thinner when they were born. Indeed, a large fraction of thick disk stars was born near the galactic plane at earlier times and get heated with time, eventually occupying high altitudes and exhibiting different population properties compared to the thin-disk stars. In conclusion, from our simulations, the thin and thick disk components are not entirely distinct at birth, but rather a result of the time evolution of the stars born in the main disk of the galaxy. (excerpted from the abstract of the upcoming paper submitted to Astrophysical Journal: Park, M.-J., Yi, S.K. et al. 2020)

[구 GC-26] Star-gas misalignment in galaxies: I. the properties of galaxies from the Horizon-AGN simulation and comparisons to SAMI

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Recent integral field spectroscopy observations have found that about 11% of galaxies show star-gas misalignment. The misalignment possibly results from external effects such as gas accretion, interaction with other objects, and other environmental effects, hence providing clues to these effects. We explore the properties of misaligned galaxies using Horizon-AGN, a large-volume cosmological simulation, and compare the result with the result of the Sydney-AAO Multi-object integral field spectrograph (SAMI) Galaxy Survey. Horizon-AGN can match the overall misalignment fraction and reproduces the distribution of misalignment angles found by observations surprisingly closely. The misalignment fraction is found to be highly correlated with galaxy morphology both in observations and in the simulation: early-type galaxies are substantially more frequently misaligned than late-type galaxies. The gas fraction is another important factor associated with misalignment in the sense that misalignment increases with decreasing gas fraction. However, there is a significant discrepancy between the SAMI and Horizon-AGN data in the misalignment fraction for the galaxies in dense (cluster) environments. We discuss possible origins of misalignment and disagreement. This presentation is mainly based on the published work Khim et al. 2020, ApJ, 894, 106 (17pp).

[구 GC-27] The Horizon Run 5 Cosmological Hydrodynamical Simulation: Probing Galaxy Formation from Kilo- to Giga-parsec Scales

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Horizon Run 5 (HR5) is a cosmological hydrodynamical simulation which captures the properties of the Universe on a Gpc scale while achieving a resolution of 1 kpc. This enormous dynamic range allows us to simultaneously capture the physics of the cosmic web on very large scales and account for the formation and evolution of dwarf galaxies on much smaller scales. Inside the simulation box. we zoom-in on a high-resolution cuboid region with a volume of 1049 × 114 × 114 Mpc3 . The subgrid physics chosen to model galaxy formation includes radiative heating/cooling, reionization, star formation, supernova feedback, chemical evolution tracking the enrichment of oxygen and iron, the growth of supermassive black holes and feedback from active galactic nuclei (AGN) in the form of a dual jet-heating mode. For this simulation we implemented a hybrid MPI-OpenMP version of the RAMSES code, specifically targeted for modern many-core many thread parallel architectures. For the post-processing, we extended the Friends-of-Friend (FoF) algorithm and developed a new galaxy finder to analyse the large outputs of HR5. The simulation successfully reproduces many observations, such as the cosmic star formation history, connectivity of galaxy distribution and stellar mass functions. The simulation also indicates that hydrodynamical effects on small scales impact galaxy clustering up to very large scales near and beyond the baryonic acoustic oscillation (BAO) scale. Hence, caution should be taken when using that scale as a cosmic standard ruler: one needs to carefully understand the corresponding biases. The simulation is expected to be an invaluable asset for the interpretation of upcoming deep surveys of the Universe.