Tidal Instabilities in Soft X-ray Transients

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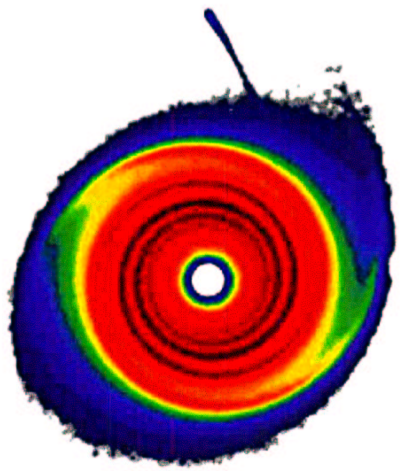
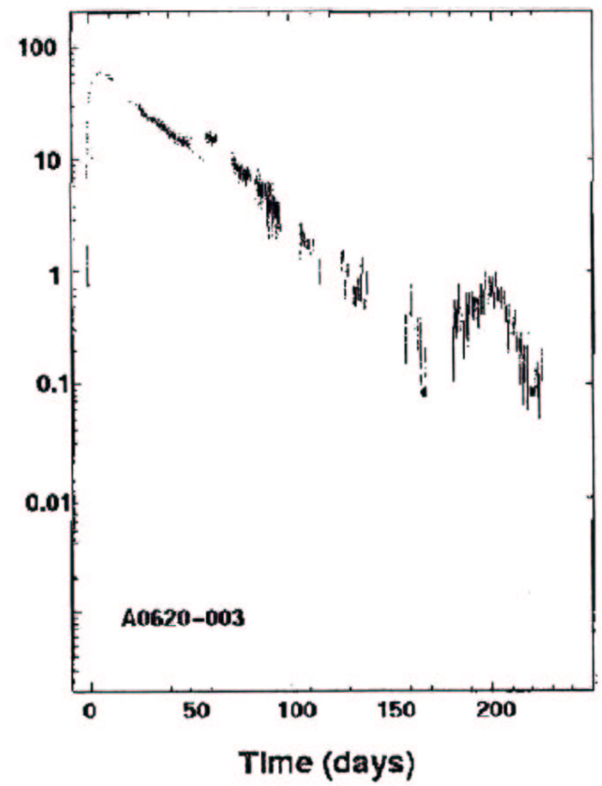


A0620–003

also:
GS2000+25
GS1124-68



$P_{orb} = 7.75^{h}$

$q = 0.067 \pm 0.010$

$M_1 \sin^3 i = 3.09 \pm 0.09\ M_{Sun}$

(Marsh, Robinson & Wood, 1994)

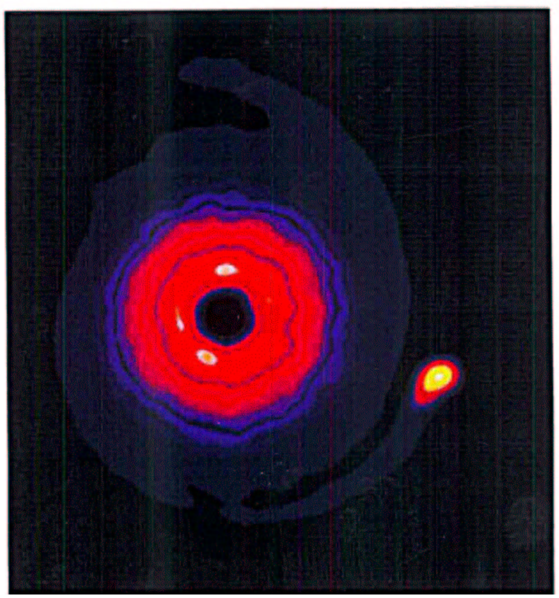
Irradiation

Accretion luminosity: $L_x = \eta\, c^2 \frac{dM_1}{dt}$

Irradiating flux : $F_{irr} = \sigma T_{irr}^4 = \frac{L_x \; f(r,H,\beta)}{4\pi r^2}$

$T_{irr} = T_H$ when: $R_{irr}^2 \sim \eta\, f \frac{dM_1}{dt}$

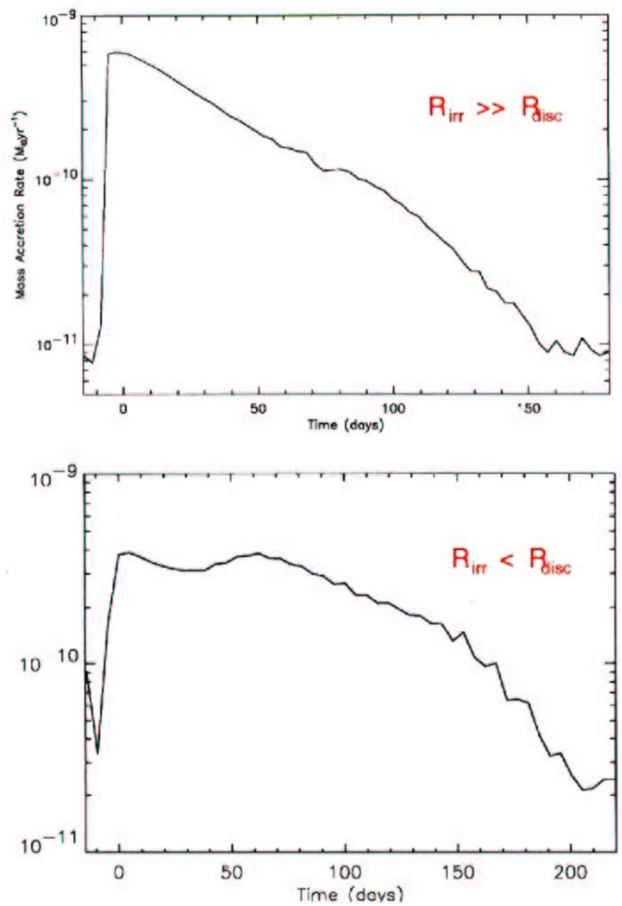
(King & Ritter 1998)



Results

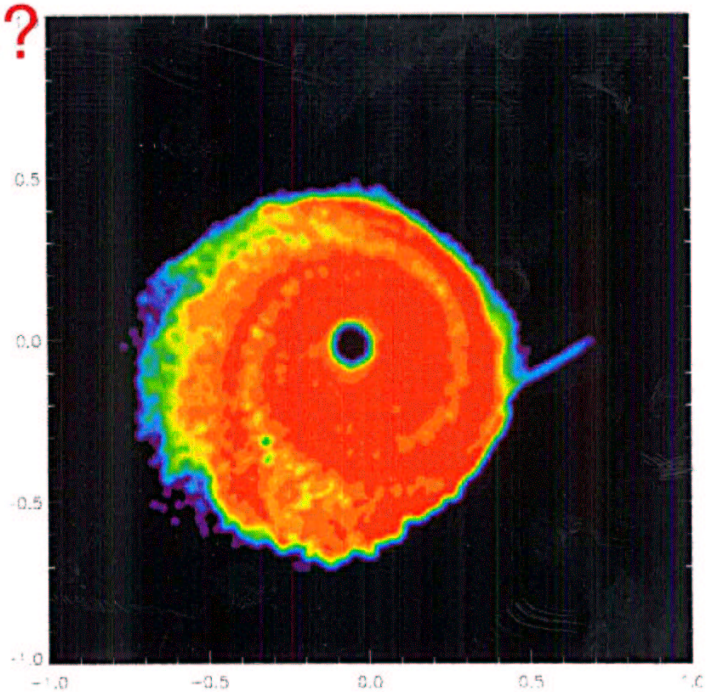
Change efficiency so that different regions of the disc are irradiated...

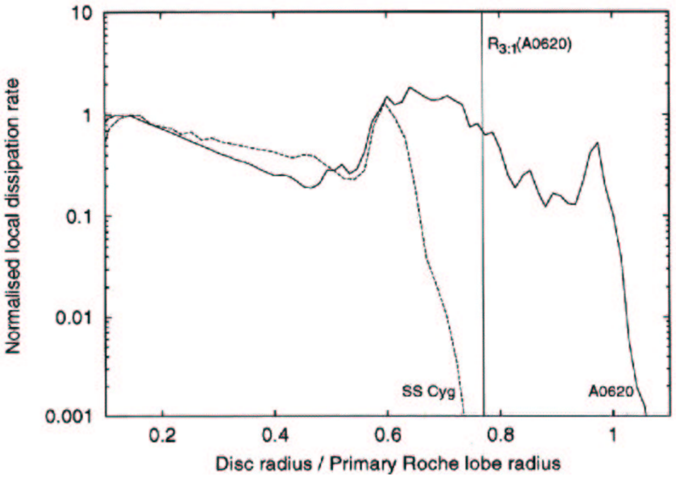
$P_{orb} = 7.75$ h ; $q = 0.07$

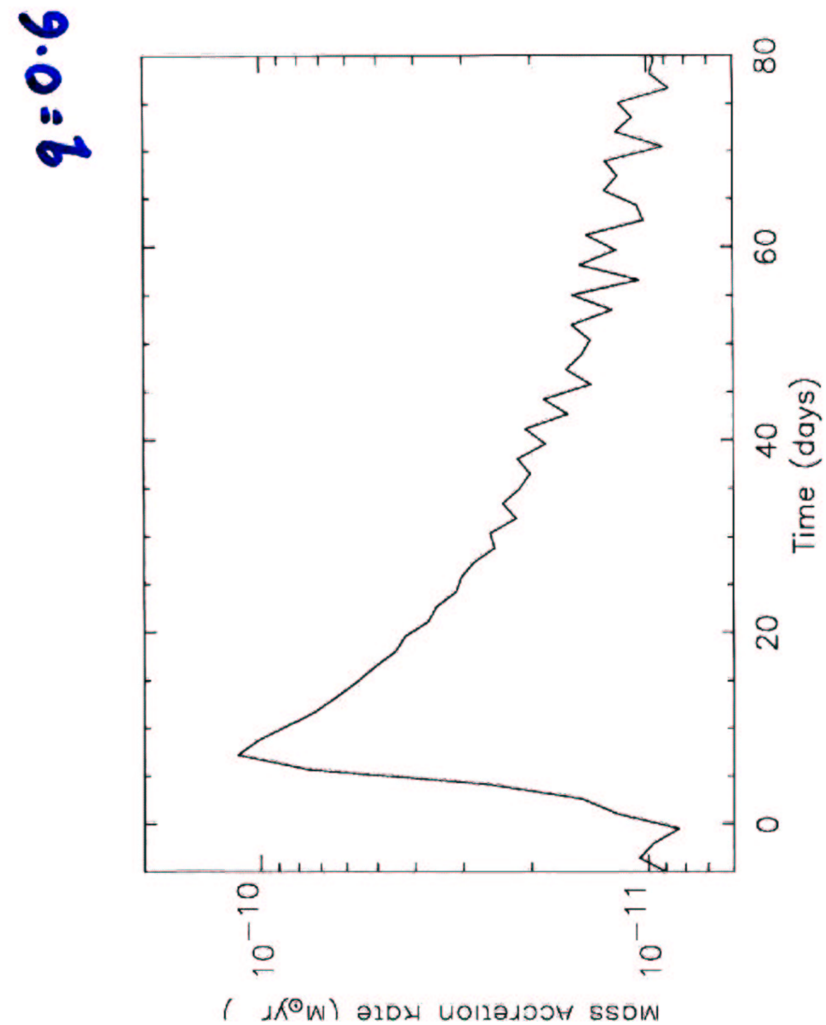


(Truss, Wynn, Murray & King, MNRAS, 337, 1329)

55 days?


0.5
0.0
-0.5
-1.0
-1.0
-0.5
0.0
0.5
1.0


R3:1(A0620)
SS Cyg
A0620
Normalised local dissipation rate
Disc radius / Primary Roche lobe radius
10
1
0.1
0.01
0.001
0.2
0.4
0.6
0.8
1


q=0.6
Time (days)
0
20
40
60
80
10^-10
10^-11
Mass Accretion Rate (M⊙yr^-1)

Conclusions & future work

1. If disc is completely irradiated, no rebrightening.
2. If outer disc is shielded, tides drive additional gas through the disc and produce the rebrightening.

How is the disc shielded?

Warps?

Self–shadowing?

What is the geometry of the irradiating flux?

What about longer orbital periods with larger discs?

What happens to the outbursts when $\dot{M} > \dot{M}_{Eddington}$?