The formation of X-ray line spectra from moving gas near black holes and neutron stars.

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Radiation transfer calculations provide a connection between the results of dynamical models and observations of photon spectra.
In this talk I will present calculations of 3-dimensional transfer of the polarized radiation adopting the generalized Sobolev approximation. These will be illustrated with applications to evaporative outflows originating from the obscuring torus in active galactic nuclei (AGN). These outflows provide a likely explanation for the rich 'warm absorber' spectra observed with recent X-ray telescopes, and these spectra provide quantitative constraints on the nature of the flow. We predict a 5-25% X-ray polarization signature of type-2 active galaxies in the 0.1-10 keV range. These results are general to flows which originate from a cold torus-like structure, located ~ 1pc from the BH, which wraps the BH and is ultimately responsible for the apparent dichotomy between type 1 and type 2 AGNs.

I will further explore Sobolev radiation transfer calculations applied to resonant absorption in a spectral line in the outflowing plasma within several tens of Schwarzschild radii from a compact object. Taking into account both Doppler and gravitational shifting effects we re-formulate the theory of P-Cygni profiles in these new circumstances. Calculations show that profiles of spectral lines produced near a neutron star or a black hole can be strongly distorted by Doppler blue-, or red-shifting, and gravitational red-shifting. These profiles may have both red- and blue-shifted absorption troughs.

Finally, I discuss the results we expect to obtain from joining the above approaches to study spectroscopically the extreme hydrodynamics near compact objects.

References

[1] Author(s), Paper Title, Vol., Page, Year (Times New Roman 10)
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