[구 AT-05] Optomechanical Design and Vibration Analysis for Linear Astigmatism-Free Three Mirror System (LAF-TMS)

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We report the design and vibration analysis for the optomechanical structures of Linear Astigmatism Free – Three Mirror System (LAF-TMS). LAF-TMS is the linear astigmatism free off-axis wide-field telescope with D = 150 mm, F/3.3, and FOV = 5.51° × 4.13°. The whole structure consists of four optomechanical modules. It can accurately mount mirrors and also can survive from vibration environments. The Mass Acceleration Curve (MAC) is adapted to the quasi-static analysis. Modal, harmonic, and random vibration analysis have been performed under the qualification level of the launch system. We evaluate the final results in terms of von Mises stress and Margin of Safety (MoS).

성간물질

[구 IM-01] MHD Turbulence in ISM and ICM

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Observations indicate that turbulence in molecular clouds of the interstellar medium (ISM) is highly supersonic (M >> 1) and strongly magnetized ($\beta \approx 0.1$), while in the intracluster medium (ICM) it is subsonic (M <~1) and weakly magnetized ($\beta \approx 100$). Here, M is the turbulent Mach number and β is the ratio of the gas to magnetic pressures. Although magnetohydrodynamic (MHD) turbulence in such environments has been previously studied through numerical simulations, some of its properties as well as its consequences are not yet fully described. In this talk, we report a study of MHD turbulence in molecular clouds and the ICM using a newly developed code based the high-order accurate, WENO (Weighted Essentially Non-Oscillatory) scheme. The simulation results using the WENO code are generally in agreement with those presented in the previous studies with, for instance, a TVD code (Porter et al. 2015 &, Park & Ryu 2019), but reveal more detailed structures on small scales. We here present and compare the properties of simulated turbulences with WENO and TVD codes, such as the spatial distribution of density, the density probability distribution functions, and the power spectra of kinetic and magnetic energies. We also describe the populations of MHD shocks and the energy dissipation at the shocks. Finally, we discuss the implications of this study on star formation processes in the ISM and shock dissipation in the ICM.

[구 IM-02] Generation of Solenoidal Modes in Turbulence Driven by Compressive Driving

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In this talk, we present numerical simulations of driven hydrodynamic and magnetohydrodynamic (MHD) turbulence with weak/strong imposed magnetic fields. We mainly focus on turbulence driven compressively ($\nabla \times f = 0$). Our main goal is to examine how magnetic fields play a role in generating solenoidal modes in compressive turbulence. From our simulation analysis, we find that solenoidal energy densities in hydrodynamic and weak magnetic field cases are generated up to ~ 30% of total ones. On the other hand, in the case of strong magnetic fields, solenoidal energy densities are excited up to ~ 70%. To interpret the results, we further analyze vorticity ($w = \nabla \times u$) equation and find that magnetic fields directly create solenoidal motions, and magnetic tension is most effective in this sense. In hydrodynamic simulations, however, we find that viscous dissipation provides vorticity seeds at the very early stage and they are amplified via stretching process. Lastly, in weak magnetic fields cases, we find that solenoidal motions are created by the effects of magnetic fields, viscosity, and stretching in conjunction.