

Gas Flows and Turbulent Motion in the X-ray Atmospheres of Clusters of Galaxies

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Galaxy clusters are immersed in hot, gaseous X-ray atmospheres shining in X-rays. At their centers reside the biggest galaxies in the universe. Despite their large sizes and vast reservoirs of hot gas available to fuel star formation, most central clusters galaxies have failed to do so for the past 7 billion years. Nevertheless, dozens contain molecular gas reservoirs exceeding 10^9 solar masses, fuelling star formation at rates of tens of solar masses per year. New observations obtained with the Atacama Large Millimeter Array have revealed a diversity of molecular gas dynamics and morphologies including, inflow and outflow, and star formation occurring preferentially in filaments rather than in molecular disks. Molecular cloud ensemble velocities generally lie far below the stellar velocity dispersions, indicating their motions are not governed by gravity. The molecular clouds may be pinned to the hot atmospheres from which they condensed, perhaps by magnetic fields. I will highlight new observations from the ASTRO-H/Hitomi X-ray observatory, launched from Japan in February, which promises major strides in our understanding of the dynamics and chemical composition of the hot atmospheres of clusters and galaxies.