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## Yu-QingLou

*Tsinghua University, China*

### Mass reservoirs, black holes, dark matter in the early Universe

There is growing evidence for observationally detected galaxies and quasars in the early Universe (redshift range of about  $z=5$  or  $6$  to  $z=11$  or  $12$ ). By extrapolating known empirical relations, hyper massive black holes (HMBHs) and supermassive black holes (SMBHs) are inferred to exist at the centers of these host quasars which are extremely luminous but appear faint and highly red shifted (large  $z$ ) because of remote distances and the expanding Universe. In the nearby Universe, we have considerably more information and knowledge about observed galaxies and quasars and their mass reservoir environment. In general, such host mass reservoirs involve much more concentrated neutral hydrogen's and massive dark matter halos. It would be natural to extend or apply the same environmental scenario for galaxies and quasars hosting HMBHs and SMBHs in the early Universe. In other words, galaxies and quasars, as well as HMBHs and SMBHs, inferred therein to serve as valuable clues of their host mass reservoirs in the early Universe. Their distribution at least partially reflects that of host mass reservoirs. As examples, such galaxies and quasars can be detected by Hubble Space Telescope (HST), James Webb Space Telescope (JWST to be launched in 2020) and large ground optical telescopes now in operation and construction. Neutral hydrogens more densely concentrated in such host mass reservoirs can be detected by Low-Frequency ARray (LOFAR) and Square Kilometer Array (SKA). It is extremely important to consistently test and detect this distribution scenario of mass reservoirs in the early Universe.

### Biography

Yu-Qing Lou, the winner of 1981 China-US Physics Examination and Application (CUSPEA) sponsored by Nobel Laureate, Professor T.D. Lee, has completed his physics PhD in 1987 from Harvard University. He became High Altitude Observatory and Advanced Study Program Fellow at National Center for Atmospheric Research (NCAR) 1987-1989. He has published more than 140 international journal papers (including Nature, Science, The Astrophysical Journal (Letters), Monthly Notices of the Royal Astronomical Society (Letters), Journal of Geophysical Research, Geophysical Research Letters, Astronomy and Astrophysics). In 2002, he became distinguished Yangtze Professor in the Physics Department of Tsinghua University. He has served in review panels in USA, China, and others.

[louyq@tsinghua.edu.cn](mailto:louyq@tsinghua.edu.cn)

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