Parkville, VIC 3010, Australia
[2]Institute for Computational Cosmology, Department of Physics, University of Durham, South Road, Durham DH1 3LE, UK

We investigate the clustering properties of Lyman-break galaxies (LBGs) at z ~ 4. Using the hierarchical galaxy formation model GALFORM, we predict the angular correlation function (ACF) of LBGs and compare this with the measured ACF from combined survey fields consisting of the Hubble eXtreme Deep Field (XDF) and CANDELS. We find that the predicted ACF is in a good agreement with the measured ACFs. However, when we divide the model LBGs into bright and faint subset, the predicted ACFs are less consistent with observations. We quantify the dependence of clustering on luminosity and show that the fraction of satellite LBGs is important for determining the amplitude of ACF at small scales. We find that central LBGs predominantly reside in $\sim 10^{11} h^{-1} M_{solar}$ haloes and satellites reside in haloes of mass $\sim 10^{12} - 10^{13} h^{-1} M_{solar}$. The model predicts fewer bright satellite LBGs than is inferred from the observation. LBGs in the tails of the redshift distribution contribute significant additional clustering signal, especially on small scales. This spurious clustering may affect the interpretation of the halo occupation distribution, including the minimum halo mass and abundance of satellite LBGs.

[구 IM-06] OH Emission toward Embedded YSOs

Hyeong-Sik Yun[1], Jeong-Eun Lee[1], Seokho Lee[1], Evans, Neal J., II[2]
[1]School of space research, Kyung Hee University, Yongin, Gyeonggi 446-701, Korea,
[2]Department of Astronomy, The University of Texas at Austin, USA

High energy photons and mechanical energy produced by the process of star formation result in copious FIR molecular and atomic lines, which are important coolants of the system. Photons thermally or mechanically induced could dissociate water in the dense envelope to change relative abundances among the species of O, OH, and H2O. Here we analyze OH emission lines toward embedded young stellar objects (YSOs) observed as part of the Herschel open time key program, 'Dust, Ice, and Gas In Time (DIGIT)' in order to study the physical conditions of associated gas and the energy budget loaded on the OH line emission. According to our analysis of the Herschel/PACS spectra, OH emission peaks at the central spaxel in most of sources, but several sources show spatially extended emission structures. In the extended emission sources, the distribution of OH emission is correlated with that of [OI] emission and extended along the outflow directions. Considering the diversity of source properties, ratios between detected OH lines are relatively constant among sources. In addition, each OH line has strong correlation with bolometric luminosity. In order to determine the physical conditions of YSOs, we adopt several methods for the analysis of the OH lines: rotational diagram, non-LTE LVG analysis, and a 2-D PDR code. From the simple LVG analysis, we find that the thermal solution with the dense (> $10^7 cm^{-3}$) and warm (~ 100 K) OH gas reproduces the ratios of detected OH lines. However, our self-consistent PDR 2-D model, which can deal with the IR-pumping effect from the central protostar as well as the warm dust in situ, cannot fit the observational results, suggesting that an irradiated shock model is necessary for a better interpretation.

태 양 계

[구 SS-01] The 10-μm Noth-Polar Bightening of Juptier: A Dynamical Phenomenon?

Sang Joon Kim[1], Haingja Seo[2]
[1]Kyung Hee University, Korea, [2]Korea Aerospace Research Institute, Korea

Since its detection in 1980, the 8-μm north-polar brightening of CH_4 on Juptier has not moved from 180° (SysIII) longitude. The 8-μm CH_4 brightening is mostly thermal and very similar to that of 13-μm C_2H_2 emissions, but the morphology of these hydrocarbon north-polar brightenings are very different from that of the 3-μm H_3^+ auroral oval suggesting a significantly different excitation process yet unknown heating mechanism. Recently, Kim et al. (submitted to Icarus, 2015) found that that the center of the 3-μm CH_4 northern bright spot is located at ~200° (SysIII) longitude, which is ~20° west from the center of the 8-μm north-polar bright spot, and it does not coincide with the 3-μm H_3^+ bright spot. They found significantly high temperatures (500 ~ 850K) from CH_4 rotational lines on the 3-μm bright spot above the 1-μbar pressure level, while we find cooler temperatures (<350K) over the the 8-μm spot. They also found that the upper states of the 3-μm CH_4 bands are mostly populated by non-thermal excitations, such as

auroral particle precipitations and/or Joule heatings in contrast to the 8-μm thermal emission. This finding indicates that the 10-μm hydrocarbon brightening is confined to low altitudes below the 1-μbar level eliminating the long-suggested possibility of direct auroral bombardments while opening a new possibility of dynamical origin for the 10-μm brightening.

[구 SS-02] A Monitoring Observation of Comet 17P/Holmes during 2014 Apparition

Yuna Kwon[1], Masateru Ishiguro[1], Hidekazu Hanayama[2], Daisuke Kuroda[3], Yuki Sarugaku[4], Yoonyoung Kim[1], Jeremie J. Vaubaillon[5], Jun Takahashi[6], and Jun-Ichi Watanabe[7]
[1]Department of Physics and Astronomy, Seoul National University, [2]Ishigakijima Astronomical Observatory, National Astronomical Observatory of Japan, [3]National Institute of Natural Sciences, Okayama Astrophysical Observatory, Japan, [4]Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Japan, [5]Observatoire de Paris, I.M.C.C.E., France, [6]Nishi-Harima Astronomical Observatory, Center for Astronomy, University of Hyogo, Japan, [7]National Astronomical Observatory, Japan

We performed a monitoring campaign of a Jupiter-Family comet 17P/Holmes, which underwent the dramatic outburst on 23.3 October 2007 at r_h=2.44AU, to investigate the secular change in activity and subsequent physical properties of the inner dust coma before and after the 2014 perihelion passage. The monitoring observation was carried out over two years: from May to July 2013, from July to November 2014, and January 2015 with ~weekly cadence. We conducted photometry monitoring in Rc band using four ground-based telescopes, which are the Ishigakijima Astronomical Observatory 105cm telescope, the Okayama Astrophysical Observatory 50cm telescope, the Nishi-Harima Astronomical Observatory 2m telescope, and the T30 51cm i-telescope, respectively. In order to examine the dust production rate, we put a constraint upon the physical distance from the center of the nucleus as rho=2500km and conducted aperture photometry. We found that the average absolute Rc magnitude over the period between July to November 2014 was mR(1,1,0)~12.29, which was approximately 1.5 magnitudes fainter than those of 2013 data. Accordingly, comet 17P/Holmes seemed to become dormant, although a minor eruption was detected on January 26, 2015. In this presentation, we will introduce our ongoing project for 17P/Holmes and discuss why the nucleus becomes dormant within one orbital period.

[구 SS-03] Multiple Outbursts of a Short-Periodic Comet 15P/Finlay

Masateru Ishiguro1, DaisukeK uroda2, Yoonyoung Kim1, Yuna Kwon1, Hidekazu Hanayama[3], Takeshi Miyaji[3], Satoshi Honda[4], Jun Takahashi[4], Jun-ichi Watanabe[5]
[1]Seoul National University,
[2]Okayama Astrophysical Observatory,
[3]Ishigakijima Astronomical Observatory,
[4]University of Hyogo,
[5]National Astronomical Observatory of Japan

15P/Finlay is one of the Jupiter-Family Comets that has long been known since the late 19 century. The comet maintains the perihelion around 1.0 AU over a century, without showing any prominent activities (i.e. fragmentation or eruption) since the discovery. According to reports in unpublished observations, the comet exhibited an outburst in the middle of 2014 December. We conducted a imaging observation of 15P/Finlay just after the report, from 2014 December 23 to 2015 February 18 using three telescopes (the Okayama Astrophysical Observatory 50-cm telescope, the Ishigakijima Astronomical Observatory 105-cm telescope, and the Nishi-Harima Astronomical Observatory 2-m telescope), which constitute a portion of the OISTER (an inter-university observation network in the optical and infrared wavelengths). As a result of the frequent observations, we witnesses the second outburst around UT 2015 January 16.

Such cometary outbursts draw the attention to researchers on ground that they could offer insight into the internal structure of comets, following a historical outburst occurred at 17P/Holmes on 2007 October 23. Although cometary outbursts have been often reported mostly in unpublished observations or unreviewed reports, it should be emphasized that there are not a sufficient number of astrophysical research which characterizes the physical properties by observing the aftermaths. This presentation provides a new observational result of 15P/Finlay outburst. Based on the morphological development of the dust cloud as well as the near-nuclear magnitude, we will derive the kinetic energy of the outburst. Finally we plan to compare the results of 15P/Finlay with those of analogical events at 17P/Holmes and P/2010 V1 (Ikeya-Murakami).

[구 SS-04] The phase angle dependences of