gravitational waves and electromagnetics waves from the merging of neutron stars opened up multi-messenger astronomy. The forthcoming observations with better sensitivity by the network of ground based detectors will enrich the gravitational wave source populations and provide valuable information regarding stellar evolution, dynamics of dense stellar systems, and star formation history across the cosmic time. The precision of the Hubble constant from the distance measurement of gravitational sources will improve with more binary neutron star events are observed together with the aftweglows. I will also briefly cover the expected scientiic outcomes from the future detectors that are sensitive to much lower frequenies than current detectors.

외부은하 / 은하단

[구 GC-01] Statistical Analysis of Interacting Dark Matter Halos: On two physically distinct interaction types

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We present a statistical analysis of dark matter halos with interacting neighbors using a set of cosmological simulations. We classify the neighbors into two groups based on the total energy (E_{12}) of the target−neighbor system; *flybying* neighbors ($E_{12} \geq 0$) and *merging* ones ($E_{12} < 0$). First, we find a different trend between the flyby and merger fractions in terms of the halo mass and large-scale density. The flyby fraction highly depends on the halo mass and environment, while the merger fraction show little dependence. Second, we measure the spin−orbit alignment, which is the angular alignment between the spin of a target halo ($\vec{S}$) and the orbital angular momentum of its neighbor ($\vec{L}$). In the spin−orbit angle distribution, the flybying neighbors show a weaker prograde alignment with their target halos than the merging neighbors do. With respect to the nearest filament, the flybying neighbor has a behavior different from that of the merging neighbor. Finally, we discuss the physical origin of two interaction types.

[구 GC-02] Dual effects of ram pressure on star formation in multiphase disk galaxies with strong stellar feedback

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We investigate the impact of ram pressure stripping due to the intracluster medium (ICM) on star-forming disk galaxies with a multiphase interstellar medium maintained by strong stellar feedback. We carry out radiation-hydrodynamic simulations of an isolated disk galaxy embedded in a 1011 M⊙ dark matter halo with various ICM winds mimicking the cluster outskirts (moderate) and the central environment (strong). We find that both star formation quenching and triggering occur in ram pressure-stripped galaxies, depending on the strength of the winds. HI and H2 in the outer galactic disk are significantly stripped in the presence of moderate winds, whereas turbulent pressure provides support against ram pressure in the central region, where star formation is active. Moderate ICM winds facilitate gas collapse, increasing the total star formation rates by ~40% when the wind is oriented face-on or by ~80% when it is edge-on. In contrast, strong winds rapidly blow away neutral and molecular hydrogen gas from the galaxy, suppressing star formation by a factor of 2 within ~200 Myr. Dense gas clumps with nH≳10 M⊙ pc-2 are easily identified in extraplanar regions, but no significant young stellar populations are found in such clumps. In our attempts to enhance radiative cooling by adopting a colder ICM of T=106K only a few additional stars are formed in the tail region, even if the amount of newly cooled gas increases by an order of magnitude.

[구 GC-03] The Origin of the Spin−Orbit Alignment of Galaxy Pairs

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Galaxies are not just randomly distributed in space; instead, a variety of galaxy alignments have been found over a wide range of scales. Such alignments are the outcome of the combined effect of interacting neighbors and the surrounding large-scale structure. Here, we focus on the spin−orbit alignment (SOA) of galaxy pairs, the dynamical coherence between the spin of a target galaxy and the orbital angular momentum of its neighbor. Based on a recent cosmological hydrodynamic simulation, the IllustrisTNG project, we identify paired galaxies with mass ratios from 1/10 to 10 at z = 0 and statistically analyze their