found to be in maximal accretion with the Eddington ratios, λEdd ~ 1, suggesting enhanced nuclear activities in the early universe. However, this may not be the whole picture of supermassive black hole (SMBH) growth since previous studies have not reached on faint quasars that are more likely to harbor SMBHs with low λEdd. To understand the accretion activities in quasars at high redshift, we obtained the deep near-infrared (NIR) spectrum of a quasar, IMS J2204+0112, one of the few faintest quasars that have been identified at z ~ 6. From the NIR spectrum, we find that IMS J2204+0112 harbors a SMBH with about a billion solar mass, with log(λEdd) = -0.91. This is the lowest accretion rate found so far for quasars at z ~ 6, but a common value among quasars at z ~ 2. The inclusion of this object in the λEdd analysis gives the intrinsic λEdd distribution of z ~ 6 quasars, which is lower than previous results that are based on bright quasars, but it is still higher than λEdd of z ~ 2 quasars. Although the number statistics needs to be improved in future, the low peak λEdd value is consistent with the SMBH growth from a massive black hole seed (~ 105 Msun) or from a stellar mass black hole through short-duration super-Eddington accretion events (λEdd > 10).

[구 GC-19] What we have learned about Gamma-ray bright AGNs using the iMOGABA program

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A Korean VLBI Network Key Science Program, the Interferometric Monitoring of Gamma-ray Bright AGNs (iMOGABA) program continues to aim at revealing the origins of the gamma-ray flares that are often detected in active galactic nuclei (AGNs). Here in this presentation, we would like to present what we have learned about the Gamma-ray bright AGNs based on the recent results of the Korean VLBI Network Key Science Program: the iMGOABA. The results will include a) the source properties of the whole samples obtained from a single-epoch observation, and b) some of scientific highlights for the iMOGAGBA on specific sources. From those highlighted works, we find that the Gamma-ray bright AGNs become fainter at higher frequencies, yielding optically thin spectra at mm wavelengths. Based on the studies on specific sources, taking into account the synchrotron self-absorption model of the relativistic jet, we estimated the magnetic field strength in the mas emission region during the observing period.

[구 GC-20] Phase-space Analysis in the Group and Cluster Environment: Time Since Infall and Tidal Mass Loss

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Using the latest cosmological hydrodynamic N-body simulations of groups and clusters, we study how location in phase-space coordinates at z = 0 can provide information on environmental effects acting in clusters. We confirm the results of previous authors showing that galaxies tend to follow a typical path in phase-space as they settle into the cluster potential. As such, different regions of phase-space can be associated with different times since first infalling into the cluster. However, in addition, we see a clear trend between total mass loss due to cluster tides and time since infall. Thus, we find location in phase-space provides information on both infall time and tidal mass loss. We find the predictive power of phase-space diagrams remains even when projected quantities are used (i.e.,line of sight velocities, and projected distances from the cluster). We provide figures that can be directly compared with observed samples of cluster galaxies and we also provide the data used to make them as supplementary data to encourage the use of phase-space diagrams as a tool to understand cluster environmental effects. We find that our results depend very weakly on galaxy mass or host mass, so the predictions in our phase-space diagrams can be applied to groups or clusters alike, or to galaxy populations from dwarfs up to giants.

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