

significant contribution to \bar{B} field amplification. Conversely, β effect contributing to the magnetic diffusion maintains a negative value, which plays a key role in the amplification with Laplacian $\nabla^2 (= -k^2)$ for the large scale regime. In addition, negative magnetic diffusion accounts for the attenuation of plasma kinetic energy $E_V (= \langle U^2 \rangle / 2)$ (U: plasma velocity) when the system is saturated. The negative magnetic diffusion is from the interaction of advective term $-U \cdot \nabla B$ from magnetic induction equation and the helical velocity field. In more detail, when 'U' is divided into the poloidal component U_{pol} and toroidal one U_{tor} in the absence of reflection symmetry, they interact with $B \cdot \nabla U$ and $-U \cdot \nabla B$ from $\nabla \times \langle U \times B \rangle$ leading to α effect and (negative) β effect, respectively. We discussed this process using the theoretical method and intuitive field structure model supported by the simulation result.

[구 SS-07] Photometric study of Main-belt asteroid (298) Baptistina

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The Main-belt asteroid (298) Baptistina (hereafter 'Baptistina') is regarded as an X- (or C-) type asteroid and the largest member of the Baptistina asteroid family. Its basic physical properties play an important role in understanding the rotational evolution and orbital dynamics of the Baptistina family. In this study, we determined the physical characteristics of Baptistina from the optical observations. We conducted BVRI and R band photometric observations from 2017 to 2021 for a total of 47 nights using the 0.5 - 2.0 m-class telescopes. As a result, the color indices of Baptistina were derived as , , and ; this result is consistent with the previous classification of Baptistina as an X- (or C-) type. We also determined absolute magnitude () and slope parameter () by using a simplified version of the IAU H & G function (owell et al. 1989) are mag and respectively. We calculated the effective radius of Baptistina of km considering the visual geometric albedo of 0.131 from the NEOWISE data.

Using the light-curve inversion method, the sidereal rotation period of 16.224235 h and the 3D shape model with a pole orientation (.) were also determined. In this presentation we will introduce our observations and results, and also discuss about the physical properties of Baptistina asteroid family members such as color indices.

[구 SS-08] Reflectance-Color Trends on the Lunar Mare Surface

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The lunar surface progressively darkens and reddens as a result of sputtering from solar wind particles and bombardment of micrometeoroids. The extent of exposure to these space weathering agents is frequently calculated as the location in a diagram of reflectance at 750 nm vs. 950 nm/750 nm color (R-C). Sim & Kim (2018) examined the R-C trends of pixels within ~3,500 craters, and revealed that the length (L) and skewness (s) of R-C trends can be employed as a secondary age or maturity indicator. We broaden this research to general lunar surface areas (3,400 tiles of $0.25^\circ \times 0.25^\circ$ size) in 218 mare basalt units, whose ages have been derived from the size-frequency distribution analysis by Hiesinger et al. (2011). We discover that L and s rise with age until ~3.2 Gyr and reduce rather rapidly afterward, while the optical maturity, OMAT, reduces monotonically with time. We show that in some situations, when not only OMAT but also L and s are incorporated in the estimation utilizing 750 & 950 nm photometry, the age estimation becomes considerably more reliable. We also observed that OMAT and the lunar cratering chronology function (cumulative number of craters larger than a certain diameter as a function of time) have a relatively linear relationship.

천문화학/천문생물학

[구 AB-01] Panspermia in a Milky Way-like Galaxy

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 We study the process of panspermia in Milky

Way-like galaxies by modeling the probability of successful travel of organic compounds between stars harboring potentially habitable planets. To this end, we apply the modified habitability recipe of Gobat & Hong (2016) to a model galaxy from the MUGS suite of zoom-in cosmological simulations. We find that, unlike habitability, which only occupies narrow dynamic range over the entire galaxy, the panspermia probability can vary be orders of magnitude between the inner ($R, b = 1\text{--}4 \text{ kpc}$) and outer disk. However, only a small fraction of star particles have very large values of panspermia probability and, consequently, the fraction of star particles where the panspermia process is more effective than prebiotic evolution is much lower than from naïve expectations based on the ratio between panspermia probability and natural habitability.

The lunar surface progressively darkens and reddens as a result of sputtering from solar wind particles and bombardment of micrometeoroids. The extent of exposure to these space weathering agents is frequently calculated as the location in a diagram of reflectance at 750 nm

항성 및 항성계

[구 SA-01] Long-term simultaneous monitoring observations of SiO and H₂O masers toward Mira variable WX Serpentis

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We carried out simultaneous monitoring observations of five maser lines, H₂O (22 GHz), SiO $v = 1, 2, J = 1-0$ (43.1, 42.8 GHz), and SiO $v = 1, J = 2-1, 3-2$ (86.2, 129.3 GHz), toward the Mira variable star WX Serpentis with the 21-m antennas of the Korean VLBI Network (KVN) in 2009–2021 (~12 years). Most spectra of the H₂O maser are well separated into two parts of two blue- and one redshifted features within $\pm 10 \text{ km s}^{-1}$ of the stellar velocity. All detected SiO masers are generally concentrated within $\pm 5 \text{ km s}^{-1}$ of the stellar velocity, and sometimes appear split into two components. Overall, the profiles of SiO and H₂O masers detected in WX Serpentis illustrate typical characteristics of the Mira variable. In addition, flux variations of both SiO and H₂O masers are well correlated with the optical light

curve of the central star, showing a phase lag of ~ 0.1 for SiO masers and ~ 0.2 for H₂O maser. This phenomenon is considered to be the direct effect of propagating shock waves generated by the stellar pulsation, because SiO and H₂O masers are sequentially distributed at different positions with respect to the central star. In addition, we analyzed long-term trends and characteristics of maser velocities, maser ratio, and the velocity extents (the full width at zero power: FWZP). We also investigated a spectral energy distribution (SED) ranging from 1.2 to 240 μm obtained using several infrared data: 2MASS, WISE, IRAS, ISO, COBE DIBRE, RAFGL, and AKARI (IRC and FIS). From the IRAS LRS and ISO SWS spectra of this star, we identified 9.7 and 12 μm silicate emission features consistent with the SE6 spectrum model, corresponding to the typical AGB phase.

[구 SA-02] Twelve-year simultaneous monitoring of the SiO and H₂O masers toward AGB stars: RT Vir, RR Aql, IRC-10151

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We present the results of long-term simultaneous monitoring observations (~12 years) of H₂O (22 GHz) maser and several vibrationally excited lines of SiO $J = 1-0, 2-1, 3-2$ masers (43, 86, 129 GHz) carried out with the 21-m antennas of the Korean VLBI Network (KVN) toward a sample of three AGB stars (RT Vir, RR Aql, IRC-10151) that are believed to be semiregular variable star, Mira variable star, and OH/IR star, respectively, according to a sequential evolutionary phase of AGB star. A total 10 transitions were observed, of which we detected H₂O, SiO $v = 1$ and $2, J = 1-0$, SiO $v = 1, J = 2-1$ and $J = 3-2$ maser lines in all three target objects, depending on the observational epochs. In this study, we scrutinize the evolutionary traits of each target object based on the maser line profiles, flux/velocity variations, and phase lags with the optical light curves. The IRAS two color diagram and the infrared spectral energy distributions (SEDs) in the wavelength range from 1.2 to 240 μm of three observed sources were also analyzed.

[구 SA-03] M to mid-L type members of