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SEMINAR

Revealing cosmic star formation history and black hole accretion history with the AKARI space telescope and the Subaru telescope's new Hyper-Suprime Camera

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16 July 2019, 14.00
Classroom-I

Summary: Understanding infrared (IR) luminosity is fundamental to understanding the cosmic star formation history and AGN evolution. Japanese infrared satellite, AKARI, provided unique data sets to probe this both at low and high redshift; the AKARI all sky survey in 6 bands (9-160 μm), and the AKARI NEP survey in 9 bands (2-24 μm).

The AKARI performed all sky survey in 6 IR bands (9, 18, 65, 90, 140, and 160 μm) with 3-10 times better sensitivity than IRAS, covering the crucial far-IR wavelengths across the peak of the dust emission. Combined with a better spatial resolution, we measure the total infrared luminosity ($L_{\rm TIR}$)of individual galaxies, and thus, the total infrared luminosity density of the local Universe much more precisely than previous work.

In the AKARI NEP wide field, AKARI has obtained deep images in the mid-infrared (IR), covering 5.4 deg^2. However, our previous work was limited to the central area of 0.25 deg^2 due to the lack of deep optical coverage. To rectify the situation, we used the newly advent Subaru telescope's Hyper Suprime-Cam to obtain deep optical images over the entire 5.4 deg^2 of the AKARI NEP wide field. With this deep and wide optical data, we, for the first time, can use the entire AKARI NEP wide data to construct restframe 8 μm, 12 μm, and total infrared (TIR) luminosity functions (LFs) at $0.15 < z < 2.2$. A continuous 9-band filter coverage in the mid-IR wavelength (2.4, 3.2, 4.1, 7, 9, 11, 15, 18, and 24 μm) by the AKARI satellite allowed us to estimate restframe 8 μm and 12 μm luminosities without using a large extrapolation based on a SED fit, which was the largest uncertainty in previous work.

By combining these two results, we reveal dust-hidden cosmic star formation history and AGN evolution from $z = 0$ to $z = 2.2$, all probed by the AKARI satellite.