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Fluid flow experiments in galaxy clusters: Using cluster galaxies and minor mergers as probes for transport coefficients of the ICM

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The ICM transport properties (viscosity, thermal conductivity) and magnetic field structure are still ill-constrained. We use the ICM flows around gas-stripped elliptical cluster galaxies and in merging clusters as direct probes of these ICM properties. Galaxies moving through the ICM experience a head wind that strips off their gaseous atmospheres. The structure of the galaxy-ICM interface and of the stripped gas tails depends on ICM transport coefficients and magnetic field structure, but also on the galaxy infall dynamics. Minor mergers set the ICM in clusters sloshing, which in turn leads to sloshing cold fronts, whose fine-structure depends on the ICM properties. Our team has in hand deep high resolution X-ray data, e.g. of the stripped cluster ellipticals M89, M49, M60, M86, and NGC 1404. These data set have sufficient quality to distinguish different ICM properties – if we can disentangle the effects of ICM transport properties and ICM dynamics. We do so by one-to-one comparisons between observations and specifically tailored numerical simulations of these galaxies and merging clusters. We report on first evidence for a highly suppressed ICM viscosity in the Virgo cluster.

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