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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

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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?

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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