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Gas density and velocity power spectra in galaxy clusters

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Measurements of gas density fluctuations in galaxy clusters using X-ray images are discussed. We argue that for relaxed clusters there is a linear relation between the rms density and velocity fluctuations across a broad range of scales. The normalization of this relation can be predicted, provided that the gas motions are slow enough. The normalization is set at large scales by buoyancy physics, while at small scales the density and velocity power spectra remain proportional to each other because the gas entropy serves as a passive scalar advected by the gas motions. This opens an interesting possibility to measure the velocity power spectra in relaxed clusters using existing Chandra and XMM-Newton images.

Author: Dr CHURAZOV, Eugene (MPA)

Presenter: Dr CHURAZOV, Eugene (MPA)

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