[GC-05] The Mid Infrared Fundamental Plane of Early-Type Galaxies

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We present here the fundamental plane (FP) relations for mid infrared early-type galaxy data from the Spitzer Space Telescope. The scaling relations for 51 galaxies within 5 nearby clusters are in agreement with previous work; compared to the optical and near infrared, the exponents of the parameters, or the slope of the FP come closer to that of virial theorem expectation in the mid infrared. However, the slope of the FP still suffers from some degree of discrepancy from theory; in terms of the wavelength and methodology dependence the tilt of the FP is further studied in this work.

[GC-06] Heating and Turbulence Driving by Galaxy Motions in Galaxy Clusters

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Using three-dimensional hydrodynamic simulations, we investigate heating and turbulence driving in an intracluster medium (ICM) by orbital motions of galaxies in a galaxy cluster. We consider N_g member galaxies on isothermal and isotropic orbits through an ICM typical of rich clusters. An introduction of the galaxies immediately produces gravitational wakes, providing perturbations that can potentially grow via resonant interaction with the background gas. When $N_g^{1/2}M_{g,11} < 100$, where $M_{g,11}$ is each galaxy mass in units of 10^{11} $M_\odot$, the perturbations are in the linear regime and the resonant excitation of gravity waves is efficient to generate kinetic energy in the ICM, resulting in the velocity dispersion $\sigma_v \sim 2.2\ N_g^{1/2}M_{g,11}$ km/s. When $N_g^{1/2}M_{g,11} >$ 100, on the other hand, nonlinear fluctuations of the background ICM destroy galaxy wakes and thus render resonant excitation weak or absent. In this case, the kinetic energy saturates at the level corresponding to $\sigma_v \sim$ 220 km/s. The angle-averaged velocity power spectra of turbulence driven in our models have slopes in the range of -3.7 to -4.3. With the nonlinear saturation of resonant excitation, none of the cooling models considered are able to halt cooling catastrophe, suggesting that the galaxy motions alone are unlikely to solve the cooling flow problem.