environments, after light-curve shape and color or extinction corrections. Our results are then compared to previous studies, and show consistent results.

[포GC-22] Big Data Astronomy : Let's "PySpark" the Universe (빅데이터 천문학 : PySpark를 이용한 천문자료 분석)

Sungryong Hong
Korea Institute for Advanced Study

The modern large-scale surveys and state-of-the-art cosmological simulations produce various kinds of big data composed of millions and billions of galaxies.

Inevitably, we need to adopt modern Big Data platforms to properly handle such large-scale data sets.

In my talk, I will briefly introduce the de facto standard of modern Big Data platform, Apache Spark, and present some examples to demonstrate how Apache Spark can be utilized for solving data-driven astronomical problems.

항성/항성계/외계행성

[포SA-01] High Resolution Spectroscopic Monitoring of Symbiotic Stars AG Draconis and UV Aurigae

Soo Hyun Kim[1], Tae Seog Yoon[1], Hyung-il Oh[1]
[1]Kyungpook National University

보현산 천문대 1.8m 망원경과 고분산 에셀 분광기 BOES(BOao Echelle Spectrograph)를 이용한 공생별 AG Draconis와 UV Aurigae의 분광학적 특성을 파악한다. 중성수소 Balmer 선과 주요 원소에 의한 방출선들의 특징과 변화를 살펴보며, 두 별의 활동성 및 등급에 따른 Balmer 선의 변화 양상에 대해 알아보고자 한다.

[포SA-02] A comparison study between the AESOPUS Low Temperature Opacity and that of Ferguson, on Standard Stellar Models and Isochrones

Yong -Cheol Kim[1] and Minje Beom[2]
[1]Astronomy Department, Yonsei University, Korea
[2]Astronomy Department, NMSU, USA

A comparison study between two low temperature opacity tables has been conducted. The opacity is the one of the major input physics in stellar model construction. Opacity is generally provided in a tabular form and as a function of 3 parameters, ie, density, temperature and chemical composition. Among available opacity tables, it has been common practice to utilize OPAL opacity table (Iglesias & Rogers, 1996) augmented with Ferguson opacity table (Ferguson et al. 2005) for the low temperature domain. For low temperature domain, another table, AESOPUS (Marigo & Aringer, 2009), has been announced in 2007. Reportedly, this opacity covers even lower temperature region, and is compatible with that of Ferguson in the overlapping temperature domain. To test the compatibility, stellar models and isochrones for various ranges in mass, metallicity and chemical composition, have been constructed. It is confirmed that there is no significant difference in the stellar models and isochrones constructed with the two different low temperature opacities. Therefore, in the construction of stellar models and isochrones, Ferguson low temperature opacity can be replaced with the AESOPUS opacity. The wider range in the temperature and chemical mixtures, and the easier accessibility make AESOPUS favorable in practical purpose.

[포SA-03] Stellar Wind Accretion and Raman O VI Spectroscopy of the Symbiotic Star AG Draconis

Young-Min Lee[1], Hee-Won Lee[1], Ho-Gyu Lee[2], Rodolfo Angeloni[3]
[1]Sejong University, [2]KASI, [3]Universidad de La Serena

High resolution spectroscopy of the yellow symbiotic star AG Draconis is performed with the Canada-France-Hawaii Telescope to analyse the line profiles of Raman scattered O VI broad emission features at 6825 Å and 7082 Å with a view to investigating the wind accretion process from the mass losing giant to the white dwarf.

These two spectral features are formed through inelastic scattering of O VI$\lambda\lambda$1032 and 1038 with atomic hydrogen.

We find that these features exhibit double-component profiles with red parts stronger than blue ones with the velocity separation of $\sim$ 60 km s$-$1 in the O VI velocity space.

Monte Carlo simulations for O VI line radiative transfer are performed by assuming that the O VI emission region constitutes a part of the accretion flow around the white dwarf and that Raman O VI features are formed in the neutral part of the slow stellar wind from the giant companion.

The overall Raman O VI profiles are reasonably fit with an azimuthally asymmetric accretion flow and the mass loss rate $\sim 4 \times 10^{-7}$ M_sun yr^{$-$

1}.

We also find that additional bipolar neutral regions moving away with a speed ~ 70 km s^{−1} in the directions perpendicular to the orbital plane provide considerably improved fit to the red wing parts of Raman features.

[포SA-04] Intensive Monitoring Survey of Nearby Galaxies: Current Status

Myungshin Im[1], Changsu Choi[1], Gu Lim[1], Sophia Kim[1], Seunghak Gregory Paek[1], Joonho Kim[1], Sungyong Hwang[1], Suhyung Shin[1], Insu Baek[1], Sangyun Lee[1], Sung A O[1], Sung Chul Yoon[1], Hyun-Il Sung[2], Yeong-Beaom Jeon[2], Sang Gak Lee[3], Wonseok Kang[3], Tae-Woo Kim[3], Sun-gil Kwon[3], Soojong Pak[4], Shuhrat Eghamberdiev[5], and IMSNG Team
[1]Astronomy Program/CEOU, Dept. of Physics & Astronomy, Seoul National University
[2]Korea Astronomy & Space Science Institute
[3]National Youth Space Center
[4]School of Space Research and Institute of Natural Sciences, Kyunghee University
[5]Ulugh Beg Astronomical Institute, Uzbekistan

SNe light curves have been used to understand the expansion history of the universe, and a lot of efforts have gone into understanding the overall shape of the radioactively powered light curve. However, we still have little direct observational evidence for the theorized SN progenitor systems. Recent studies suggest that the light curve of a supernova shortly after its explosion (< 1 day) contains valuable information about its progenitor system and can be used to set a limit on the progenitor size, R*. In order to catch the early light curve of SNe explosion and understand SNe progenitors, we are performing a ~8hr interval monitoring survey of nearby galaxies (d < 50 Mpc) with 1-m class telescopes around the world. Through this survey, we expect to catch the very early precursor emission as faint as R=21 mag (~0.1 Rsun for the progenitor). In this poster, we outline this project, and present a few scientific highlights, such as the early light curve of SN 2015F in NGC 2442.

교육홍보 & 기타

[포SE-01] IAnalysis of Michigan catalog of HD stars

Yongcheol Shin[1], Jihyun Yoo[1], Jeongeun Kim[1], Wonseok Kang[1], Sanggak Lee[2]
[1]National Youth Space Center, [2]Seoul National University

지금으로부터 100년 전, 하버드대학교 천문대에서 에드워드 찰스 피커링과 윌리어미나 플레밍, 애니 점프 캐넌 등의 여성 천문학자들이 분광관측 자료를 가지고 헨리 드레이퍼 목록(HD catalog)을 만들기 시작했다. 이는 항성 분류의 근간을 마련하고 현대 천문학의 본격적인 시작을 알리는 일이었다. 현재 국립청소년우주센터는 이를 기념하여, 디지털 이미지로 보유중인 1975년에서 1999년에 걸쳐 발간된 『Michigan catalog of HD stars』의 사진건판을 활용한 연구를 진행 중이다. 본 센터를 방문하는 청소년이 100년 전 그들과 한 것과 같은 고전적 항성 분류 과정을 체험하며, 별의 스펙트럼을 이해하고 우주를 이해하는데 필수적인 분광학에 대한 이해를 높이길 기대한다. 이를 위한 선행 작업인 대물프리즘 사진건판 이미지에서 별의 스펙트럼을 추출하는 과정을 소개하고자 한다.

[포SE-02] Development of the Astronomy Education Program for Elementary Students and Astronomy Outreach Initiative : 초등학생 천문교육 프로그램 개발을 통한 천문학 대중화

Jinhee Yu[1,2,3], Seunghyun Kim[2], Yongik Byun[3], San NamKung[1,2], Eunseok Lee[2], Donggan Park[2], Hyunsik Jo[2], Hyunyoung Lee[1,2], Yojun Hyun[2], Jungmin Kim[1,2], Jeehye Yu[1,2], Honggyu Lee[2]
[1]Astrocamp Contents Research Institute, Goyang 10329, Korea, [2]Astrocamp, Goyang 10329, Korea, [3]Department of Astronomy, Yonsei University & University Observatory, Korea,

어린이천문대는 2003년부터 15년간 어린이들의 천문 지식 함양과 과학탐구 능력의 향상을 도모하기 위해 수준별 3단계 프로그램을 연구 개발해왔다. 우리의 3단계 천문교육 시스템은 저학년을 대상으로 한 체험교실, 고학년을 대상으로 한 탐구교실, 그리고 탐구교실을 수료한 학생들을 위한 심화 단계인 테마교실로 이루어져 있다. 단계별 교재, 교보재, 관측실험 및 시각자료의 개발을 통해 프로그램의 완성도를 높여왔다. 우리의 천문교육 프로그램으로 교육된 누적 인원은 모두 67986명(2018년 3월 31일 기준)에 달한다. 그중 천문학 진출 사례로는 페리지로켓의 신동윤 대표와 다수의 천문학 전공 학생들이 있다. 전문적인 초등학생 천문교육 프로그램의 지속적인 연구개발을 통해 대한민국 천문학 대중화에 이바지할 수 있을 것으로 기대된다.

[포SE-03] Citizen Science in KMLA

Sukbum A. Hong, SeungJunRhee, Jeongjun Yun, Minseok Kim, Seung Ho Lee, Jaihyun Kim, Gukmyeong Son
Korean Minjok Leadership Academy

We present a study of citizen science performed at Korean Minjok Leadership Academy (KMLA). The importance of citizen involvements in scientific