Contribution ID: **17** Type: **Contribution talk**

Existence of effectively optically thin accretion flow around black holes

Thursday, 17 October 2024 16:50 (15 minutes)

At high accretion rates, the high temperature and low density in the standard thin disk (SSD) suppress the absorption of the radiation, making the innermost region effectively optically thin. In this work, we systematically investigate the effectively optically thin accretion flow through the generalized self-similar solution of the steady axisymmetric, non-relativistic accretion flow. Our results show the existence of the effectively optically thin accretion flow in the range of accretion rates between the SSD regime and the slim disk regime. Due to the inefficient bremsstrahlung by low density, the effectively optically thin accretion flow is heated to a high temperature and cooled by inverse-Compton scattering. Despite being supported by radiation pressure, the advection and the saturated self-Compton scattering help this accretion flow to be thermally stable, whereas the viscosity instability still exists. The feature of the effectively optically thin accretion flow is a Wien bump in the X-ray band. Its intensity and cut-off energy are sensitive to the viscosity parameter, which provides an alternative way to constrain the viscosity parameter via spectral analysis. The effectively optically thin accretion flow would give the natural explanations for the soft X-ray excess in AGNs and the very high state of XRBs. Besides, the radial cooling, bound-free process, and inner boundary conditions are also discussed.

Primary author: LIU, Mingjun (National Astronomical Observatories, Chinese Academy of Sciences)

Presenter: LIU, Mingjun (National Astronomical Observatories, Chinese Academy of Sciences)

Session Classification: Session