

Joint Physics and Astronomy Colloquium

Monday, May 3, 2010 4:15 PM 428 Pupin Hall

Accretion of gas with small angular momentum onto supermassive black holes in elliptical galaxies

Very diversified activities are observed in the vicinity of low luminosity supermassive black holes in the nuclei of giant elliptical galaxies containing hot X-Ray emitting gas. We observe superluminal jets, shock waves, cavities filled with relativistic plasmas. All this activity demonstrates that mechanical energy losses contribute the lion portion to the energy release in the vicinity of such black holes. Obvious question: is this energy release connected with accretion of gas or arises due to slow down of Kerr black hole rotation? X-ray measurements provide us with precise information about density and temperature of the gas in vicinity of the black hole. Using Bondi solution it is easy to estimate the accretion rate and (under brave assumptions) the rate of energy release by accretion flow. Such estimates are widely used now in the numerical cosmological simulation of the black hole feedback on the growth of galaxies. Gas in the elliptical galaxies has small but finite angular momentum which should stop simple spherically symmetric Bondi flow at some radius of circulization. The new solution of accretion problem with gas cooling due to saturated thermal electron conductivity and free-free emission describes two-temperature subsonic flow leading to formation of the cold thori near circulization radius. Disk accretion takes place at smaller radii, and disk type outflow is responsible for outward transportation of the angular momentum access. Possibly such outflow was detected already by Hubble Telescope. Most important that accretion rate according to this solution is an order of magnitude smaller than critical Bondi value. This provides additional difficulties for models and simulations explaining mechanical energy release in vicinity of black holes by gas accretion.



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Talk will be followed by wine & cheese in the 14th floor library