

X47a eROSITA/eFEDS X-ray view of WERGS radio galaxies selected by the Subaru/HSC and VLA/FIRST survey

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We constructed the eROSITA/eFEDS X-ray catalog containing 393 radio galaxies discovered by the WERGS survey, made by cross-matching the wide area Subaru/HSC optical survey and VLA/FIRST 1.4 GHz radio survey. The sample contains the rare and most X-ray luminous radio galaxies above the knee of the X-ray luminosity function, spanning $44 < \log(L_{0.5-2\text{keV}}^{\text{(abs,corr)}}/\text{erg s}^{-1}) < 46.5$ at $1 < z < 4$. Based on the X-ray properties obtained by the spectral fitting, 37 sources show obscured AGN signatures with $\log(N_{\text{H}}/\text{cm}^{-2}) > 22$. These obscured and radio AGN reside in $0.4 < z < 3.2$, indicating that they are obscured counterparts of the radio-loud quasar, which were missed in the previous optical quasar surveys. We find that there are 14 sources with extremely high jet production efficiency at $\eta_{\text{jet}} \approx 1$, which might be a result of the decreased radiation efficiency of $\eta_{\text{rad}} < 0.1$, due to the low accretion rate for those sources, and/or of the boosting due to the decline of $L_{\text{AGN,bol}}$ by a factor of 10–100 by keeping P_{jet} constant in the previous Myr, indicating the experience of the AGN feedback. Finally, inferring the BH masses from the stellar mass, we find that X-ray luminous sources show the excess of the radio emission with respect to the value estimated from the fundamental plane. This radio emission excess cannot be explained by the Doppler boosting alone, and therefore the disk-jet connection of X-ray luminous eFEDS-WERGS is fundamentally different from the conventional fundamental plane which mainly covers the low-accretion regime.