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## Evolution of QSO Luminosity Functions based on Many QSO Populations model and the Spectral-luminosity correlation

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We derive the LF of QSOs in various energy bands, which are strongly affected by the spectral evolution coupled with luminosity evolution under the simple assumption that the various spectral states of Galactic Black hole candidates (GBHCs) can be applied to the spectral states of QSO, and also apply this correlation and basic assumption to test two classes of the evolution models of QSO luminosity functions (LFs): single long-lived ( $\geq 10^9$  yr) QSO population and multiple short-lived ( $\sim 10^7$  yr) QSO populations. We explore whether the observed QSO LF can be explained by many QSO populations with an evolutionary time scale of  $\sim 10^7$  yr for the each population as a whole. We summarize the parameter determination of the LFs of QSO in multiple QSO populations model and present the analytical LFs in various energy bands and compare them to the observed data and then briefly discuss the respective contribution of each model in order to solve the outstanding unsolved problems in the evolution of QSOs population.