Investigating the intracluster medium viscosity using the tails of jellyfish galaxies

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Résumé

The microphysics of the intracluster medium (ICM) in galaxy clusters is still poorly understood. Observational evidence suggests that the effective viscosity is suppressed by plasma instabilities that reduce the mean free path of particles. Measuring the effective viscosity of the ICM is crucial to understanding the processes that govern its physics on small scales. The trails of ionized interstellar medium left behind by the so-called jellyfish galaxies can trace the turbulent motions of the surrounding ICM and constrain its local viscosity. We present the results of a systematic analysis of the velocity structure function (VSF) of the Hα line for ten galaxies from the GASP sample. The VSFs show a sub-linear power law scaling below 10 kpc which may result from turbulent cascading and extends to 1 kpc, below the supposed ICM dissipation scales of tens of kpc expected in a fluid described by Coulomb collisions. Our result constrains the local ICM viscosity to be 0.3-25% of the expected Spitzer value. Our findings demonstrate that either the ICM particles have a smaller mean free path than expected in a regime defined by Coulomb collisions, or that we are probing effects due to collisionless physics in the ICM turbulence.

Mots-Clés: intracluster medium, MUSE

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