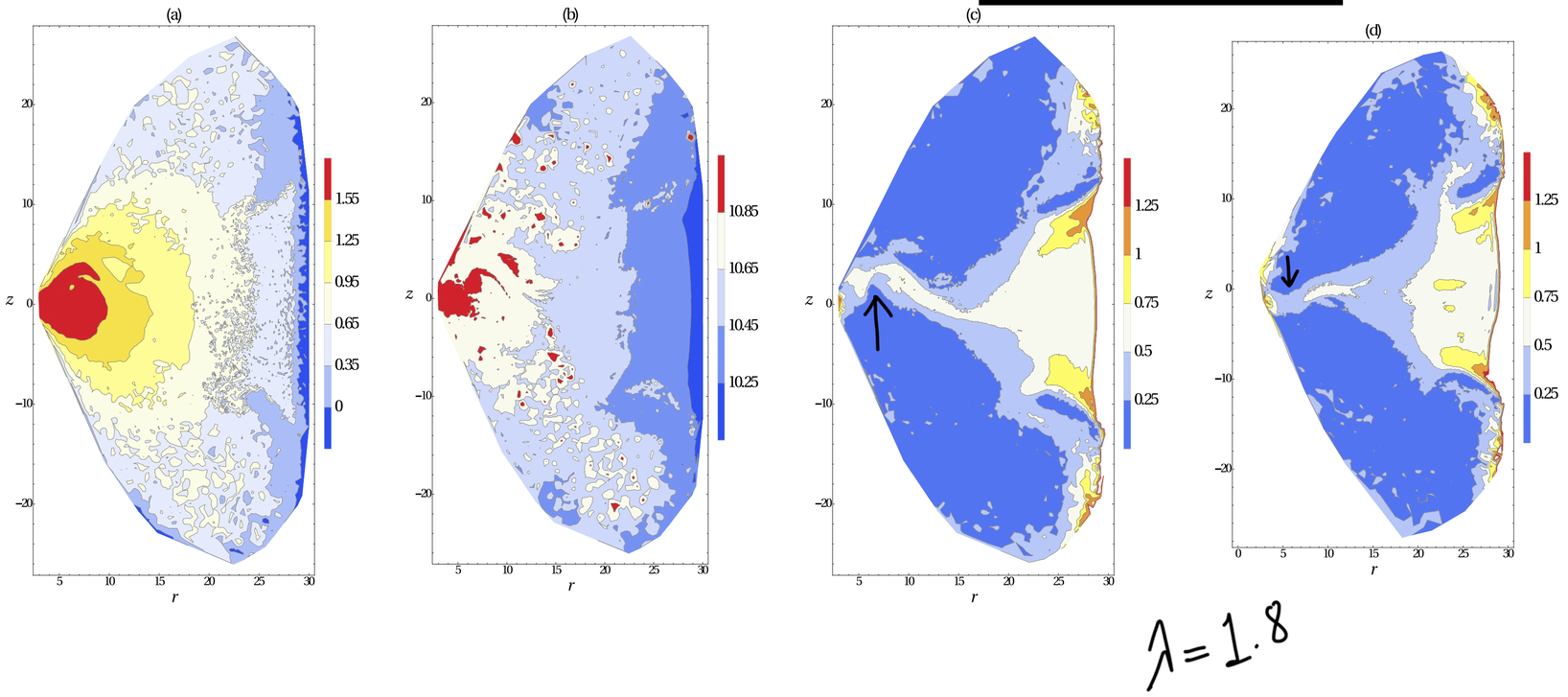
Results: Timing Properties

Density

Temperature

Mach Number

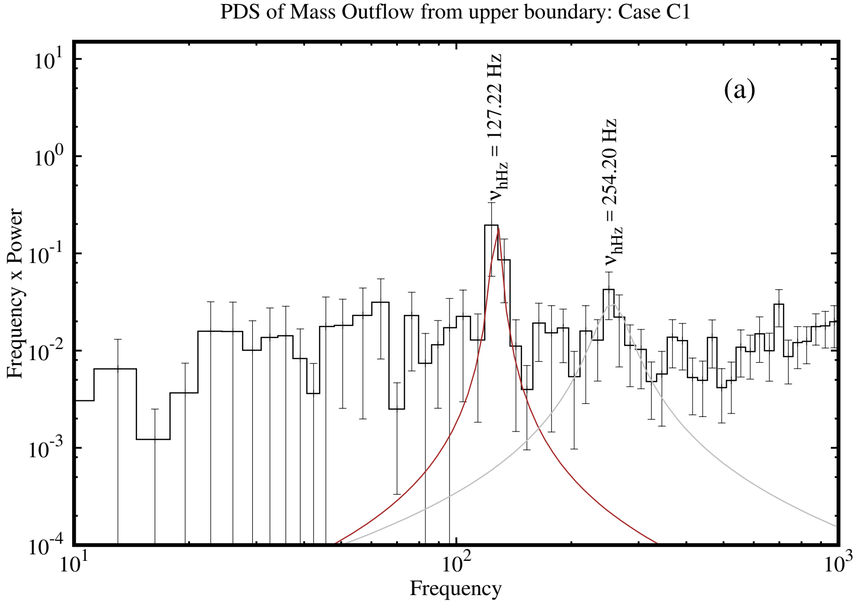


1. Rise in density and Temperature in the post-shock region.
2. Vertical oscillation of inner hot region.

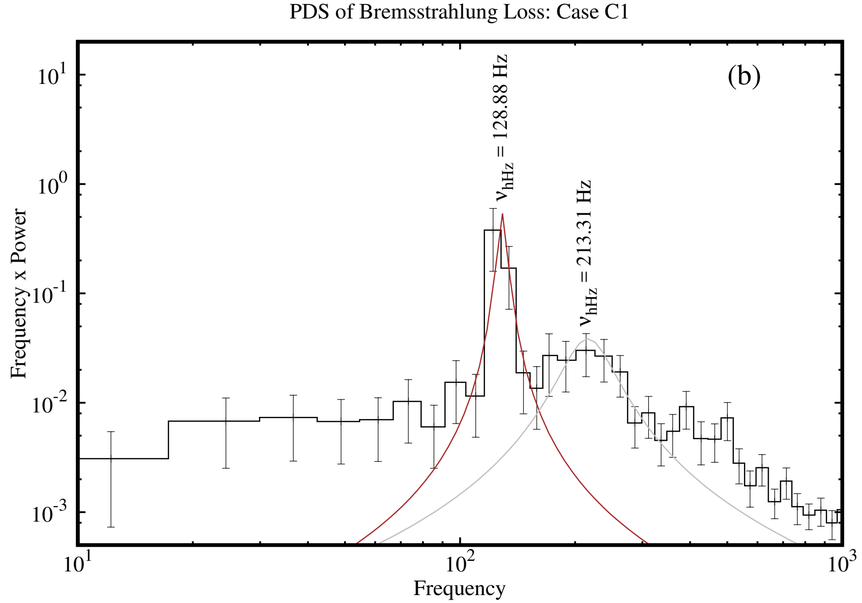
Bhattacharjee and Chakrabarti, 2019, ApJ, 873, 119

Results: Timing Properties

Mass-outflow rate



Dissipated Energy

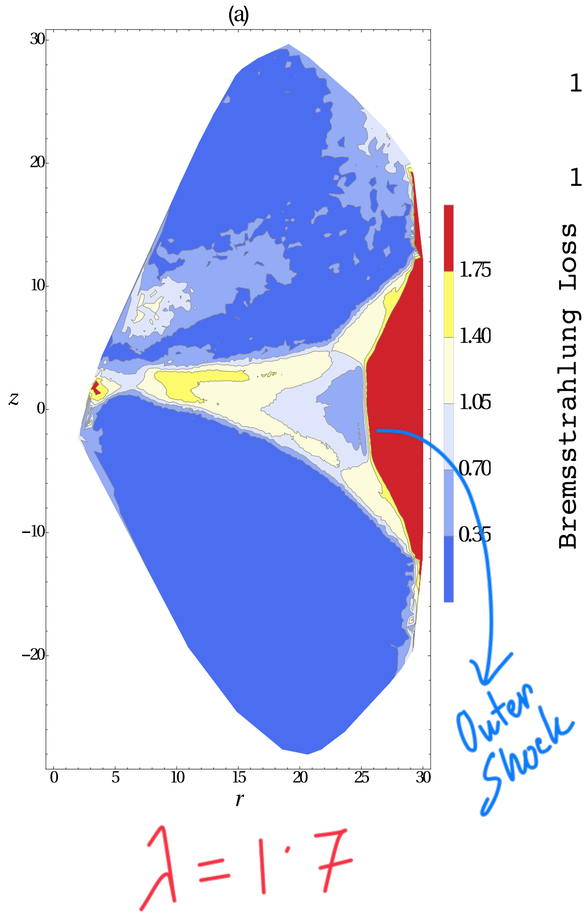


1. Mass-outflow through z-boundary shows oscillation.
2. Dissipated energy from the system also shows oscillation at same frequency.

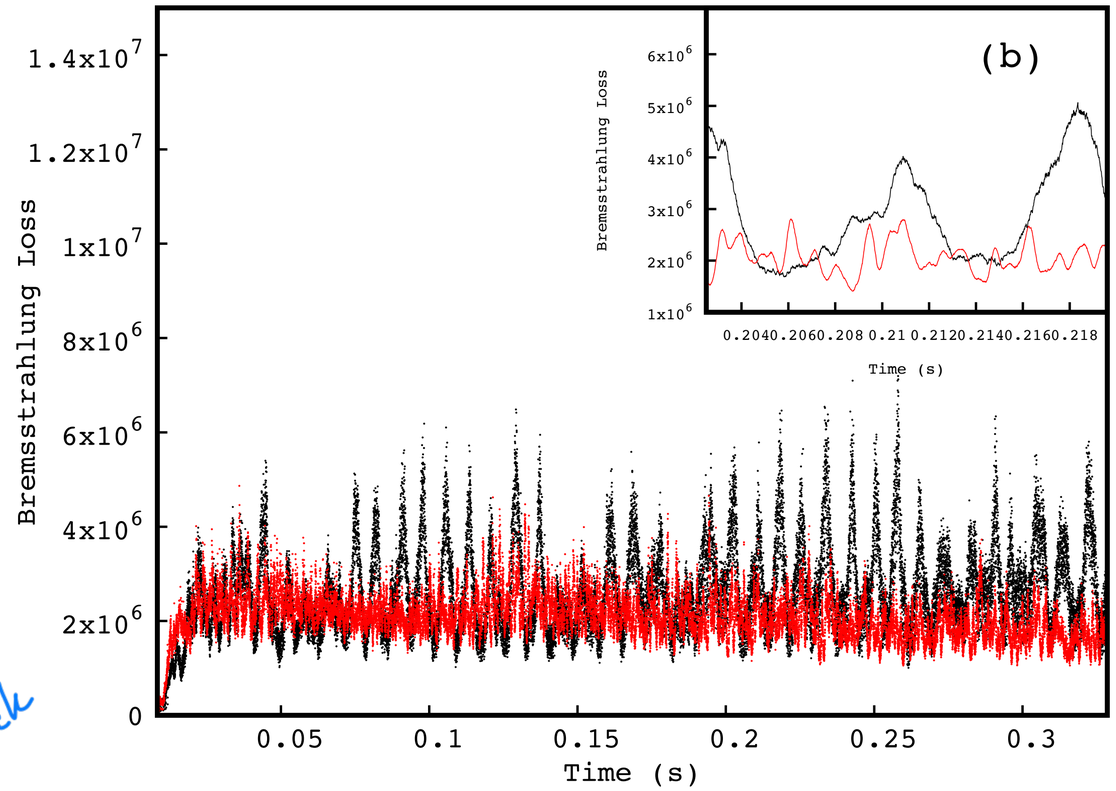
Bhattacharjee and Chakrabarti, 2019, ApJ, 873, 119

Results: Timing Properties

Mach Number



Light-curve



1. Flow configuration is affected by changes in angular momenta: for lower λ, the shocks move inward.

2. The oscillation frequency of the simulated light curve increases when λ is lowered.

Bhattacharjee and Chakrabarti, 2019, ApJ, 873, 119

Results: Timing Properties

Power-Density Spectra

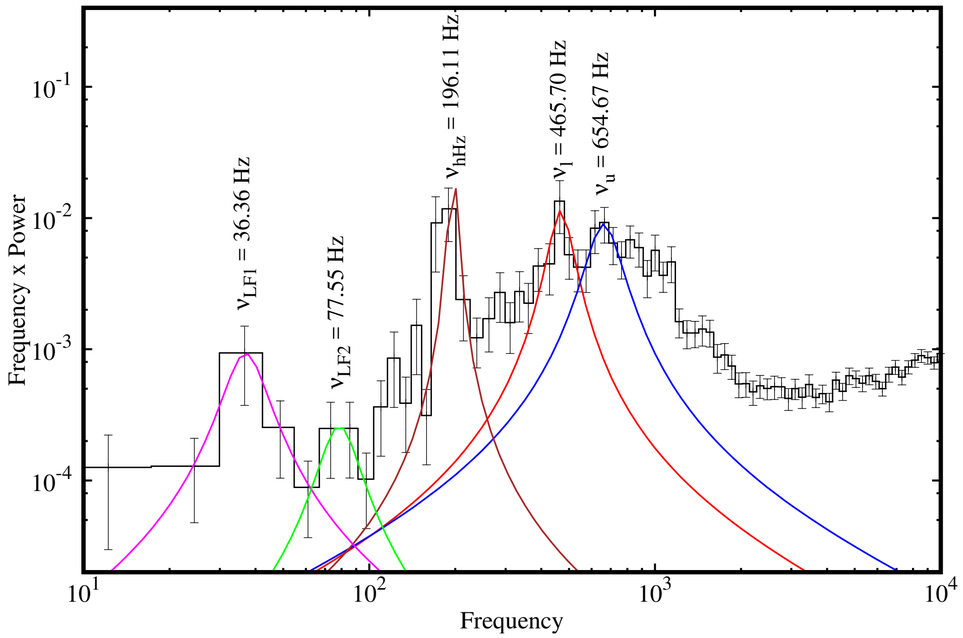


Table 1: Parameters for the simulations and centroid frequencies (in Hz) found in the PDS of bremsstrahlung loss.

ID	$\dot{m}_h$ $(\dot{M}_{EDD})$	λ $(r_S c)$	R_{NS} (r_S)	α	ν_{LF1}, Q_{LF1}	ν_{LF2}, Q_{LF2}	ν_{hHz}, Q_{hHz}	ν_l, Q_l	ν_u, Q_u
C1	0.094	1.8	3.0	0.5	-	-	128.88, 17.82	213.31, 3.17	-
C2	0.094	1.7	3.0	0.5	-	-	102.22, 3.91	425.40, 5.61	633.78, 1.77
C3	0.188	1.7	3.0	0.5	-	-	115.55, 5.02	486.08, 2.49	742.73, 1.48
C4	0.094	1.7	3.0	0.6	41.62, 1.30	94.41, 4.66	137.58, 5.78	434.97, 4.96	599.23, 3.51
C5	0.094	1.7	4.0	0.5	36.36, 2.91	77.55, 3.14	196.11, 18.06	465.70, 5.11	654.67, 3.51

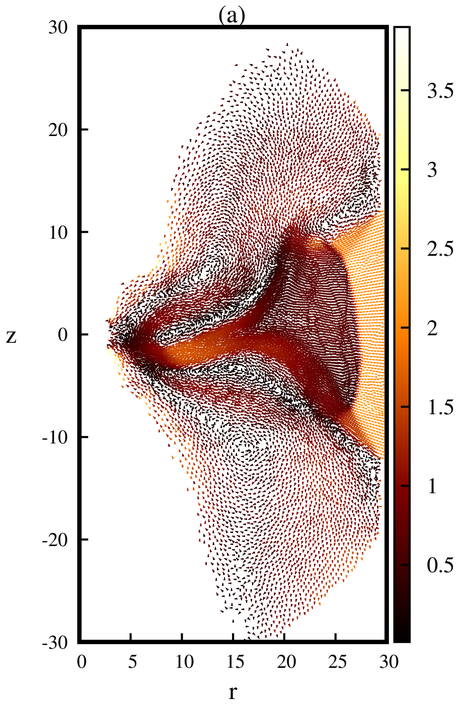
1. Multiple peaks are seen in PDS: LF radial oscillation of outer shock, hecto-Hz vertical oscillation of inner hot region, and ‘kHz’ radial oscillation of inner shock.

2. This was the first simulation of multiple QPOs being simulated within a purely hydrodynamic framework that included cooling.

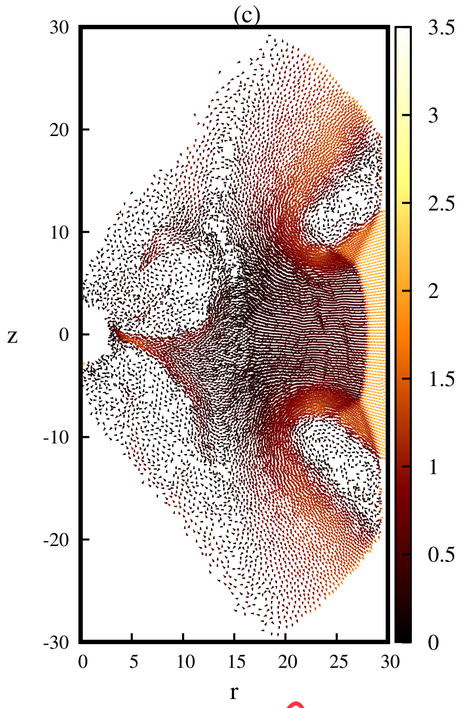
Bhattacharjee and Chakrabarti, 2019, ApJ, 873, 119

Results: Timing Properties

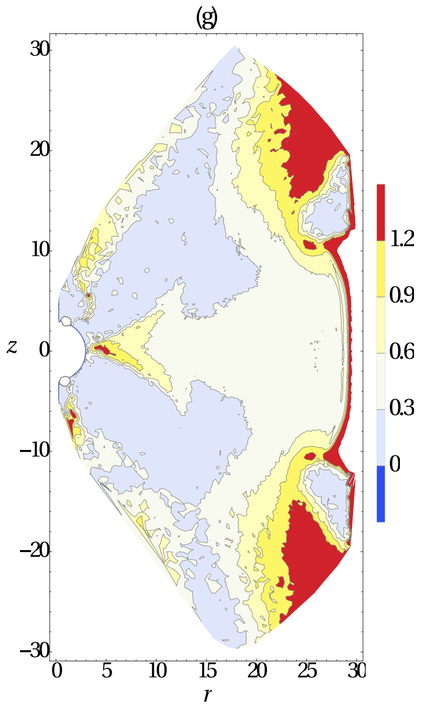
Viscous Flows

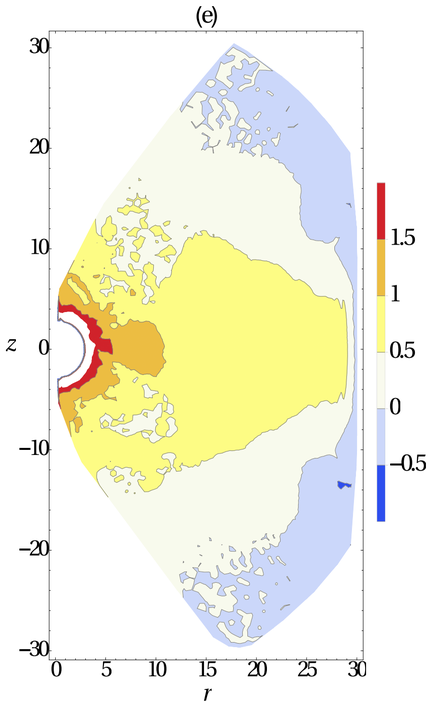


$\alpha = 0.075$



$\alpha = 0.3$





1. Inclusion of viscosity stabilized the inner turbulent flow and the outflows.
2. Increase in viscosity pushes the shock outward.
3. A disk like structure appears along the equatorial plane with higher viscosity.