Outflow in a Luminous Quasar AKARI J1757+5907

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Over the past decade it has been regarded that the mass of the black hole and the mass of the galactic bulge has the tight correlation. The black hole mass is ~0.1% of the bulge mass[1]. The outflow phenomena of gas is one of processes which may connect the growth of galactic bulge and black hole. Active black holes is capable to blow out gas in the host galaxies and may suppress the star formation activities (e.g., [2]). In fact outflow phenomena are ubiquitous among the galaxies which possess active black holes. The blueshifted absorption lines are the sign of the outflow. However, it has been still unclear the details of outflow phenomena around the black hole. The basic knowledge of the outflow are vague: How much amount of gas has been blown out? How long does the outflow last? Does the outflow significantly affect the star formation in the host galaxy?

We selected a luminous quasar, AKARI J1757+5907 as the target. This quasar was discovered during the follow-up observations of AKARI mid-infrared All-Sky Survey[3,4]. The follow-up low-resolution spectroscopy revealed that AKARI J1757+5907 is a $z = 0.615$ quasar that shows blueshifted absorption lines. Its apparent magnitude is 15th and very suitable for high resolution spectroscopy of absorption lines. More than three hours integration was done with HDS attached to the Subaru 8.2 m telescope. The resolving power was $R \sim 36000$.

Our high resolution spectroscopy revealed that the absorption consists of 9 distinct troughs (Figure 1). We can measure accurate column densities of He I*, Fe II and Mg II for the troughs at $\sim -1000\,\mathrm{km\,s^{-1}}$. We use photoionization models to constrain the ionization parameter, total hydrogen column density, and the number density of the outflowing gas. These constraints yield lower limits for the distance, and mass flow rate for the outflow of 3.7 kpc, and $70\,M_{\odot}\,\mathrm{yr}^{-1}$, respectively. This distance contrasts with the previous understanding of the outflow which occurs at the close to the black hole. The our derived mass flow rate and the velocity is similar to those recently discovered in massive post-starburst galaxies[5].

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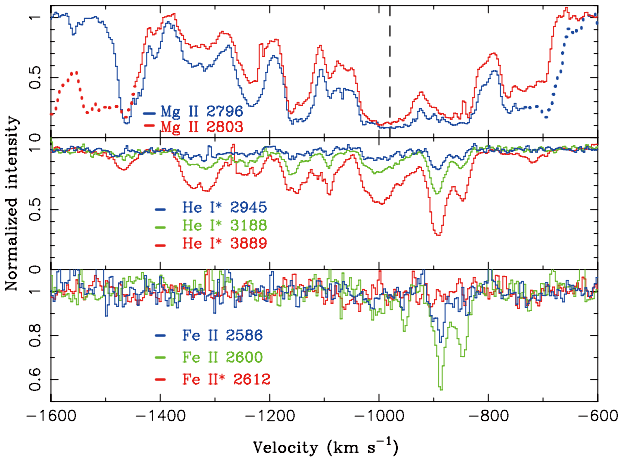

Figure 1: Outflow troughs in AKARI J1757+5907. Ordinate is a normalized flux density, and abscissa is velocity from the systemic redshift ($z = 0.61525$). Blended parts are denoted as dotted spectra. The dashed vertical line indicates the position of the blue component of [O III] emission line of this quasar. The velocity of that [O III] corresponds to the trough at $\sim -1000\,\mathrm{km\,s^{-1}}$.

References

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