structures such as spurs/feathers and wiggles as well as in angular momentum transport between stars and gas. We present our recent results of global magnetohydrodynamic simulations to study nonlinear responses of self-gravitating and magnetized gas to an imposed stellar spiral potential. We vary the arm strength, the arm pattern speed, and magnetic field strength to explore various galactic situations. Magnetic fields not only reduce the peak density of galactic spiral shocks but also make angular momentum transport more efficient via magnetic pressure and tension forces. The extent and shapes of gaseous arms as well as the radial mass drift rate depend rather sensitively on the magnetic field strength. The wiggle instability apparent in unmagnetized models is suppressed with increasing magnetic field strength, while magnetic fields promote the development of magneto-Jeans instability of the arms and magnetic islands in between arms. We quantify the angular momentum transport by spiral shocks, focusing on the effects of magnetic fields. We also present physical interpretations of our numerical results and discuss astronomical implications of our findings.

[구 GC-24] Viscosity and Turbulence Dynamo in the Intracluster Medium

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The origin of magnetic fields in the intracluster medium (ICM) is uncertain: it can be either primordial or astrophysical. Turbulence plays important roles in the origin of magnetic fields in the ICM. This is because turbulence can amplify a weak seed magnetic field very efficiently. The efficiency of the turbulence dynamo critically depends on the magnitude of viscosity: the smaller the viscosity is, the more efficient the turbulence dynamo is. In this talk, I'll discuss turbulence dynamo in both very small viscosity limit and very large viscosity limit. I'll show that when the viscosity in the ICM is comparable to the Spitzer viscosity, the origin of magnetic field in the ICM is likely to be astrophysical. On the other hans, when the viscosity is much smaller than the Spitzer value, the origin of magnetic field can be either astrophysical or primordial.

[구 GC-25] The evolution of Magnetic fields in IntraClusterMedium

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IntraCluster Medium (ICM) located at the galaxy cluster is in the state of very hot, tenuous, magnetized, and highly ionized X-ray emitting plasmas. High temperature and low density make ICM very viscous and conductive. In addition to the high conductivity, fluctuating random plasma motions in ICM, occurring at all evolution stages, generate and amplify the magnetic fields in such viscous ionized gas. The amplified magnetic fields in reverse drive and constrain the plasma motions beyond the viscous scale through the magnetic tension. Moreover, without the influence of resistivity viscous damping effect gets balanced only with the magnetic tension in the extended viscous scale leading to peculiar ICM energy spectra. This overall collisionless magnetohydrodynamic (MHD) turbulence in ICM was simulated using a hyper diffusivity method. The results show the plasma motions and frozen magnetic fields have power law of $E_V^k \sim k^{-3}, E_M^k \sim k^{-1}$. To explain these abnormal power spectra we set up two simultaneous differential equations for the kinetic and magnetic energy using an Eddy Damped Quasi Normal Markovianized (EDQNM) approximation. The solutions and dimensions of leading terms in the coupled equations derive the power spectra and tell us how the spectra are formed. We also derived the same results with a more intuitive balance relation and stationary energy transport rate.

[구 GC-26] Radiation mechanism of gamma-ray burst prompt emission

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Synchrotron radiation of relativistic electrons is an important radiation mechanism in many astrophysical sources. In the sources where the synchrotron cooling timescale is shorter than the dynamical timescale, electrons are cooled down below the minimum injection energy. It has been believed that such fast-cooling electrons have a power-law distribution in energy with an index −2,