学 位 論 文 要 旨
Dissertation Summary

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論　　文　　名： Statistical Properties of Low-Luminosity Quasars in the Early Universe
(Dissertation Title)

We present the results of our low-luminosity quasar survey at $z \sim 4$–5 in the COSMOS field. Using the COSMOS photometric catalog, we selected 31 and 15 quasar candidates with $22 < i' < 24$ at $z \sim 4$ and 5, respectively, to study the faint end of the quasar luminosity function (QLF). We obtained optical spectra for 23 of the 31 candidates at $z \sim 4$ but 14 of the 15 candidates at $z \sim 5$ using the Subaru Telescope. We identified eight low-luminosity quasars at $z \sim 4$ and did not identify any low-luminosity type-1 quasars at $z \sim 5$ while a type-2 quasar at $z \sim 5.07$ was discovered.

Our QLF at $z \sim 4$ has a much flatter faint-end slope than that obtained by another recent survey in the same redshift. Similarly flat QLF is inferred also at $z \sim 5$ based on the upper limit of the quasar number density. We find that the quasar space density decreases gradually toward higher redshift at low luminosity, being similar to the trend found for quasars with high luminosity. This result is consistent with the so-called downsizing evolution of quasars seen at lower redshifts, suggesting that the more massive black holes grow earlier than the less massive black holes if the quasar luminosity is roughly in proportion to the black hole mass.

We also calculate the quasar bias factor for the low-luminosity quasars utilizing the quasar-Lyman break galaxy (LBG) cross-correlation function and LBG auto correlation function at $z \sim 4$, to constrain the triggering mechanism of the low-luminosity quasars. It is inferred that the calculated quasar bias factor is generally consistent with the quasar bias factor for luminous quasars, suggesting that the low-luminosity quasars at $z \sim 4$ is mostly triggered by the galaxy mergers.