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Probing Gas Dynamics in the Intracluster Medium: Current Status and Future Perspectives

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Hot, volume-filling gas in the intracluster medium (ICM) is continuously perturbed by matter accretion along cosmic filaments, mergers, and AGN feedback. Measuring velocities of gas motions is important for understanding energy partition during large-scale structure evolution, astrophysical processes that drive the evolution of galaxies within the ICM, and plasma physics. In my talk, I will review recent updates from indirect methods, namely, through the analysis of X-ray surface brightness fluctuations and how they compare with predictions from cosmological simulations. Selected challenges in interpreting the observed properties of gas motions will be discussed. Finally, I will review exciting opportunities with high-resolution X-ray spectroscopy, particularly with the recently launched XRISM satellite and more distant future missions like LEM.

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