Galaxy dynamics probes weak gravity at accelerations below the de Sitter scale of acceleration adS = cH, where c is the velocity of light and H is the Hubble parameter. Low and high redshift galaxies hereby offer a novel probe of weak gravity in an evolving cosmology, satisfying H(z) = H0(1 + A(6z + 12z^2 +12z^3+ 6z^4+ (6/5)z^5)/(1 + z) with baryonic matter content A sans tension to H0 in surveys of the Local Universe. Galaxy rotation curves show anomalous galaxy dynamics in weak gravity aN <adS across a transition radius r beyond about 5 kpc for galaxy mass of 1e11 solar mass. where aN is the Newtonian acceleration based on baryonic matter content. We identify this behavior with a holographic origin of inertia from entanglement entropy, that introduces a C0 onset across aN=adS with asymptotic behavior described by a Milgrom parameter satisfying a0=omega/(2pi), where omega=sqrt(1-q)H is a fundamental eigenfrequency of the cosmological horizon. Extending an earlier confrontation with data covering 0.003< aN/adS < 1 at redshift z about zero in Lellie et al. (2016), the modest anomalous behavior in the Genzel et al. sample at redshifts 0.854< z <2.282 is found to be mostly due to clustering 0.36 < aN/adS < 1 close to the C0 onset to weak gravity and an increase of up to 65% in a0.

[구 CO-09] Cosmological Gas in RAMSES

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The distribution of gas on cosmological scales is vital to our understanding of galaxy formation. Using the RAMSES cosmological hydrodynamical simulation code we have explored the evolution of the gas properties in a cosmological volume. We have identified the effect of the maximum simulation force resolution, and the resolution of the initial conditions, on the gas density power spectrum, as well as artefacts due to the RAMSES algorithm. The RAMSES methodology can add spurious power on small scales, particularly in low resolution simulations. This effect can be expected to have a strong impact on the results of RAMSES simulations, because this additional power appears at specific epochs, implying a sudden change to the system.

[구 CO-10] Effects of large-scale structures on cosmological hydrodynamic simulations

Jihye Shin, Changbom Park, and Juhan Kim
Korea Institute for Advanced Study

We in the Korea Institute for Advanced Study are preparing the fifth Horizon Run in a series of large-scale cosmological simulations. For the first time we will include full hydrodynamics and astrophysical processes using a RAMSES code. I will discuss the impact of large-scale structures on smaller scale properties in cosmological hydrodynamic simulation to justify our choice of simulation boxsize, whose one side length is up to 1 Gpc.

천문우주관측기술

[구 AT-01] Breakthrough Starshot Project: Could Relativistic Spacecraft Make it to Alpha Centauri?

Thiem Hoang
Korea Astronomy and Space Science Institute & Korea University of Science and Technology

The Breakthrough Starshot initiative aims to launch gram-scale spacecraft to a speed of v~0.2c, capable of reaching Alpha Centauri and seeing the Earth-like exoplanet, Proxima b, from close distance, in about 20 years. However, a critical challenge for the initiative is the effects of interstellar matter and magnetic field to the relativistic spacecraft during the journey. In this talk, I will first present our evaluation for the damage to the spacecraft by interstellar gas and dust based on a detailed analysis of the interaction of a relativistic spacecraft with the ISM. Second, I will discuss the deflection and oscillation of spacecraft by interstellar magnetic fields.

Third, I will discuss the gas drag fore at high energy regime and quantify its effect on the slowing down of the relativistic lightsails. Finally, we will discuss practical strategies to mitigate the damage by interstellar dust and to maintain the spacecraft aiming at the intended target.

[구 AT-02] Critical Design Status of the G-CLEF Flexure Control Camera

Jae Sok Oh[1], Chan Park[1], Kang-Min Kim[1],

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The GMT-Consortium Large Earth Finder (G-CLEF) is the very first light instrument of the Giant Magellan Telescope (GMT) to be commissioned in 2022. The instrument is a fiber feed, optical band echelle spectrograph that is capable of extremely precise radial velocity measurement. Korea Astronomy and Space Science Institute (KASI) has been involved in the development of the G-CLEF as one member of the international consortium consisted of five astronomical institutes including Smithsonian Astrophysical Observatory (SAO), Observatories of the Carnegie Institution of Washington (OCIW). It is scheduled to have KASI side Critical Design Review in December 2017. In this presentation we will report the recent progress on the critical design activities for the G-CLEF Flexure Control Camera (FCC).

[구 AT-03] Development of KHU Automatic Observing Software for McDonald 30inch telescope (KAOS30)

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Automatic observing is the most efficient system for sky surveys that image many targets over large areas of the sky. Such a system requires the integrating control software that systematically manages astronomical instruments that are not connected to each other. In February of 2017, we installed a wide-field 10 inch telescope for Supernovae survey on the McDonald 30 inch telescope as a piggyback system. However, during the observations, information such as target coordinates could not be exchanged with the telescope mount. The reason is the program that controls the telescope control system (TCS) and the program that controls the imager operate on independent PCs. KAOS30 is an integrated observing software developed to improve this environment. The software is composed of four packages that are the Telescope Control Package (TCP), the Data Acquisition Package (DAP), the Auto Focus Package (AFP), and the Script Mode Package (SMP). The TCP communicates to the TCS and also communicates weather information. SMP supports automatic observing in a script mode, which improves the efficiency of the survey. KAOS30 was developed based on Visual C ++ and runs on the Windows operating system. It also supports the ASCOM driver platform for various manufacturers. The instruments that support ASCOM can be installed without modification of the program code. KAOS30 can be applied as software for many different telescopes in future projects.

[구 AT-04] Plan of the Extended KVN (KVN 확장 계획)

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Korea Astronomy and Space Science Institute (한국천문연구원)

KVN is a millimeter VLBI array composed of three 21m-diameter radio telescopes at Seoul, Ulsan and Jeju island in Korea. KVN has unique simultaneous multi-frequency receiving systems, which enable us to correct phase fluctuation of troposphere by transferring phase solution of low frequency data to higher frequency data. Although KVN can achieve very high performance up to 130 GHz through multi-frequency technique, imaging capability is highly limited because of lack of the number of baselines. In order to enhance imaging capability and maximizing multi-frequency capability, we plan to extend KVN baselines from 3 to 10 (or more) by constructing new KVN stations. This talk introduce expected performances, science cases, required budgets and periods of the Extended-KVN.

[구 AT-05] ASTE receiver optics design using ultra wideband corrugated horn at combined ALMA band 7 and band 8 frequencies

Bangwon Lee[1], Jung-won Lee[1] & Alvaro Gonzalez[2]