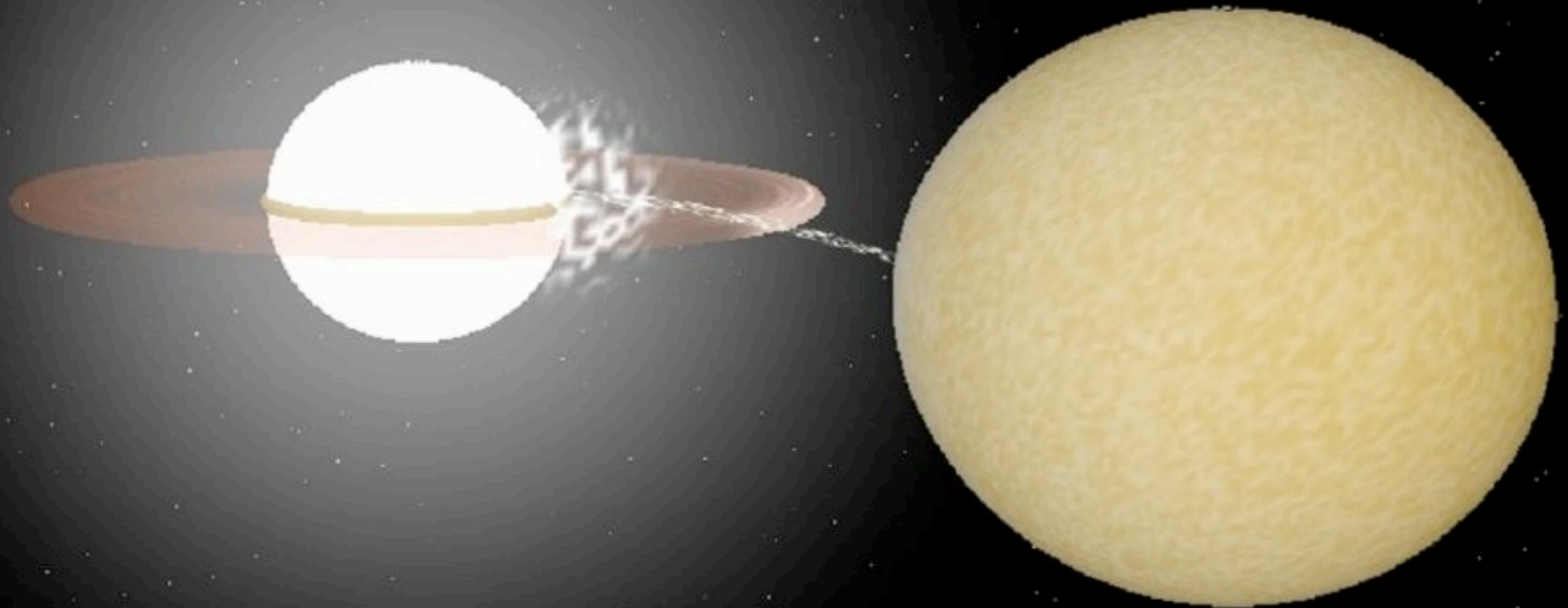


SPECTROSCOPIC CONFIRMATION OF THE 5.4MIN ORBITAL PERIOD IN HM CNC

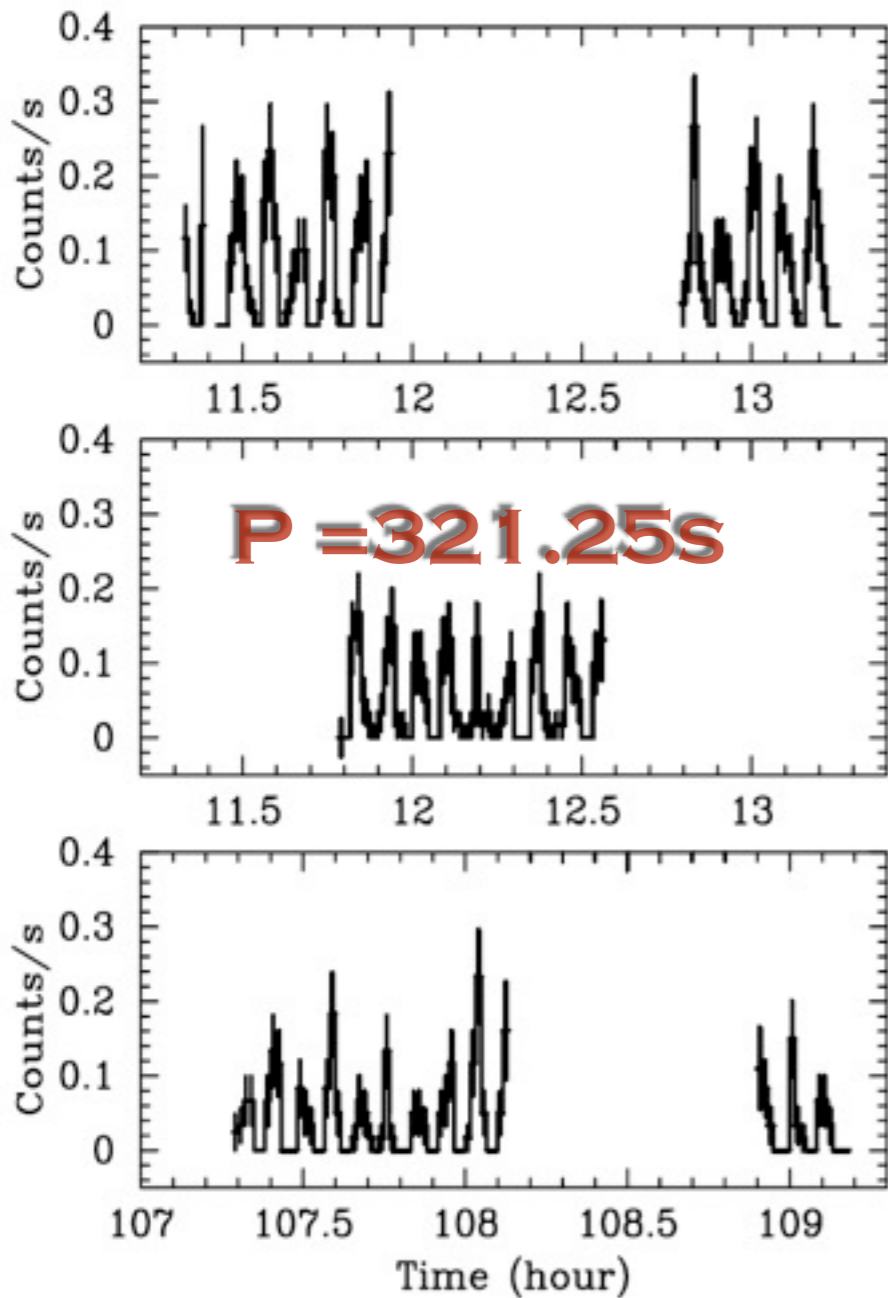
ARNE RAU (MPE GARCHING)

G. ROELOFS, T. MARSH, D. STEEGHS, P. GROOT, G. NELEMANS

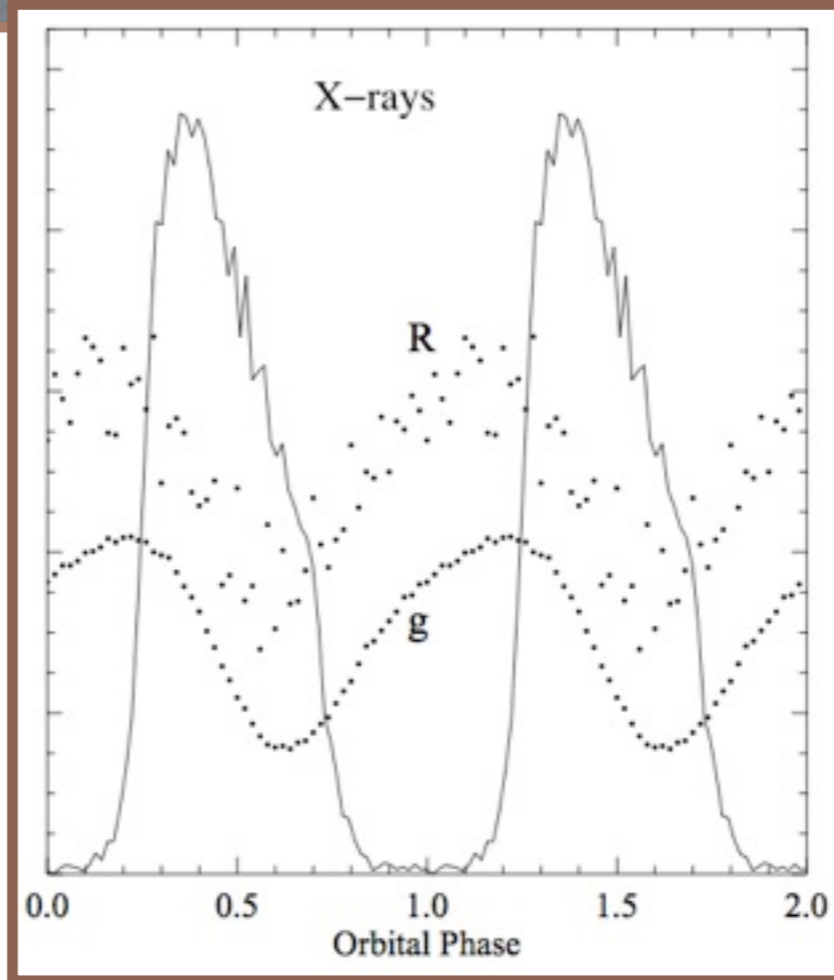


ROELOFS, AR, ET AL. 2010 APJL, 711, 138

X-RAY AND OPTICAL DISCOVERIES

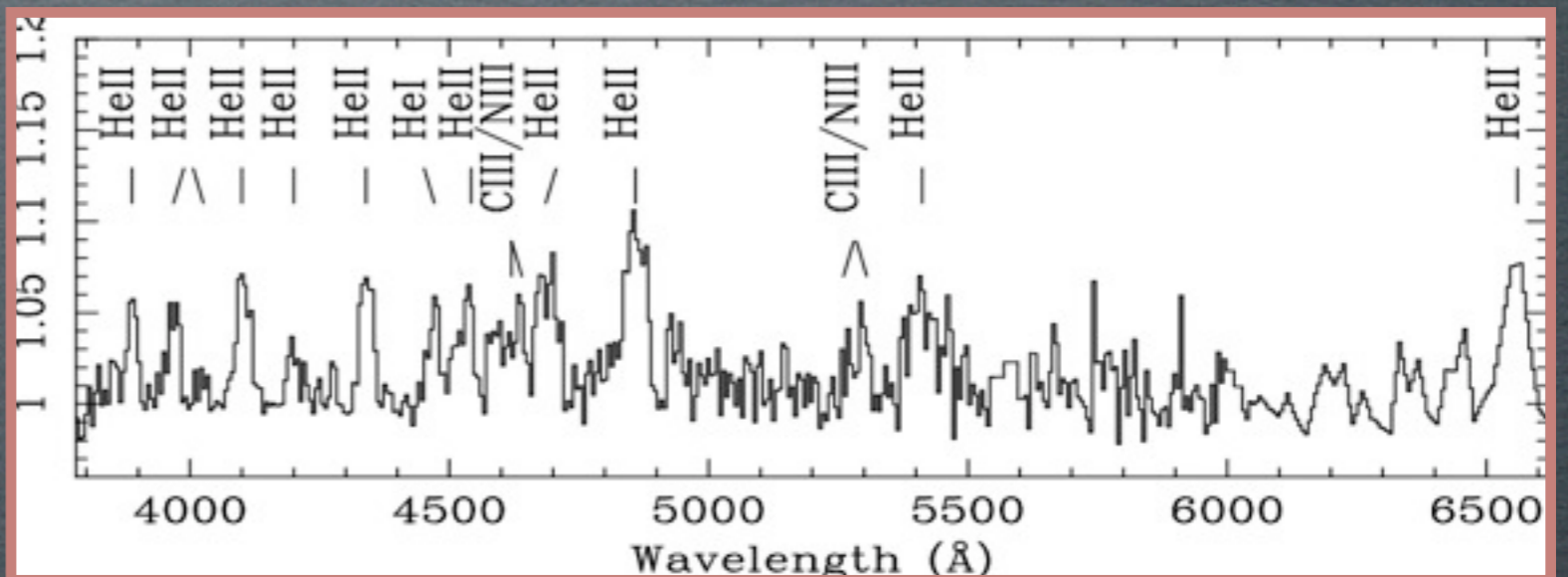


(Israel et al. 1999)



(Barros et al. 2007)

- (100%) VARIABLE HRI SOURCE
- OPTICAL PHASE-SHIFTED
- HELI SPECTRUM
- P_{ORB} DECREASES



(Israel et al. 1999)

MODELS: INTERMEDIATE POLAR

(Israel et al. 1999, Burwitz & Reinsch 2001, Norton et al. 2002)

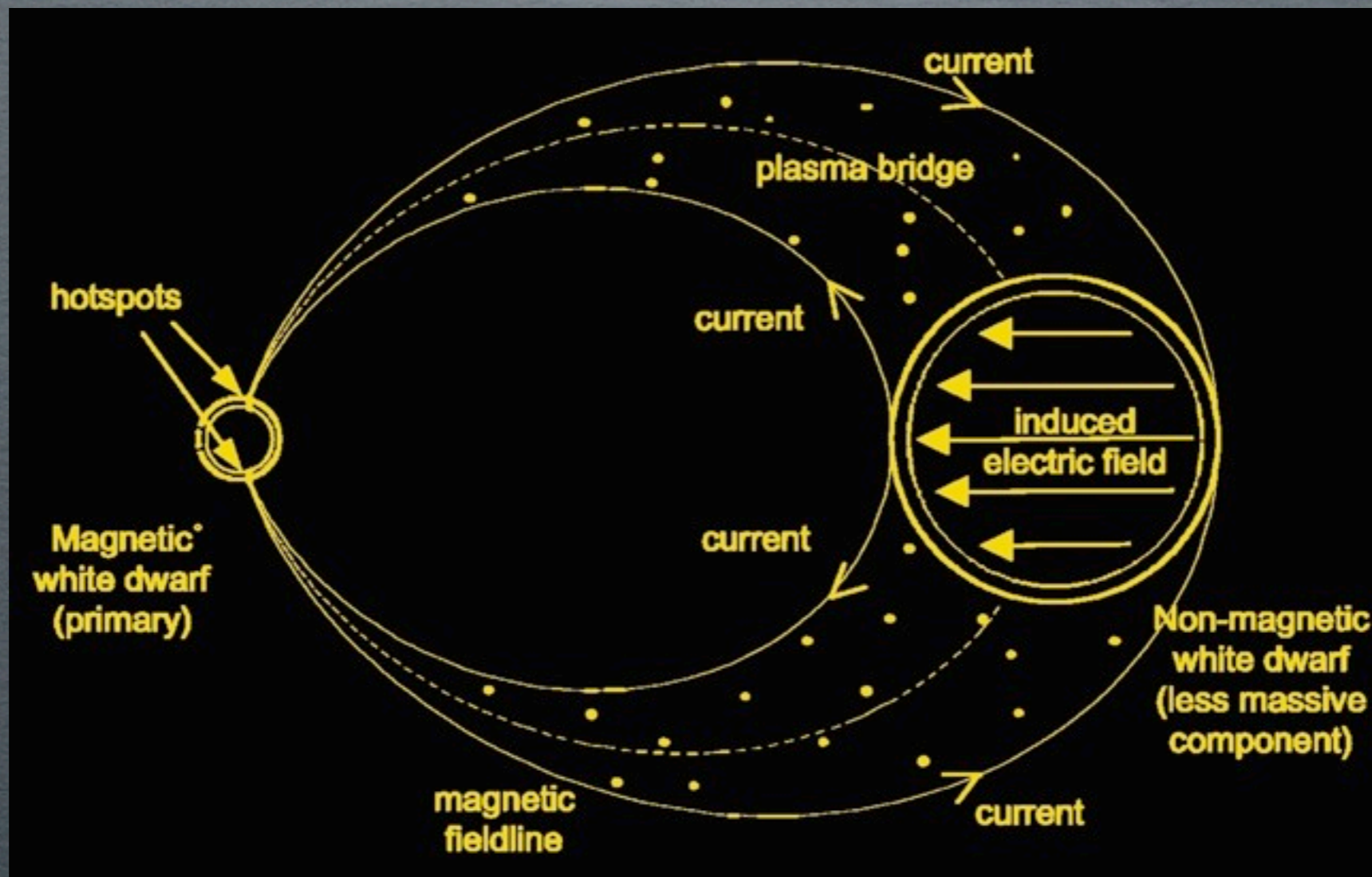
- MAGNETIC WHITE DWARF + MAIN SEQUENCE COMPANION
- 5.4MIN WHITE DWARF SPIN PERIOD
- X-RAYS AND OPTICAL FROM IMPACT SPOTS
- SPIN-UP FROM ANGULAR MOMENTUM IN ACCRETED MATTER
- FACE-ON GEOMETRY FOR LACK OF LONGER 'ORBITAL PERIOD'
- X-RAY/OPTICAL PHASE SHIFT & WEAK EMISSION LINES



MODELS: UNIPOLAR INDUCTOR

(Wu et al. 2002, Dall'Osso et al. 2006, 2007)

- DETACHED DOUBLE WHITE DWARF SYSTEM IN 5.4MIN ORBIT
- ELECTRIC FIELD ON SECONDARY FROM MAGNETIC PRIMARY
- X-RAYS FROM OHMIC LOSSES IN FLUX TUBE FOOTPOINTS
- OPTICAL FROM RESISTIVE HEATING OF THE SECONDARY
- PERIOD DECREASE BY ANGULAR MOMENTUM LOSS
- X-RAY/OPTICAL PHASE SHIFT + HEII

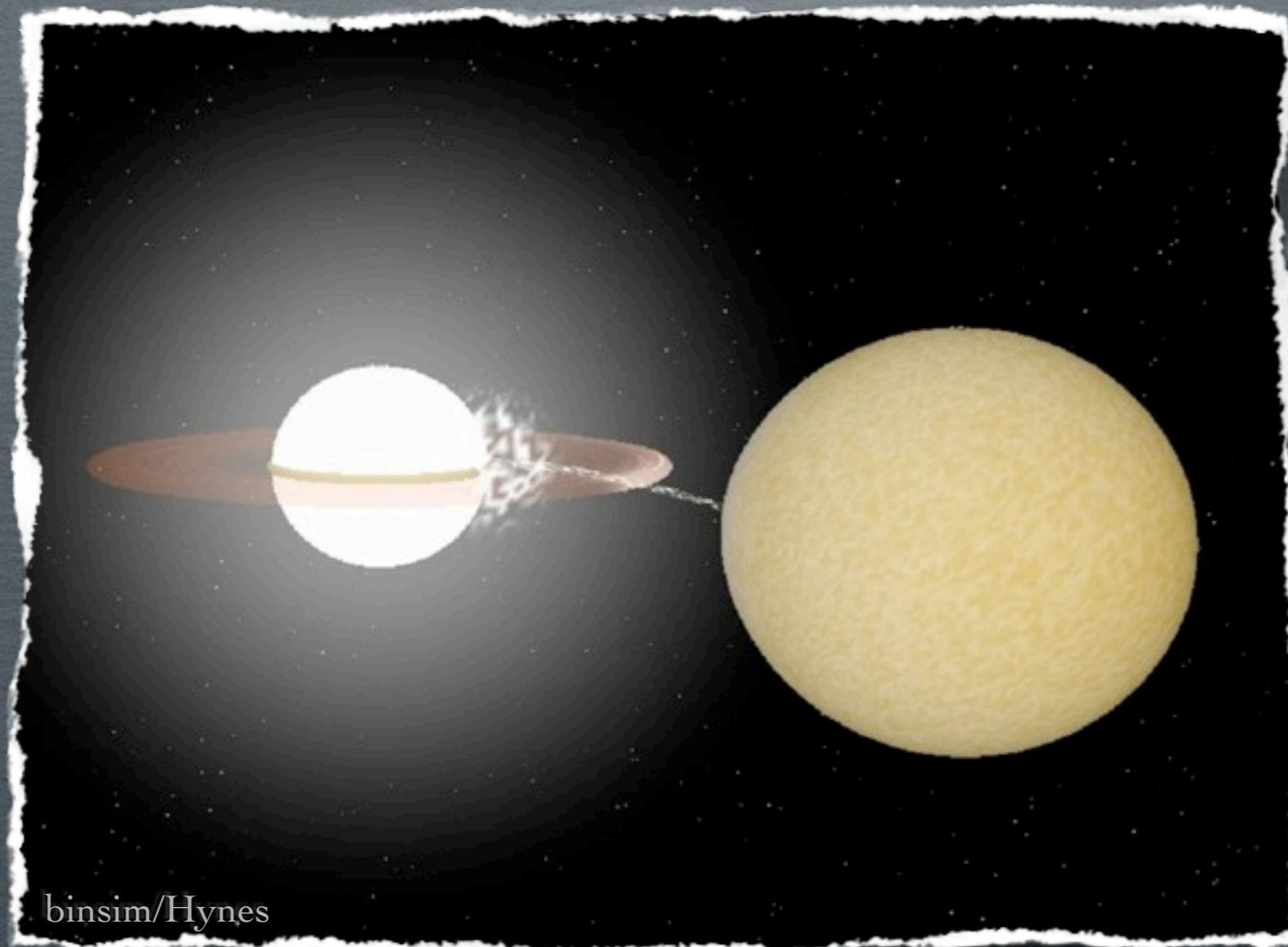


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MODELS: AM CVN STAR

(Marsh & Steeghs 2002, Ramsay et al. 2002)

- INTERACTING WHITE DWARF BINARY IN 5.4MIN ORBIT
- DIRECT IMPACT ACCRETOR
- X-RAYS FROM HOT SPOT ON PRIMARY
- PHASE SHIFT - DEFLECTED ACCRETION STREAM
- PERIOD DECREASE PROBLEMATIC

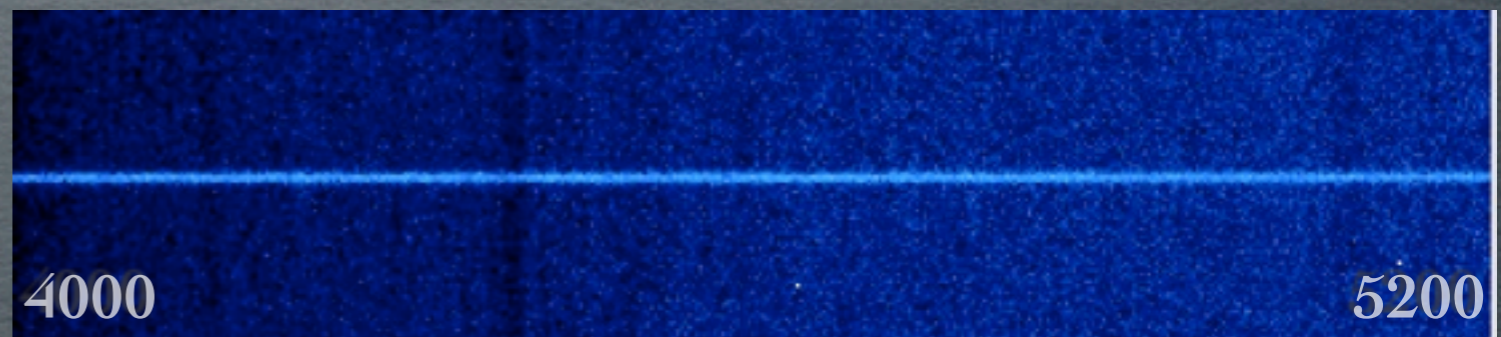
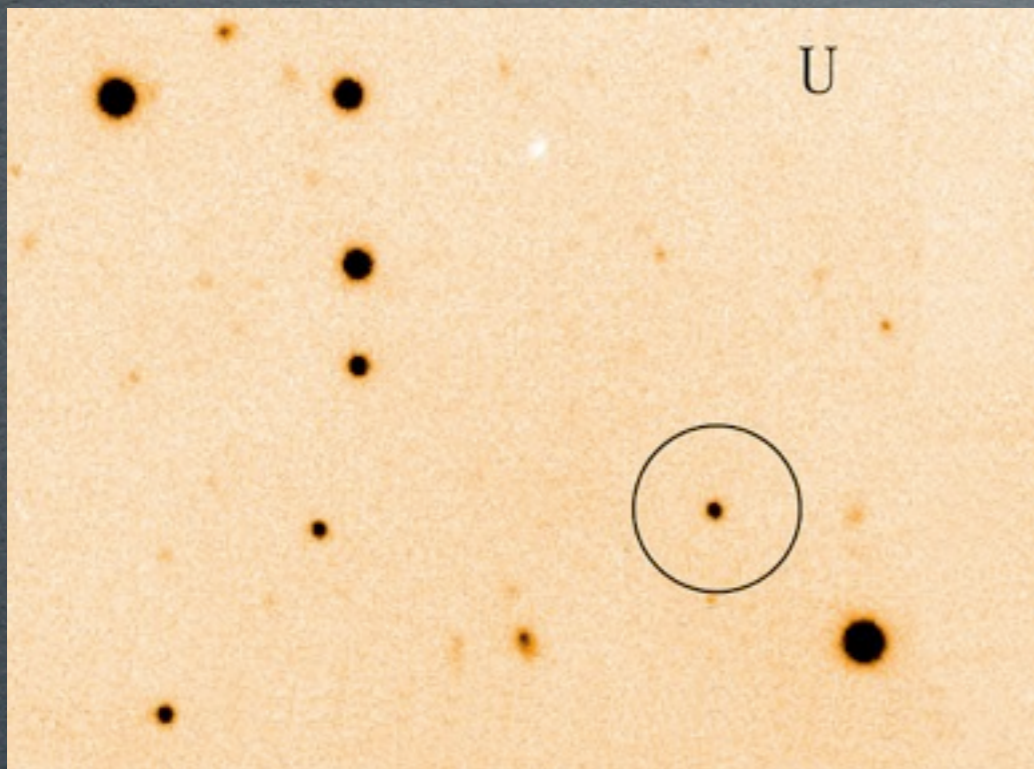
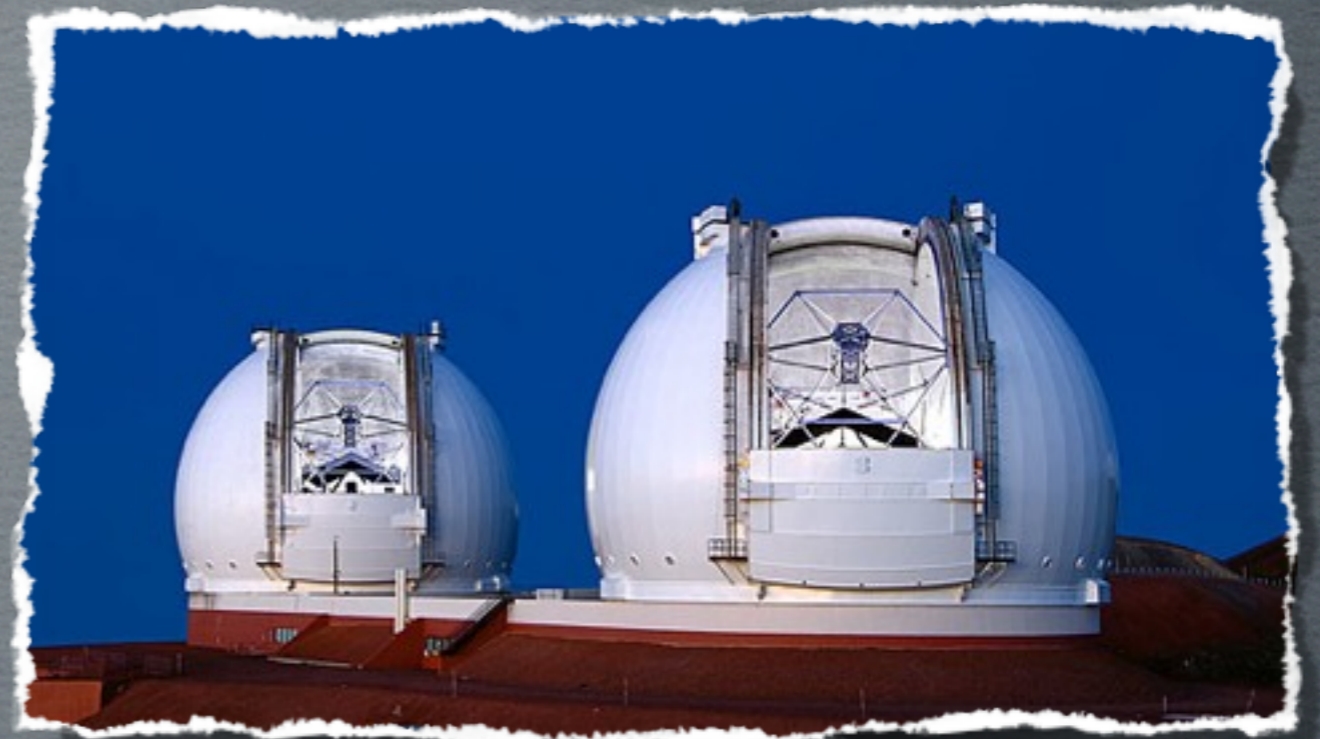


binsim/Hynes

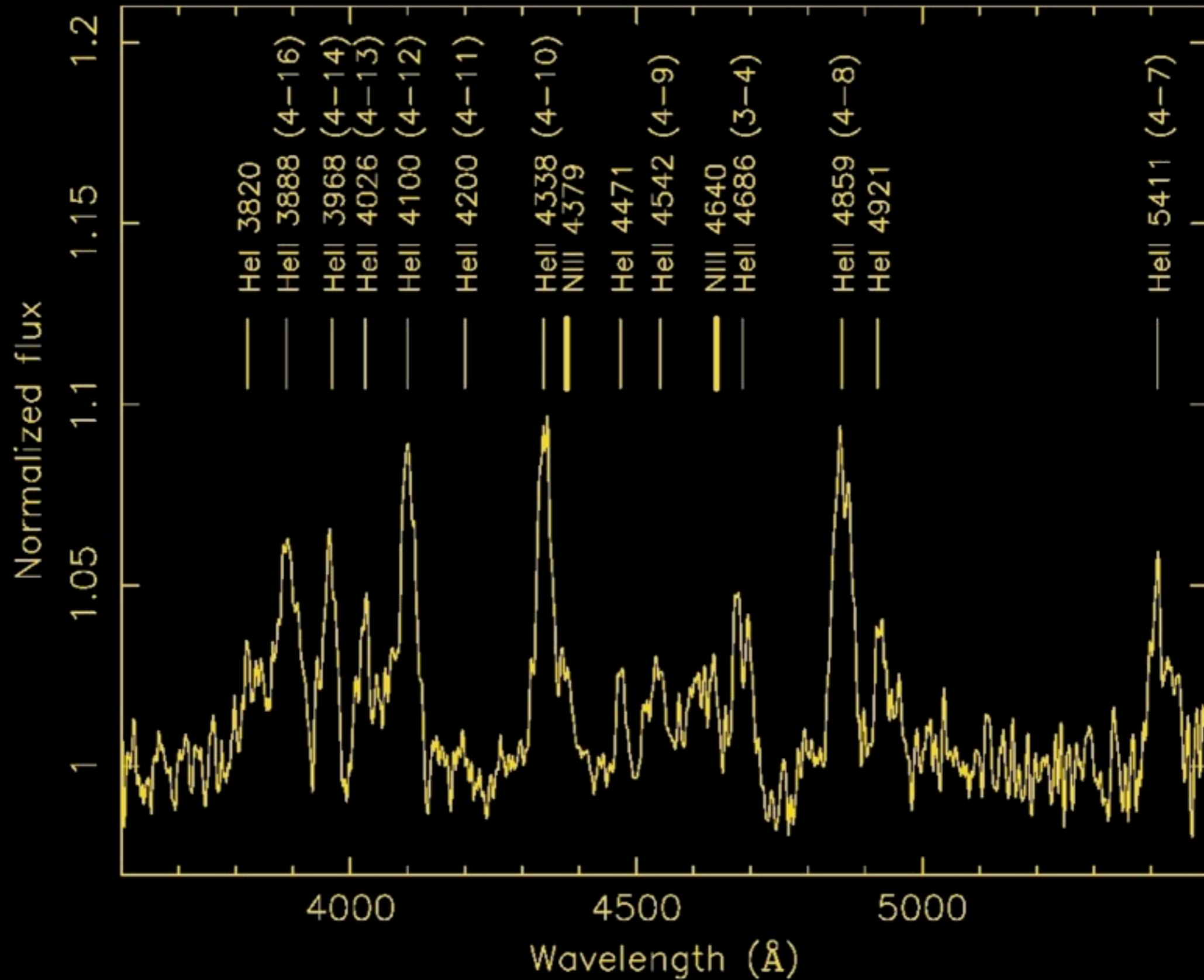
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OBSERVATIONS

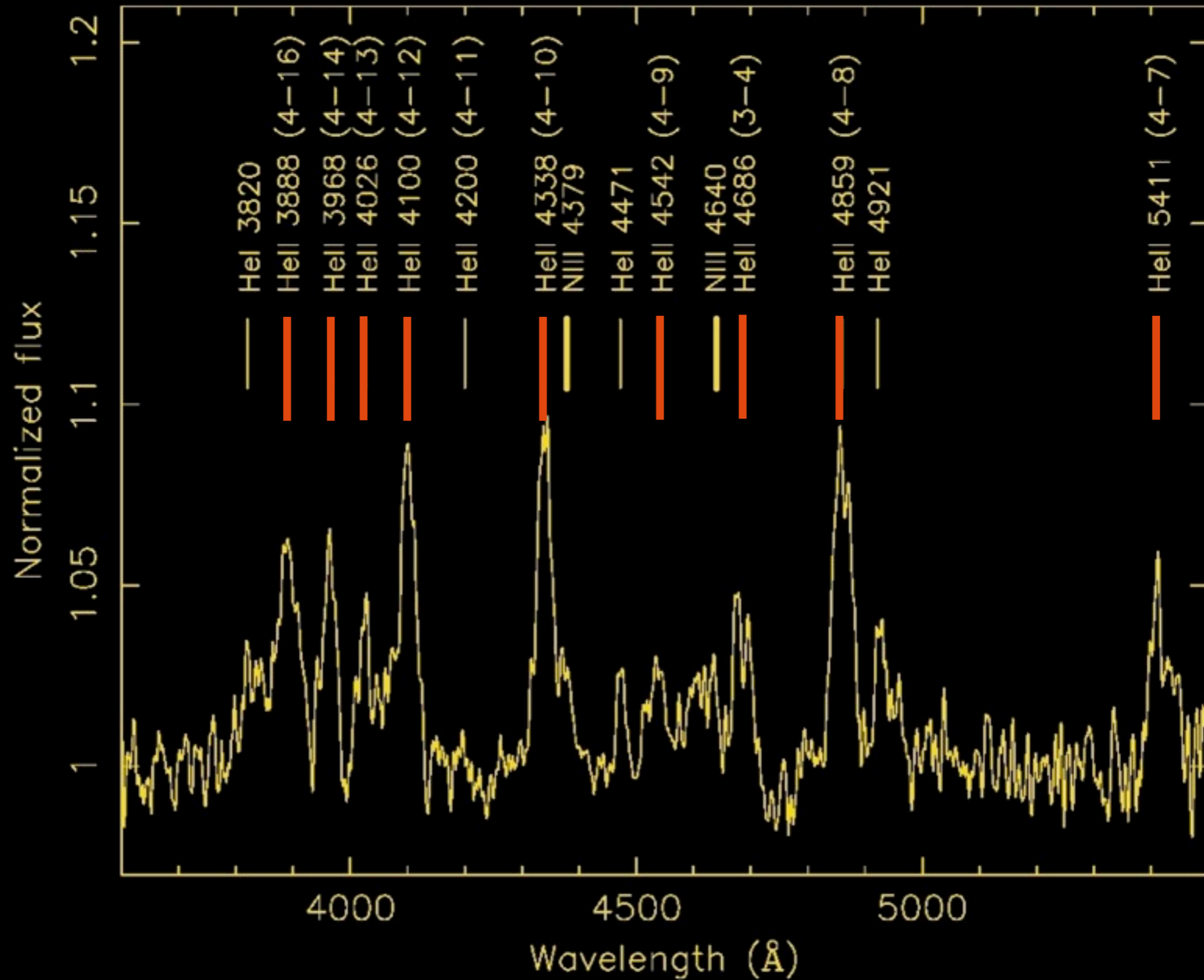
- SPECTROSCOPY KECK-I / LRIS
- JAN/MAR 2009 (FAILED ATTEMPTS IN 2005/6/7)
- 300 KM/S RESOLUTION
- ~400X 60S EXPOSURES (U~19.6MAG, B~20.7MAG)



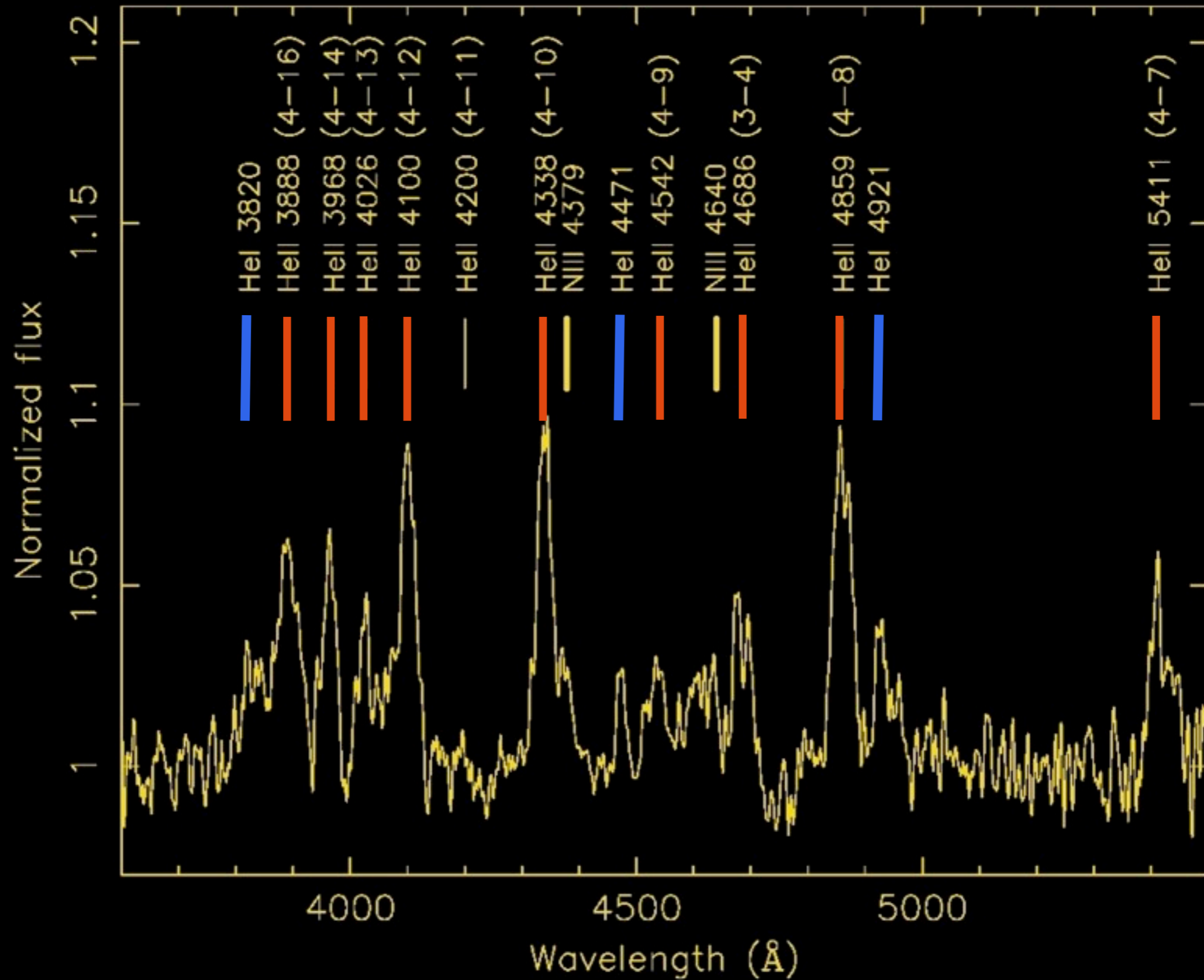
AVERAGED OPTICAL SPECTRUM



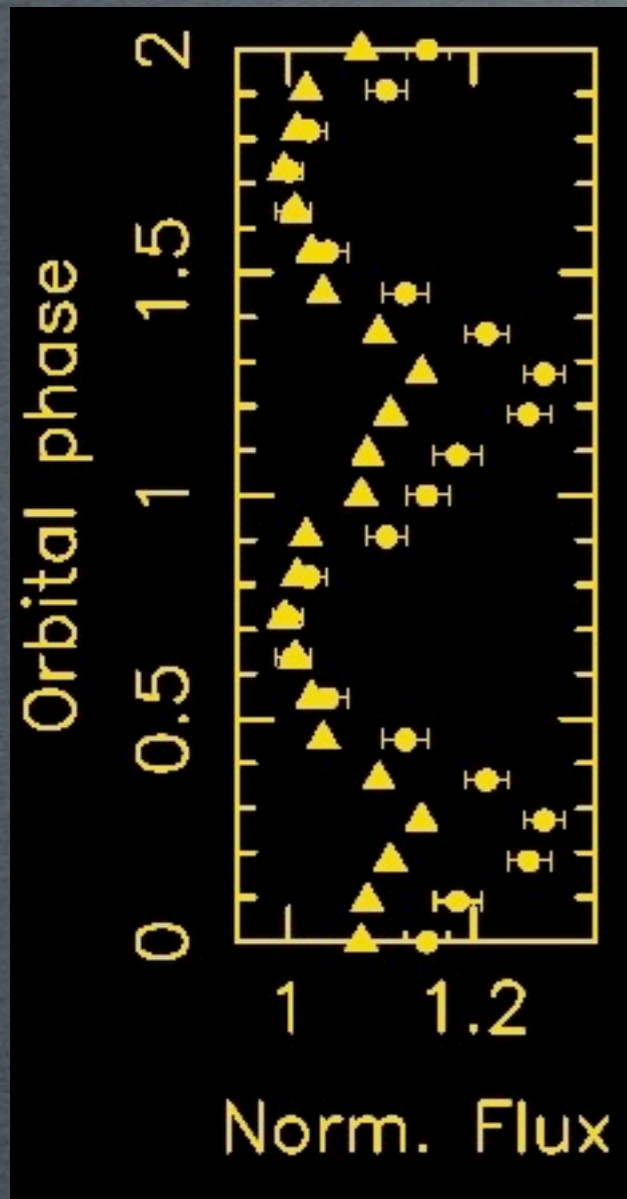
AVERAGED OPTICAL SPECTRUM



AVERAGED OPTICAL SPECTRUM

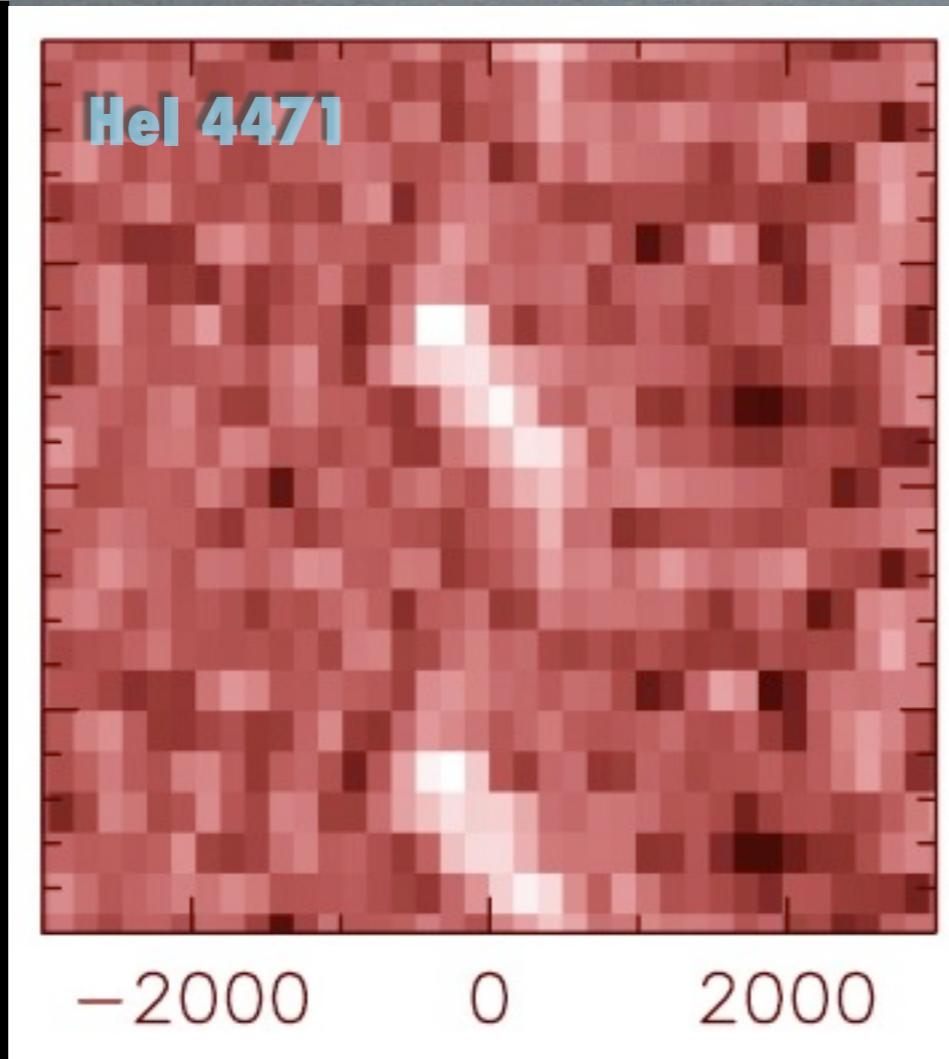
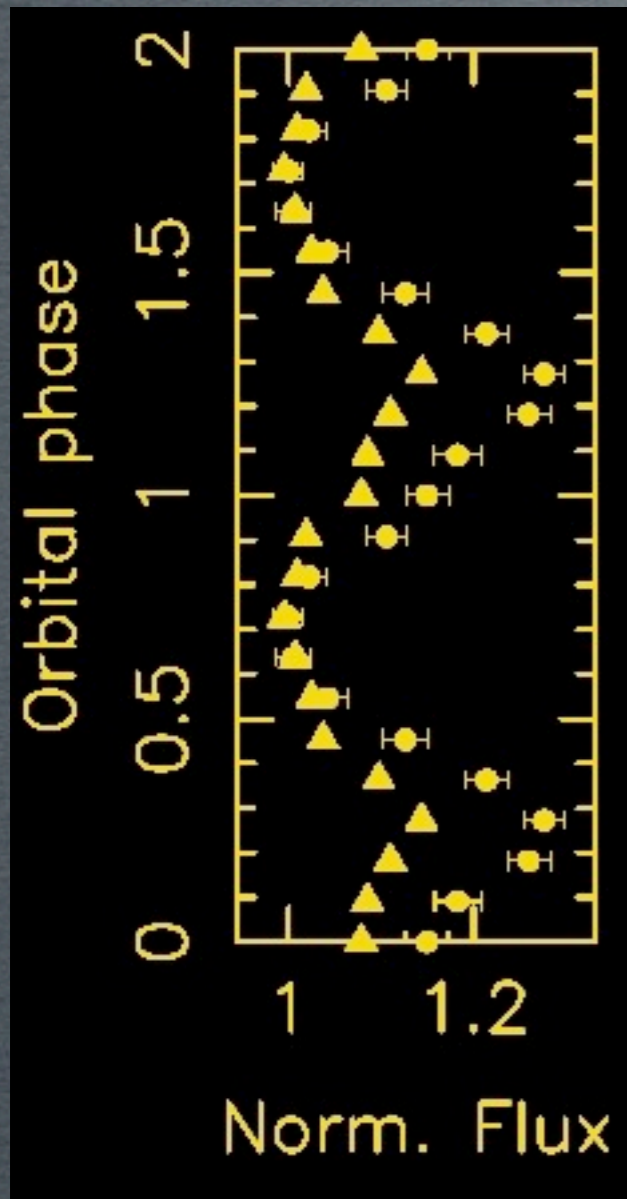


TIME RESOLVED SPECTROSCOPY



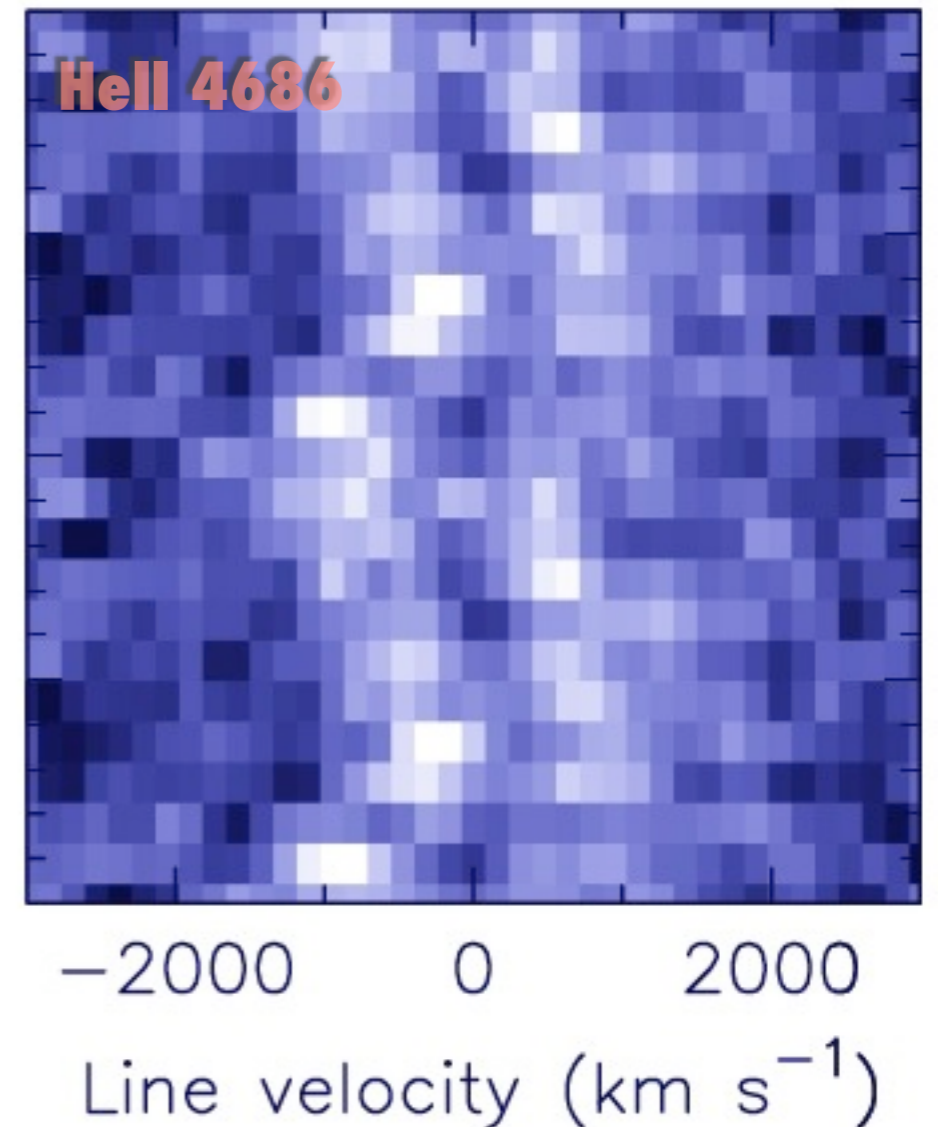
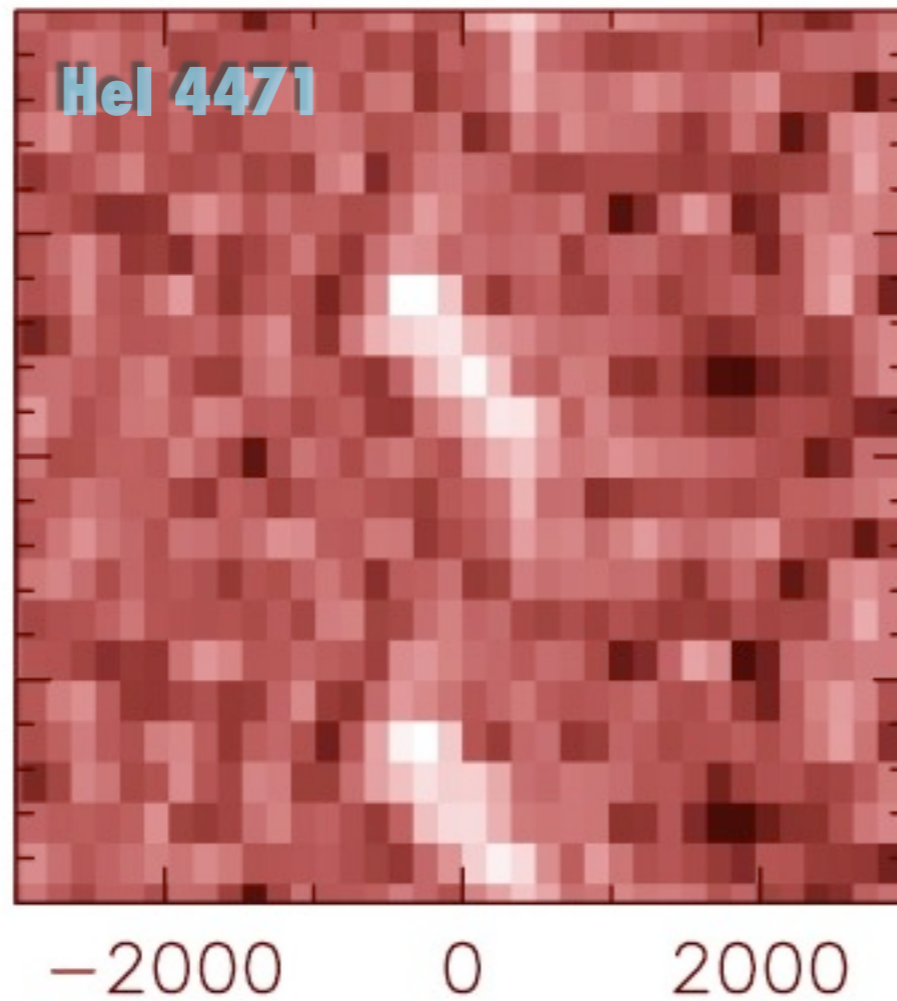
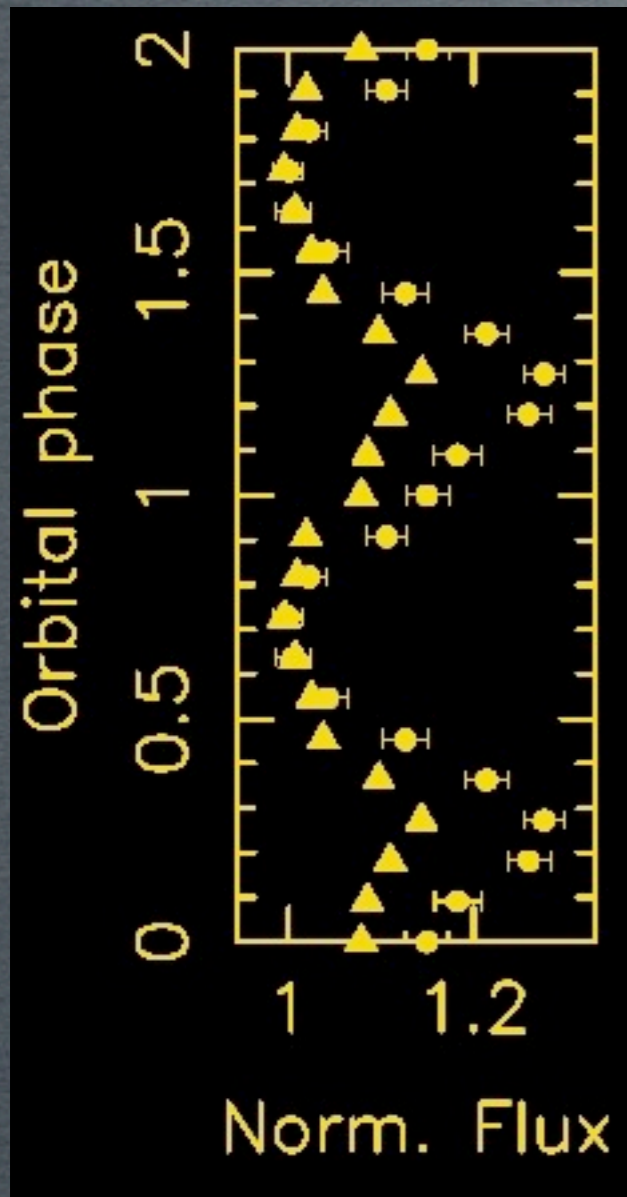
- CONTINUUM FLUX AND HeI EMISSION IN PHASE

TIME RESOLVED SPECTROSCOPY



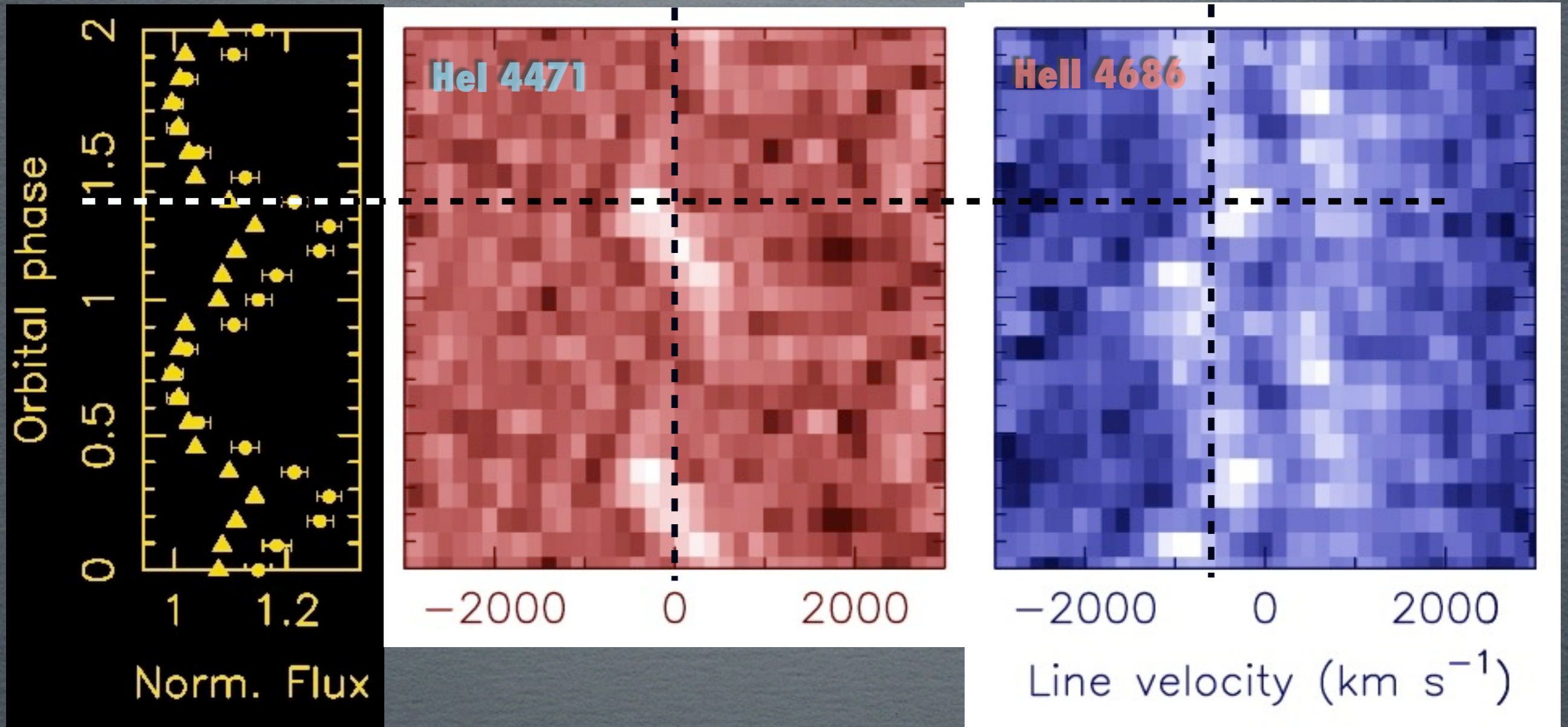
- CONTINUUM FLUX AND HE I EMISSION IN PHASE

TIME RESOLVED SPECTROSCOPY



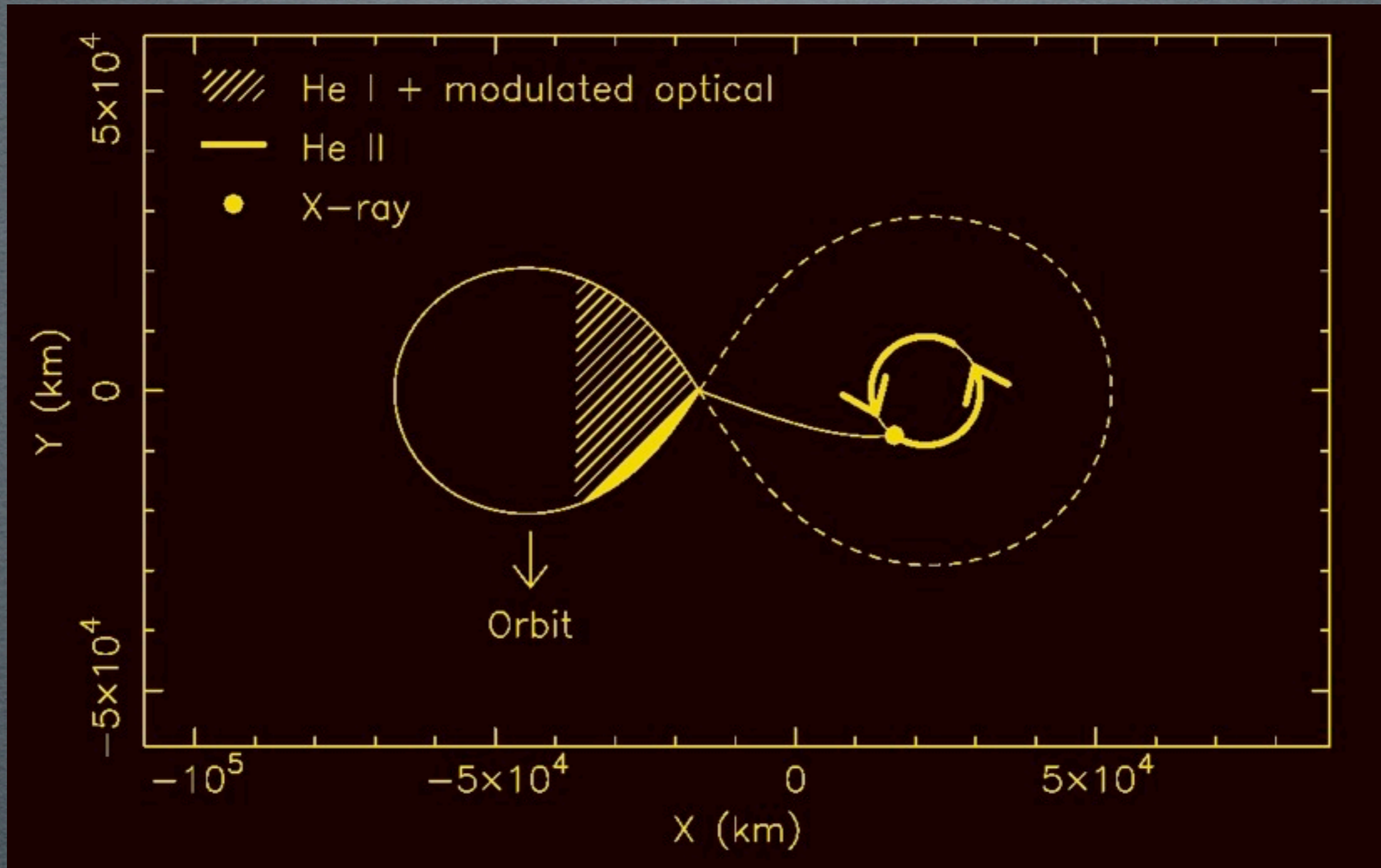
- CONTINUUM FLUX AND HE I EMISSION IN PHASE
- HE I AND HE II ANTI-PHASE
- SEMI-AMPLITUDES OF ~ 390 (HE I) AND ~ 260 (HE II) KM/S

TIME RESOLVED SPECTROSCOPY



- CONTINUUM FLUX AND HE I EMISSION IN PHASE
- HE I AND HE II ANTI-PHASE
- SEMI-AMPLITUDES OF ~ 390 (HE I) AND ~ 260 (HE II) KM/S

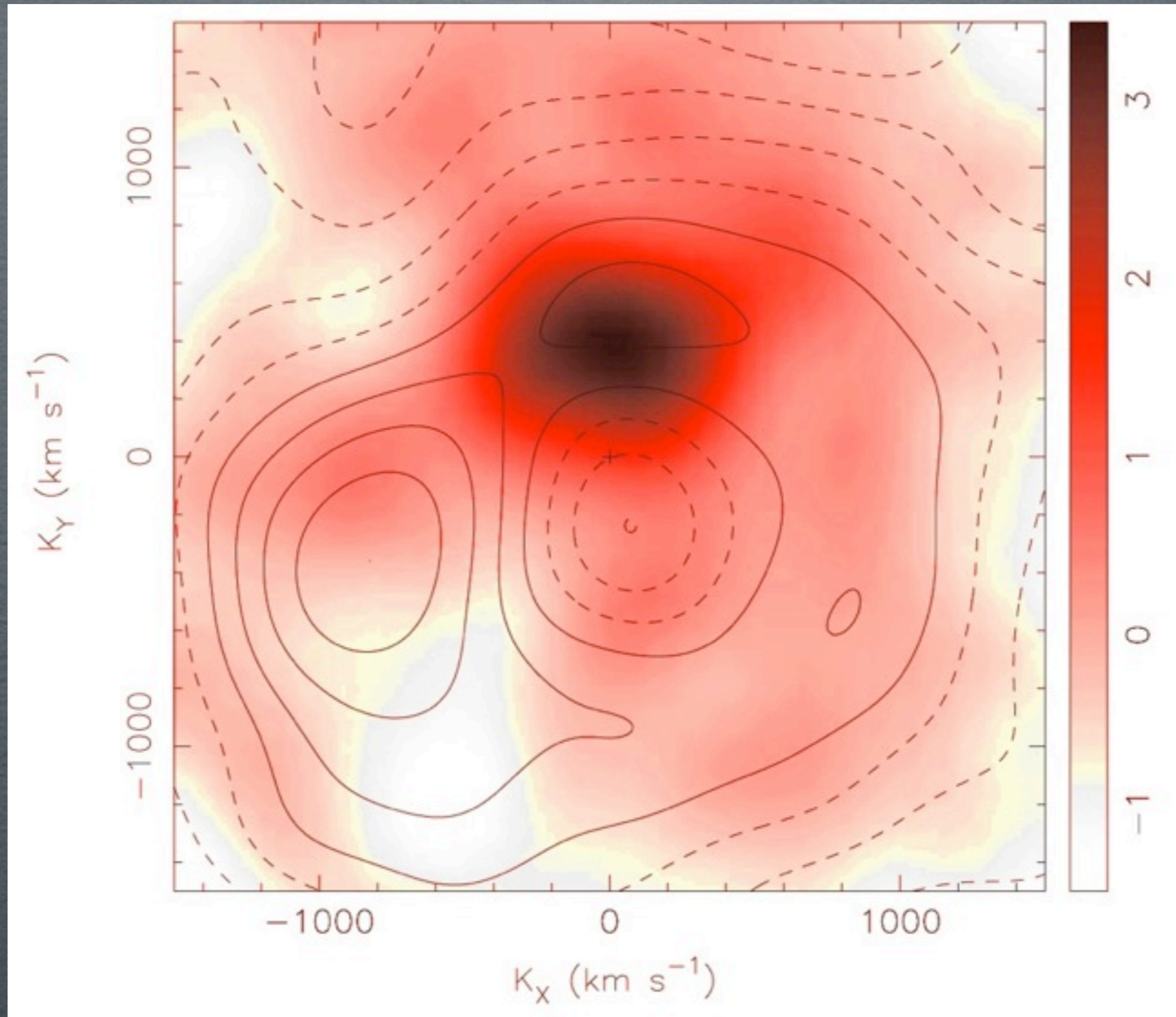
AM CVN MODEL FOR HM CNC



- HEI FROM IRRADIATED DONOR
- HEII FROM BELT/DISK AROUND ACCRETOR
- $Q = 0.50 \pm 0.13$

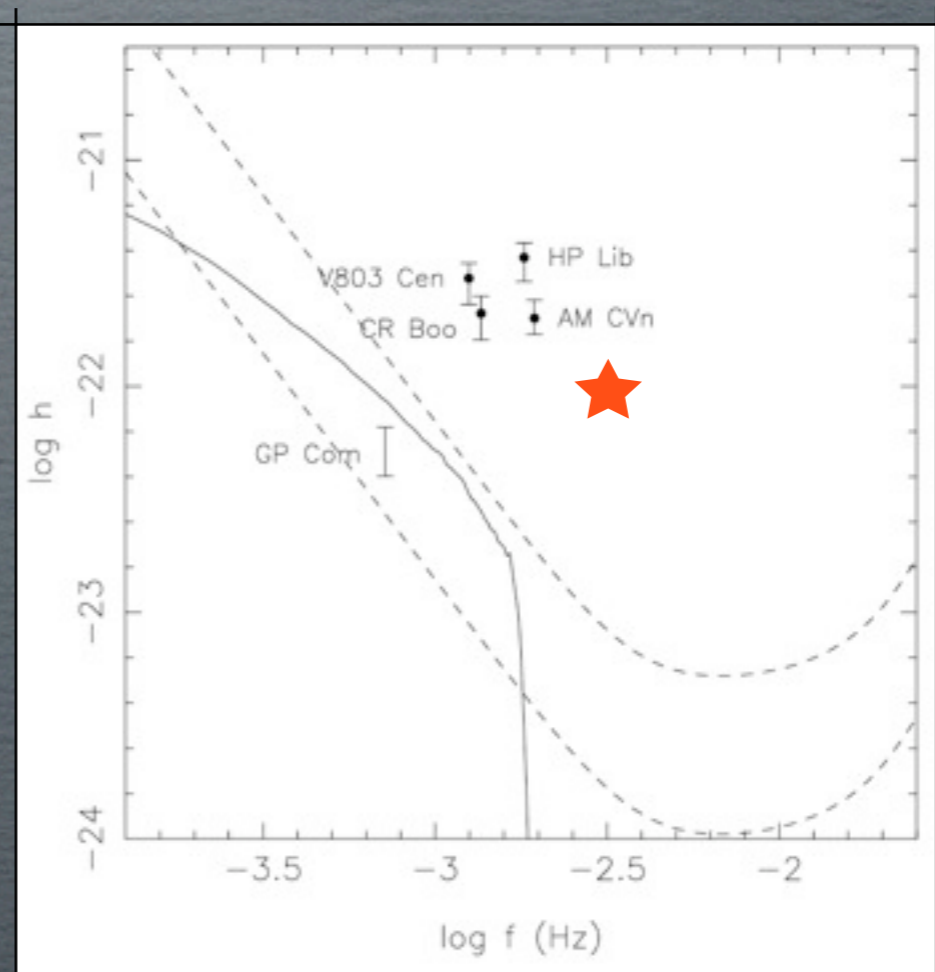
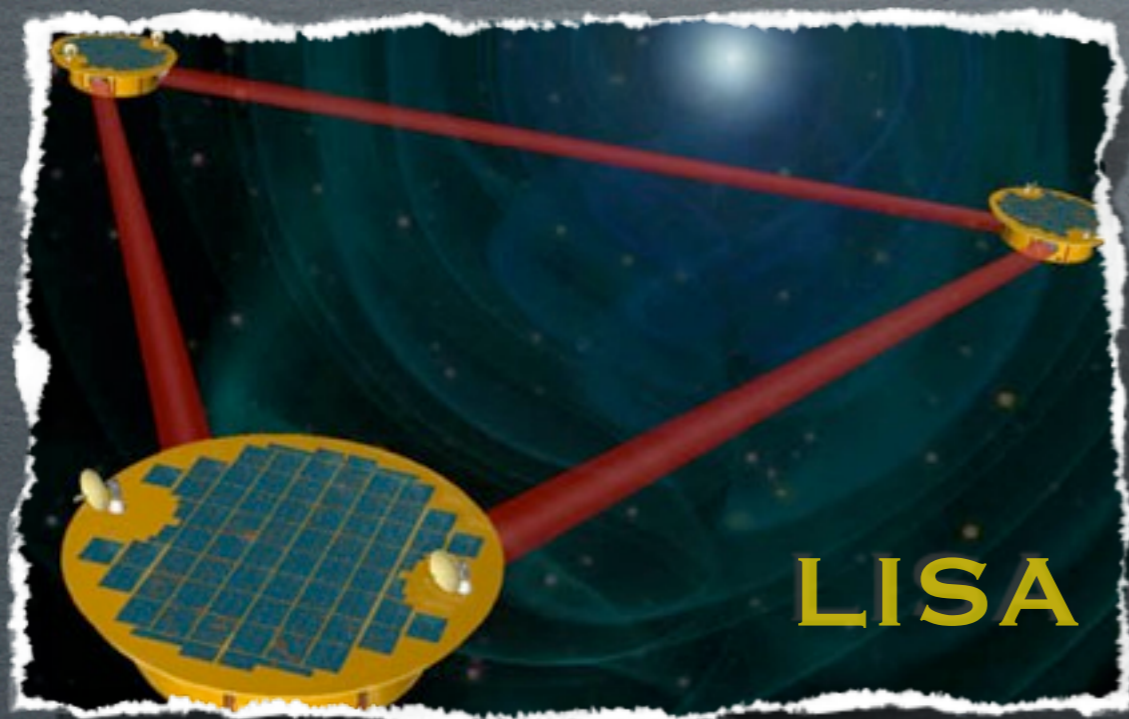
DOPPLER TOMOGRAM

- HEI 4471 (RED-SCALE) + HeII (CONTOURS)
- $M_2=0.27M_{\text{SUN}}$, $M_1=0.55M_{\text{SUN}}$



SUMMARY

- HM Cnc (RXJ0806) IS THE SHORTEST ORBITAL PERIOD BINARY KNOWN.
- HEI AND HEII EMISSION FROM IRRADIATED FACE OF SECONDARY AND FROM RING AROUND PRIMARY, RESPECTIVELY
- MASS RATIO = 0.50 ± 0.13 , $M_2 = 0.27 M_{\text{SUN}}$, $M_1 = 0.55 M_{\text{SUN}}$
- ONE OF THE STRONGEST KNOWN GRAVITY-WAVE SOURCES FOR LISA



E N D