Cosmic Evolution of Quasar Host Galaxies

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Abstract. Using HST WFPC2 and NICMOS observations, and our 2D image weighting and modelling technique (Floyd et al. 2004), we have reliably disentangled host from nucleus for nine optically matched radio-loud quasars (RLQ) and nine radio-quiet quasars (RQQ) at $z = 1 & 2$, in two bands spanning the 4000Åbreak. The resulting galaxy colours provide the first unbiased estimates of galaxy mass for a statistical sample of quasars at high redshift, and indicates a difference in the evolution of radio-loud and radio-quiet objects.

Keywords. galaxies: active, galaxies: fundamental parameters, (galaxies:) quasars: general.

We revisit the sample of Kukula et al. (2001), consisting of 18 QSOs at $z ∼ 1 & 2$. Each epoch has equal numbers of RLQs and RQQs that are optically matched to ensure no a priori selection bias. We used NICMOS $J$ and $H$ band imaging in Kukula et al. (2001) to explore the rest-frame $V$ hosts. Here we add WFPC2 $R$ and $I$-band imaging (Floyd et al. in preparation) to explore the rest-frame $U$. We follow the observing and modelling strategy of Floyd et al. (2004) with deeper integrations of 3600–7800 s. Both the RL and RQ hosts follow roughly passive evolution of 1–4 $L^*$ populations (Fig. 1). However, within our sample, the RQQ hosts in general have bluer colour than their RL counterparts, indicating somewhat higher star-formation rates. This implies that the RLQ hosts have already formed the majority of their stars at an earlier epoch, while the RQQ hosts are still star-forming. RLQs are present in more massive, older systems and/or they can actively truncate star-formation in their hosts.

Figure 1. Mean R-J and I-H against $z$ for RLQ (open) and RQQ hosts (filled). A difference in host colour is observed at each redshift. Passive evolution (solid line), plus Jimenez et al. (2004) SSP “frosting” models (% mass in ongoing star-formation indicated) shown for comparison.

References


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