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A surprising excess of radio emission in extremely stable quasars: a unique clue to jet launching?

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Quasars are generally divided into jetted radio-loud (RL) and non-jetted radio-quiet (RQ) ones, but why only roughly 10% quasars are radio loud has been puzzling for many decades. Other than jet-induced-phenomena, black hole mass, or Eddington ratio, prominent difference between jetted and non-jetted quasars has scarcely been detected. Here we show that a unique distinction between them and the mystery of jet launching could be disclosed by a surprising excess of radio emission in extremely stable quasars (ESQs, i.e., type 1 quasars with extremely weak variability in UV/optical over 10 years). Specifically, we find that > 25% of the ESQs are detected by FIRST/VLASS radio survey, while only $\sim$ 6-8% of its control sample, matched in redshift, luminosity, and Eddington ratio, are radio detected. The excess of radio detection of ESQs has a significance of 4.4 σ (99.9995%), and dominantly occurs at intermediate radio loudness with $\sim$ 10 - 60. The radio detection fraction of ESQs also tends to increase in the ESQ samples selected with more stringent thresholds. Our results reverse the common view that RL quasars are likely more variable in UV/optical due to jet contamination. New clue/challenge posed by our findings imminently demands extensive follow-up observations to probe the nature of jets in ESQs, and theoretical studies on the link between jet launching and ESQs. Moreover, the discovery makes ESQs, a population which has never been explored, unique targets in the blooming era of time domain astronomy, like their opposite counterparts of quasars exhibiting extreme variability or changing-look feature.

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