Black Hole Growth Is Mainly Linked to Host-galaxy Stellar Mass Rather Than Star Formation Rate

Wang, J. Yang, G., Chen, C. T., Vito, F., Brandt, W. N., Alexander, D. M., Luo, B., Sun, M., Xue, Y., Baüer, F., Koekemoer, A.,Lehmer, B. D., Liu, T., Schneider, D., Shemmer, O., Trump, J. & Vignali, C. (2017). Black Hole Growth Is Mainly Linked to Host-galaxy Stellar Mass Rather Than Star Formation Rate. The Astrophysical Journal, 842(72).

Abstract:

We investigate the dependence of black-hole accretion rate (BHAR) on host-galaxy star formation rate (SFR) and stellar mass (M∗) in the CANDELS/GOODS-South field in the redshift range of 0.5≤z<2.0. Our sample consists of ≈18000 galaxies, allowing us to probe galaxies with 0.1≲SFR≲100 M⊙ yr−1 and/or 108≲M∗≲1011 M⊙. We use sample-mean BHAR to approximate long-term average BHAR. Our sample-mean BHARs are derived from the Chandra Deep Field-South 7 Ms observations, while the SFRs and M∗ have been estimated by the CANDELS team through SED fitting. The average BHAR is correlated positively with both SFR and M∗, and the BHAR-SFR and BHAR-M∗ relations can both be described acceptably by linear models with a slope of unity. However, BHAR appears to be correlated more strongly with M∗ than SFR. This result indicates that M∗ is the primary host-galaxy property related to black-hole growth, and the apparent BHAR-SFR relation is largely a secondary effect due to the star-forming main sequence. Among our sources, massive galaxies (M∗≳1010M⊙) have significantly higher BHAR/SFR ratios than less-massive galaxies, indicating the former have higher black-hole fueling efficiency and/or higher SMBH occupation fraction than the latter. Our results can naturally explain the observed proportionality between MBH and M∗ for local giant ellipticals, and suggest their MBH/M∗ is higher than that of local star-forming galaxies. Among local star-forming galaxies, massive systems might have higher MBH/M∗ compared to dwarfs.

Keywords:
Creado: Viernes, 11 de Diciembre, 2020