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Measuring turbulence and transport processes in the hot intergalactic plasma in galaxy clusters IRINA ZHURAVLEVA, University of Chicago, EUGENE CHURAZOV, Max Planck Institute for Astrophysics, ALEXANDER SCHEKOCHIHIN, University of Oxford, STEVEN ALLEN, Stanford University, ALEXEY VIKHLININ, WILLIAM FORMAN, Harvard-Smithsonian Center for Astrophysics, NORBERT WERNER, MTA-Eotvos University Lendulet, PATRICIA AREVALO, Universidad de Valparaiso — Clusters of galaxies are filled with hot, weakly-collisional and high-β plasma. The large sizes of clusters and their relative simplicity make them unique laboratories to study such plasmas. While the global characteristics of the intergalactic plasma are now routinely measured, microphysics is still poorly understood. In my talk, I will present indirect measurements of turbulence in the intracluster plasma based on the statistical analysis of X-ray surface brightness fluctuations imprinted in the X-ray images of galaxy clusters. I will discuss the role of this turbulence in the global cooling-heating balance of clusters. In the second half of my talk, I will show our recent measurements of plasma fluctuations on spatial scales comparable to Coulomb mean free path. In contrast to expectations of hydrodynamic models with pure Coulomb collision rates, we observe a continuation of the power spectrum of fluctuations with a slope that is consistent with the Kolmogorov model. This implies that the effective isotropic viscosity is orders of magnitude smaller than the Spitzer value. This also indicates an enhanced collision rate in the plasma due to the presence of plasma instabilities, or that the transport processes are anisotropic with respect to the local magnetic field.

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