG
$\langle T \rangle$	24.0 keV
T_{pond}	10 keV
T_{range}	1-29 keV
δ_{phase}	−0.11
χ^2	0.395
M_{WD}	0.98

H94

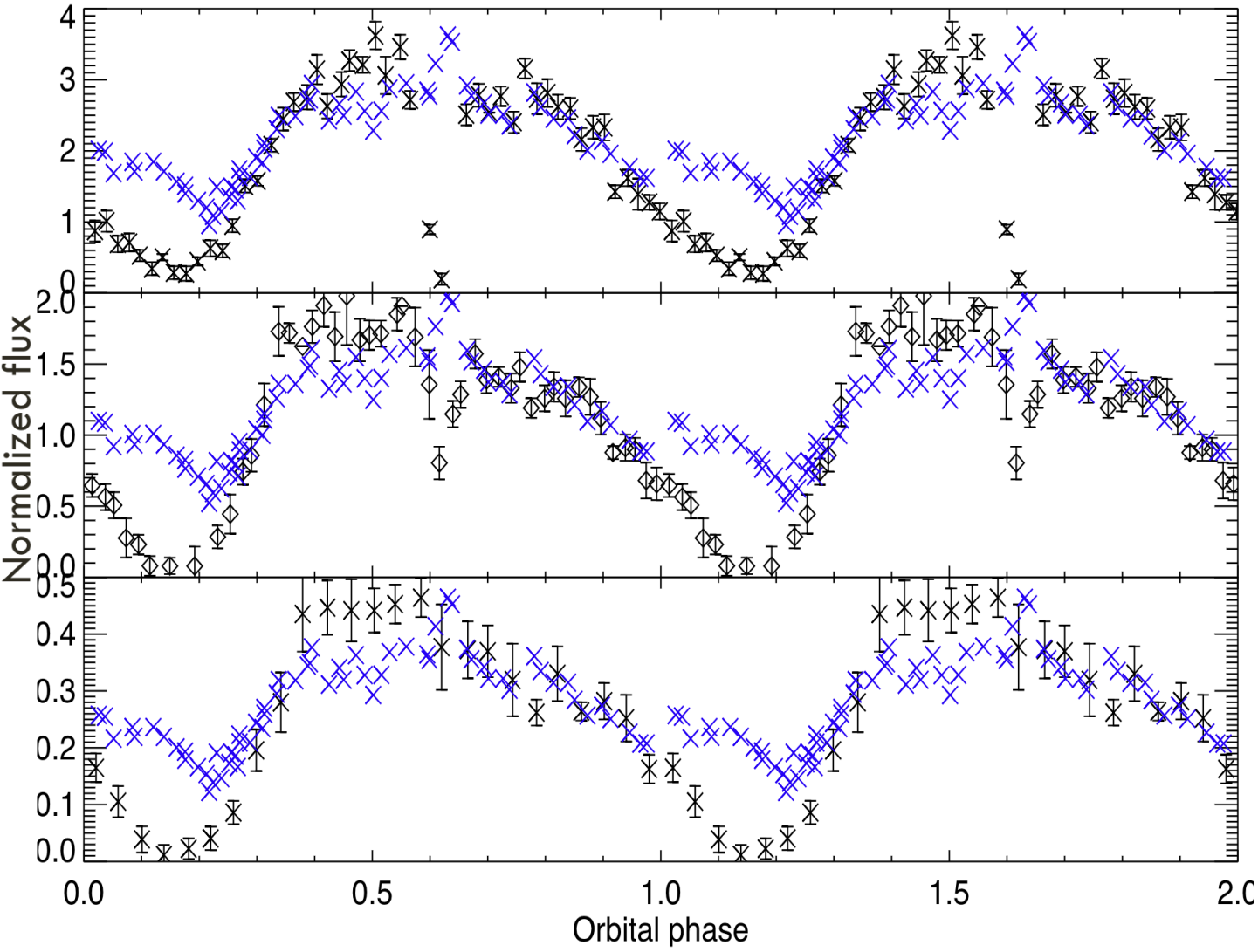
75°

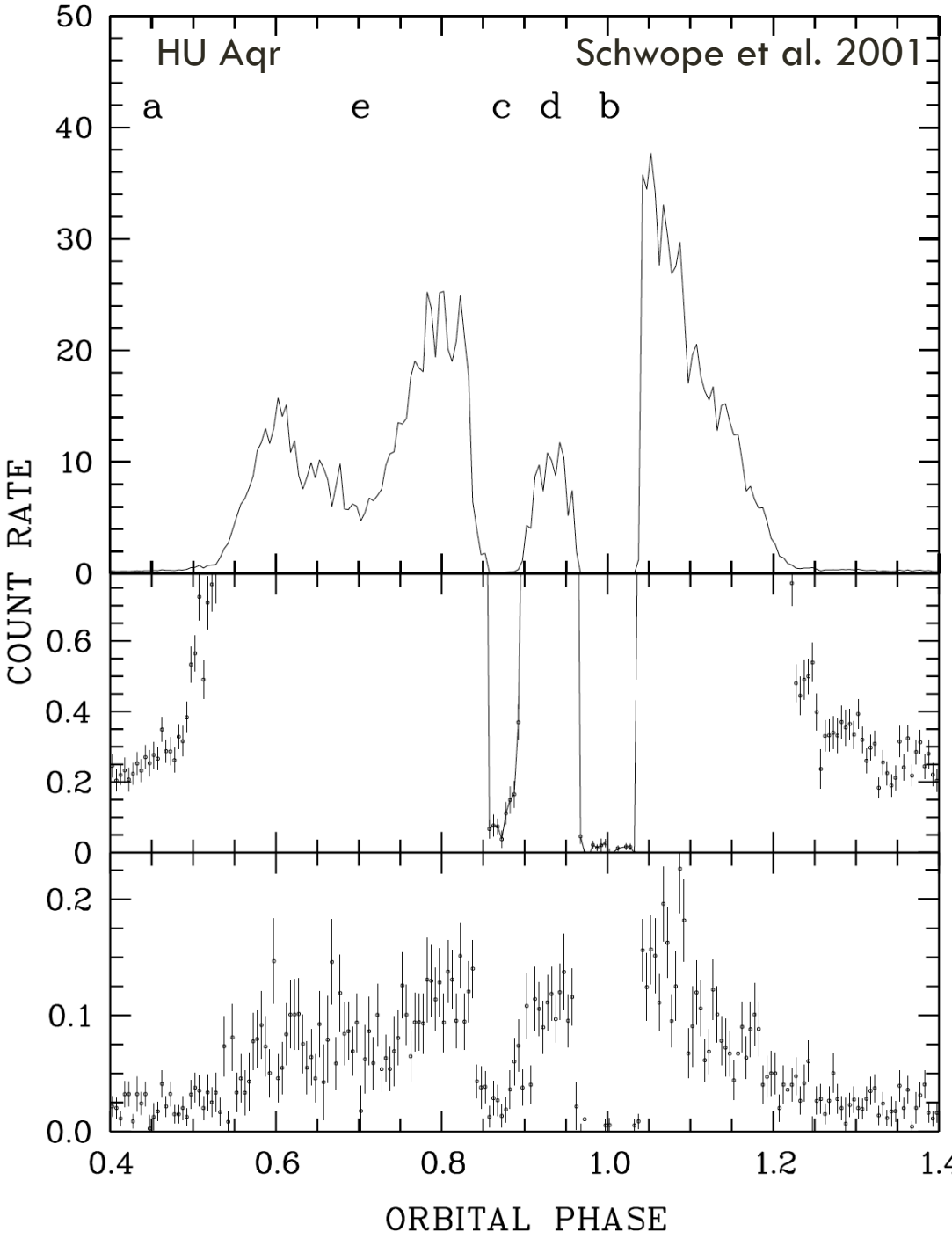
30 MG

20 keV

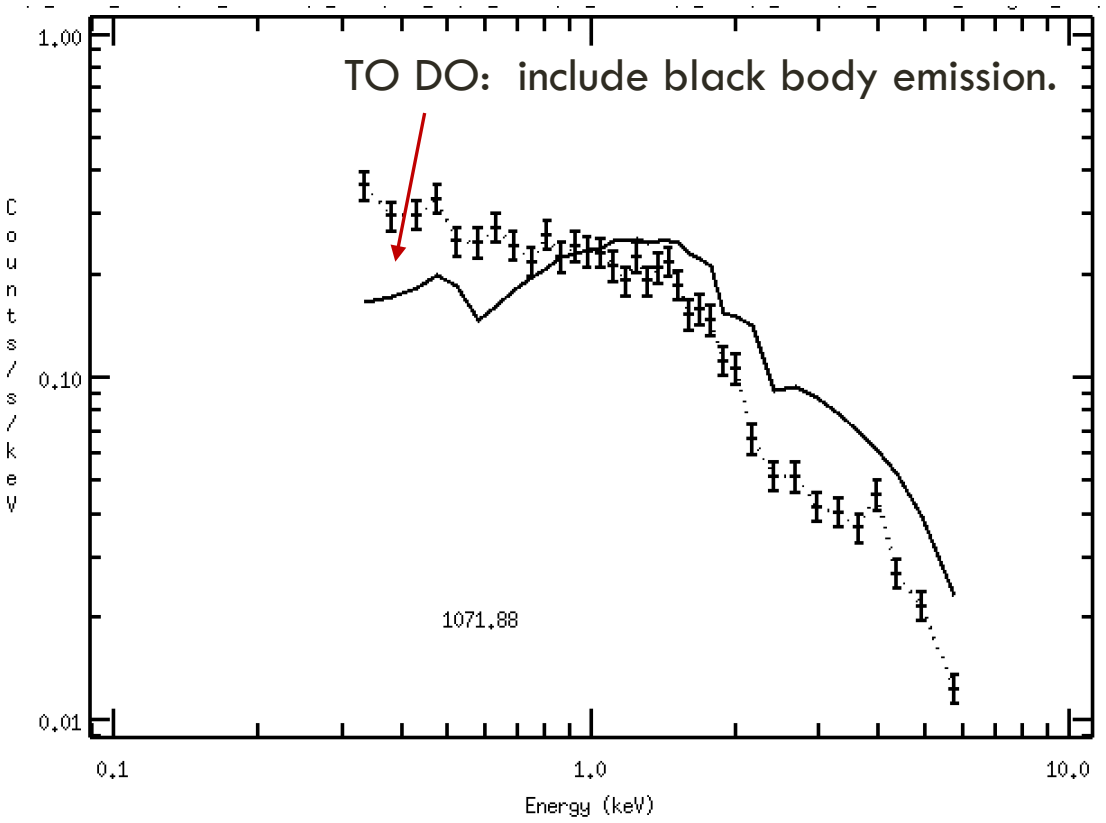


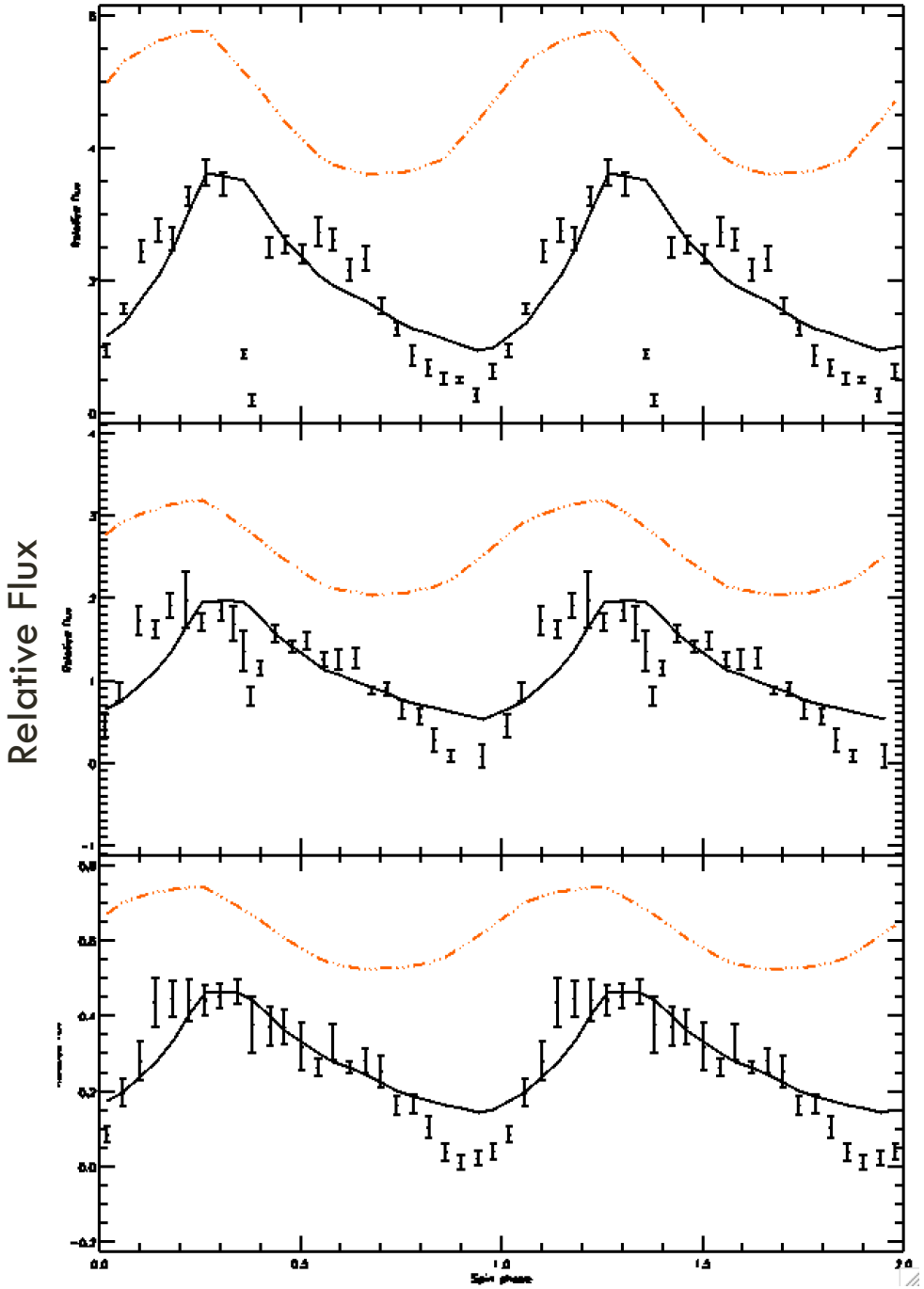
X-RAY DATA PHASE : R03 X K00





CYCLOPS MODEL FOR X-RAY LIGHT CURVES





N_H of the pre-shock region ~ 2 x 10^{22} cm^{-2} X N_H 7-20 x 10^{22} cm^{-2} (R03)

T_{max} = 56 keV → WD mass: 0.98 M_{sun}. X ~ 1.0 M_{sun} (R03)

CONCLUSIONS

Does the system has one or two accretion regions?
A: **One region.**

Did the system geometry change from 1990, 1999 to 2001, so the dip position do not coincide?
A: **Not much, we can compare 1999 to 2000, phase difference of 0.38.**

What is the modeling result of K00? Does it agree with H94 or with R03?
A: **Agree with R03. The narrow dip can not be described by our model, i.e., it is not caused by the lower part of the accretion column!**

What is the global picture considering the optical and X-ray? Can both be explained by the same model?
A: **We find one model with low inclination, very extended region, with self-eclipse and absorption modulating the X-light curve and also providing a very good representation of the optical polarization and photometry.**

THANK YOU

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