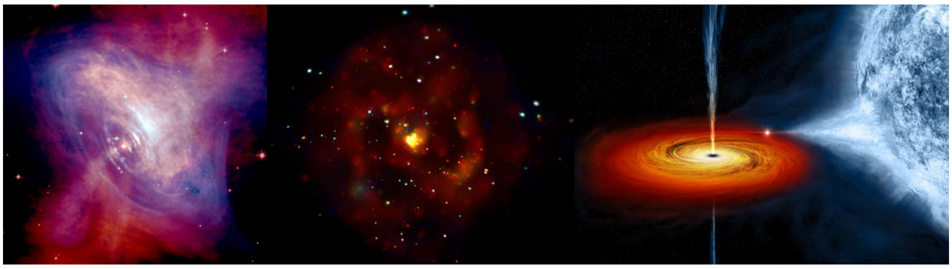

Contribution ID: **93** Type: **not specified**

Global structure of shock-induced general relativistic magneto-hydrodynamics accretion flows around black holes

Monday, April 3, 2023 9:30 AM (15 minutes)

We present the general relativistic magneto-hydrodynamic (GRMHD) accretion flow in Kerr space-time in the presence of the shock waves. Adopting the relativistic equation of state, we solve the governing equations in the ideal MHD limit and obtain the shock-induced GRMHD accretion solution for the first time to the best of our knowledge. We find that the subsonic flow entering from the outer edge of the disk experiences centrifugal repulsion and a barrier due to the magnetic pressure that eventually triggers a discontinuous shock transition, provided the GRMHD shock conditions are satisfied. Due to shock compression, the post-shock flow (equivalently post-shock corona (PSC)) becomes hot and dense that eventually emits high-energy radiations after reprocessing the soft photons via inverse Comptonization. We characterize the PSC in terms of shock location (r_s), compression ratio (R), and shock strength (S). Afterwards, we evaluate the dynamics of PSC using flow parameters, namely energy ($\mathcal{E}$), angular momentum ($\mathcal{L}$), radial (Φ^r) and azimuthal magnetic flux ($F_{\rm Iso}$) of the magnetized flow. We further notice that the shock dynamics is mainly governed by the toroidal magnetic pressure at the equatorial disk. We identify the effective region of the parameter space for GRMHD shock in $calL - calE$ plan and observe that shock parameter space is altered due to the change of both Φ^r and $F_{\rm Iso}$. Finally, we discuss the implication of present formalism in the context of astrophysical applications.

Presentation Type

Oral

Primary author: MITRA, Samik (IIT GUWAHATI)

Co-author: DAS, Santabrata (IIT Guwahati)

Presenter: MITRA, Samik (IIT GUWAHATI)

Session Classification: Black Hole: Theory

Track Classification: Black Hole: Theory