emissions from clusters of galaxies by performing cosmological hydrodynamic simulations. The estimated gamma-ray flux is below the Fermi-LAT upper limit. In addition, the possible neutrino emission due to the decay of charged pions in galaxy clusters would be about <~ 1% of the atmospheric neutrino intensity in the energy range of <~ 100 GeV. In this talk, we will discuss the implication of our results.

[구 HT-03] SED modelling of broadband emission in the pulsar wind nebula 3C 58

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We investigate broadband emission properties of the pulsar wind nebula (PWN) 3C 58 using a spectral energy distribution (SED) model. We attempt to match simultaneously the broadband SED and spatial variations and emission about 3C 58 in X-ray band. We further the model to explain a possible far-IR feature of which a hint is recently suggested in 3C 58: a small bump at ~10^11 GHz in the PLANCK and Herschel band. While external dust emission may easily explain the observed bump, it may be internal emission of PWNe implying an another additional population of particles. Although significance for the bump in 3C 58 is not higher than other PWNe, here we explore possible origins of the IR bump using the emission model and find that a population of electrons with GeV energies can explain the bump. If it is produced in the PWN, it may provide new insights into particle acceleration and flows in PWNe.

[구 HT-04] Electron Firehose Instabilities in High-β Intracluster Medium

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The firehose instability is driven by a pressure anisotropy in a magnetized plasma when the temperature along the magnetic field is higher than the perpendicular temperature. Such condition occurs commonly in astrophysical and space environments, for instance, when there are beams aligned with the background magnetic field. Recently, it was argued that, in weak quasi-perpendicular shocks in the high-β intracluster medium (ICM), shock-reflected electrons propagating upstream cause the temperature anisotropy. This electron temperature anisotropy can trigger the electron firehose instability (EFI), which excites oblique waves in the shock foot. Scattering of electrons by these waves enables multiple cycles of shock drift acceleration (SDA) in the preshock region, leading to the electron injection to diffusive shock acceleration (DSA). In the study, the kinetic properties of the EFI are examined by the linear stability analysis based on the kinetic Vlasov-Maxwell theory and then further investigated by 2D Particle-in-Cell (PIC) simulations, especially focusing on those in high-β (β~100) plasmas. We then discuss the basic properties of the firehose instability, and the implication of our work on electron acceleration in ICM shock.

[구 HT-05] Machine-assisted Semi-Simulation Model (MSSM): Predicting Galactic Baryonic Properties from Their Dark Matter Using A Machine Trained on Hydrodynamic Simulations

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We present a pipeline to estimate baryonic properties of a galaxy inside a dark matter (DM) halo in DM-only simulations using a machine trained on high-resolution hydrodynamic simulations. As an example, we use the IllustrisTNG hydrodynamic simulation of a $(75\,h^{-1}\,\mathrm{Mpc})^3$ volume to train our machine to predict e.g., stellar mass and star formation rate in a galaxy-sized halo based purely on its DM content. An extremely randomized tree (ERT) algorithm is used together with multiple novel improvements we introduce here such as a refined error function in machine training and two-stage learning. Aided by these improvements, our model demonstrates a significantly increased accuracy in predicting baryonic properties compared to prior attempts --- in other words, the machine better mimics IllustrisTNG's galaxy-halo correlation. By applying our machine to the MultiDark-Planck DM-only simulation of a large $(1\,h^{-1}\,\mathrm{Gpc})^3$ volume, we then validate the pipeline that rapidly generates a galaxy catalogue from a DM halo catalogue using the correlations the machine found in IllustrisTNG. We also compare our galaxy catalogue with the ones produced by popular semi-analytic models (SAMs). Our so-called machine-assisted semi-simulation model (MSSM) is shown to be largely compatible with SAMs, and may become a promising method to transplant the