Discovering luminous high-redshift quasars with SDSS and WISE

With the support from the National Natural Science Foundation of China, China Scholarships Council and Pilot-B program of Chinese Academy of Sciences, a research team led by Prof. Wu Xuebing (**吴学兵**) at the Peking University discovered more than 70 luminous high-redshift quasars with optical Sloan Digital Sky Survey (SDSS) and mid-IR Wide-field Infrared Survey Explorer (WISE) photometric data. This result has been published in *Astrophysical Journal* (2016, 819: 24—38).

As the most luminous non-transient objects in the early universe, high-redshift quasars are important tracers to study the early structure formation and the history of cosmic reionization. In addition, understanding the evolution of quasars from the early universe to the present epoch allows us to study the accretion history of supermassive black holes (SMBHs). However, high-redshift quasar searches are highly challenging due to their low spatial density and a high rate of contamination from cool stars when using traditional multicolor selection method.

They developed a new method to select $4.7<z<5.5$ quasars with both high efficiency and completeness by combining optical and mid-IR photometric data. They are conducting a luminous $z\sim5$ quasar survey in the whole SDSS footprint. They have done spectroscopic observations on 118 candidates, and 76 of them are quasars with redshifts $z>4.4$ and with the most distant one up to redshift 6.30. Their method has a much higher efficiency than that based on optical or near-IR photometry alone (e.g., 20% from SDSS high-redshift quasar surveys). Besides, among 76 newly identified quasars, 12 of them are at $5.2<z<5.7$, which leads to an increase of ~36% of the number of known quasars in this redshift range. More importantly, their identifications doubled the number of quasars with high luminosity (absolute magnitude $M_{1450}<-27.5$) at $z>4.5$, which sets strong constraints on the bright end of the quasar luminosity function at high redshift.

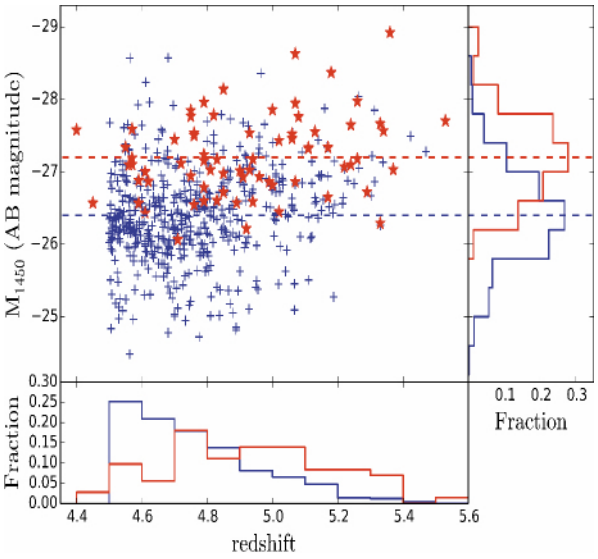

Figure The rest-frame absolute magnitude versus redshift diagram. The small blue crosses denote published $z>4.5$ quasars and the red stars denote our quasars. The lower panel and right panel are the distributions of redshift and magnitude of these quasars. Apparently their newly discovered quasars are systematically brighter than previously known quasars and improved the completeness of luminous quasars significantly.