study.

[포 ST-04] PLANETARY CAUSTIC PERTURBATIONS OF A CLOSE-SEPARATION PLANET ON MICROLENSING

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We investigate the properties and detection conditions for the planetary caustic perturbation of close-separation planets. To find the properties of the planetary caustic perturbation, we construct deviation maps by subtracting the single-lensing magnification of the lens star from the planetary lensing magnification for various lensing parameters. We find that each deviation area of the positive and negative perturbations disappears at the same normalized source radius according to a given deviation threshold regardless of mass ratio but disappears at a different normalized source radius according to the separation. We also estimate the upper limit of the normalized source radius to detect the planetary caustic perturbation. We find simple relations between the upper limit of the normalized source radius and the lensing parameters. From the relations, we obtain an analytic condition for the detection limit of the planet, and which show that we can sufficiently discover a planet with the mass of sub-Earth for typical microlensing events. Therefore, we expect to add the number of low-mass planets in the next-generation microlensing experiments and conclude that our detection condition of the planet can be used as a important criteria for maximal planet detections considering the source type and the photometric accuracy.

[포 ST-05] The Chemical Abundances of Hypervelocity Stars in the Milky Way Disk

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We present preliminary results of the analysis of chemical abundances for seven hypervelocity star (HVS) candidates. These objects are G and K dwarfs in the Galactic disk selected from the Sloan Extension for Galactic Understanding and Exploration. Unlike other HVSs discovered thus far, their stellar orbits and kinematics suggest that they do not originate in the Galactic center or in an accretion event. These factors imply yet-unknown mechanisms that give rise to these kinematically-extreme disk stars. In order to study in detail their progenitors and possible formation mechanisms, we obtained spectra of these stars at a resolving power of R~6000, with the Dual Imaging Spectrograph at the Apache Point Observatory. We derive the abundances of chemical elements, C, Mg, Ca, Ti, Cr, Fe, and Ba from the observed spectra, using MOOG. We compare them with the ones of typical Galactic disk stars and discuss discrepancies between them to search for clues to their origin.

[포 ST-06] It is surface gravity.

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In our previous study, we showed that the peculiar globular cluster M22 contains two distinct stellar populations with different physical properties, having different chemical compositions, spatial distributions and kinematics. We proposed that M22 is most likely formed via a merger of two GCs with heterogeneous metallicities in a dwarf galaxy environment and accreted later to our Galaxy. In their recent study, Mucciarelli et al. claimed that M22 is a normal mono-metallic globular cluster without any perceptible metallicity spread among the two groups of stars, which challenges our results and those of others. We devise new strategies for the local thermodynamic equilibrium abundance analysis of red giant branch stars in globuar clusters and show there exists a spread in the iron abundance distribution in M22.

[포 ST-07] Evolution of primary stars in Pop III binary systems

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Binary interactions may have significant impact on Pop III stellar evolution. Pop III single star evolution indicates that for primary masses less than 20$M_{\odot}$, no significant binary mass transfer

would occur before core helium exhaustion. We perform binary system evolution for various primary masses ($20M_\odot < M_1 < 60M_\odot$) and initial periods under same mass ratio $M_2/M_1 = 0.9$, and follow the evolution and mass transfer of the primary star. If binary mass transfer occurs during post main sequence, the primary star does not evolve into naked helium star and still contain significant hydrogen in the envelope. During the post mass transfer phase, the primary star evolves redward, and does not become sufficiently hot to enhance the number of ionizing photons, compared to the case of single star evolution for a given initial mass. This result implies that primary stars of massive Pop III binary systems would have little contribution to the reionization in the early universe. Given the large hydrogen content (0.326 - $1.793M_\odot$), the primary stars that underwent stable mass transfers would explode as a Type IIb supernova, and it would be difficult for Pop III binary stars to produce Type Ib/c supernovae that look similar to those found in the local universe.

[포 ST-08] Searching for Eccentricity Preserving Mass Transfer Mechanism during Binary Star Evolution

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상호작용 하는 쌍성계의 진화과정 중 질량이동에 의한 궤도 변화에는 아직 풀리지 않은 수수께끼가 남아있다. 예를 들면 바륨별 (Ba Star)의 경우, 관측된 궤도 이심률은 평균 0.2, 1000일 단위의 주기를 보여주고 있다. Population Synthesis시뮬레이션으로 이를 재현할 경우 관측된 궤도 성질을 맞추지 못하거나, 바륨별의 형성 개수를 맞추지 못하는 문제점이 있다. 비슷한 문제가 청색낙오성 (Blue Straggler Star)의 시뮬레이션 결과에서도 나타나고 있는데, 이 문제의 핵심은 Roche Lobe Over Flow (RLOF)를 통한 질량 이동이 결과적으로 Common Envelope (CE)으로 이어지기 때문에 각운동량을 크게 잃게 되어 궤도가 원형화 되기 때문인 것으로 판명이 되었다. 따라서 이번 연구에서는 RLOF를 통한 질량이동 중 CE 과정을 효과적으로 피해갈 수 있는 질량이동 과정을 제안하고, 이를 시뮬레이션에 적용하여 관측자료를 설명할 것이다. 최종적으로는, 위의 질량이동 과정을 오픈 소스 항성진화 프로그램인 MESA에 포함시켜, 쌍성계 궤도와 그 별들의 표면 원소 분포 사이의 상관관계를 정량적으로 설명하려고 한다.

[포 ST-09] Removing Telluric Absorbtion lines for IGRINS spectra

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There are many telluric absorption lines which are laid on the science spectrum in ground based spectroscopic observations. In especial, the IR region spectra are considerably contaminated by telluric lines. Therefore, many scientists have a difficulty in removing the telluric effect. We thus tried removing telluric lines with IGRINS data by two methods. One is using the standard stellar spectrum as telluric lines. The other adopt calculated synthetic telluric spectrum. Here we present the results of test for precise removing telluric lines on IGRINS spectra.

[포 ST-10] KIC06118779 and KIC08682849: Extremely low mass ratio contact binaries with quasi-cyclically varying O'Connell effects and strong anti-correlations in their ETV diagrams

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The Kepler mission of NASA has enabled to discover a lot of new W UMa-type binaries with continuous light curves measured with unprecedented accuracy. Interestingly, their eclipsing time variation (hereafter ETV) diagrams show anti-correlation between primary and secondary minima, presumably occurred by continuous spot variation (Tran et al. 2013; Balaji et al. 2014). Two active Kepler binaries (KIC06118779 & KIC08682849), reported as showing the anti-correlation in ETV diagram, were investigated to see that the anti-correlations are correlated with time-variable O'connell effects appeared in their light curves. As a result, it was found that the O'connell effects for two binary stars have varied in quasi-sinusoidal ways similar to the patterns of their anti-correlation variations. In addition, our light curve syntheses of two binary stars with the latest version of the Wilson-Devinney code (Wilson & devinney 1971) show that they are very deep-contact binary system with extremely low mass ratios.

[포 ST-11] Meta-analysis for the studies on extrasolar planets using Kepler mission data

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