Flagging super-Eddington candidates among jetted, γ-ray-emitting AGN

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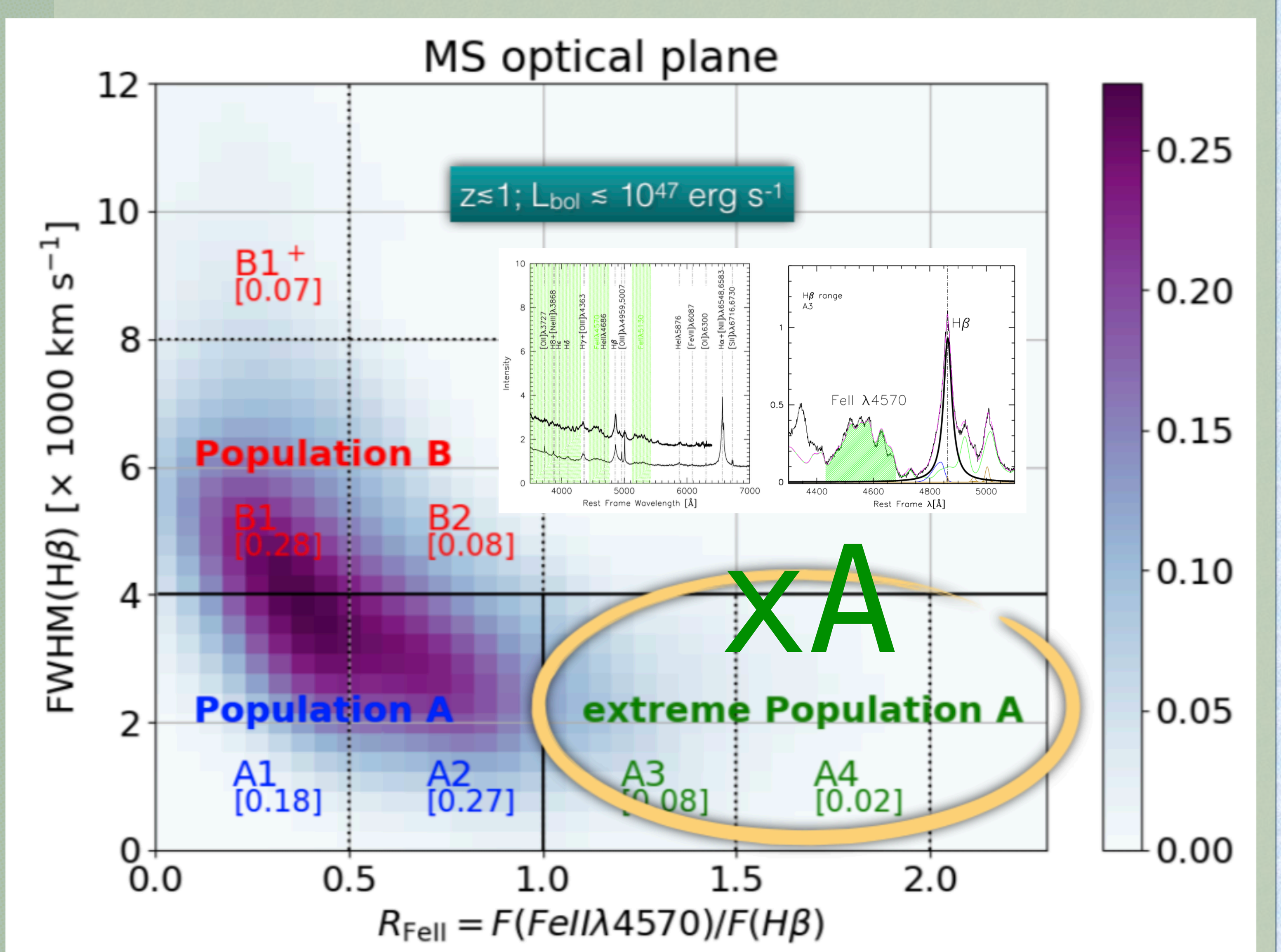
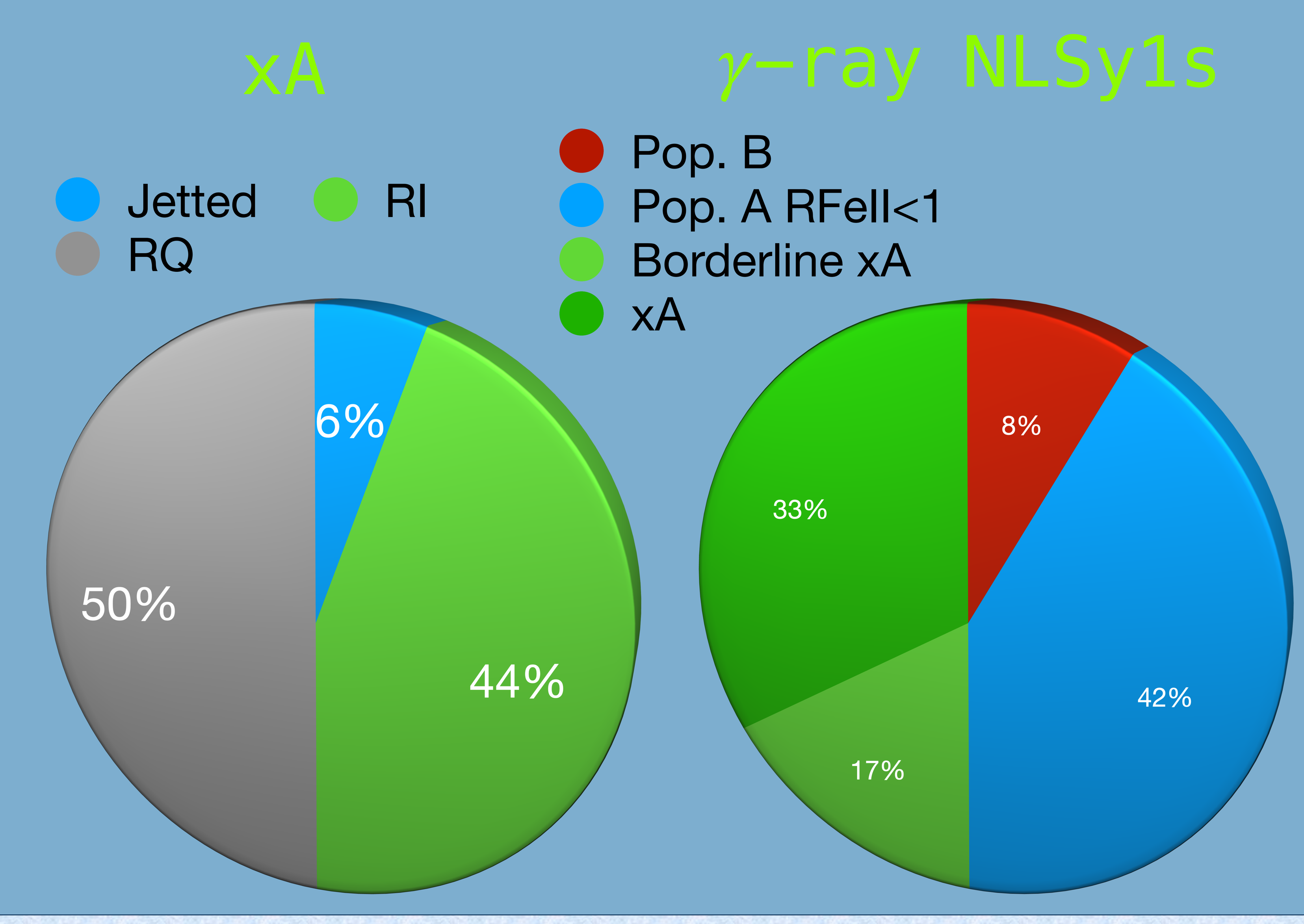
The quasar Eigenvector-1/Main Sequence (E1/MS) is a practical roadmap that organizes AGN spectral diversity by accretion state, letting us compare objects in a physically motivated trend. The E1/MS context is ideal for flagging super-Eddington candidates among type 1 AGN, as well as placing γ-ray AGN on E1 using optical spectroscopy. We apply E1/MS criteria to γ-ray targets (assuming that γ-emission is a marker of radio-loudness), and to a sample of super-Eddington candidates with powerful radio emission.

Super-Eddington (SE) candidates can be identified along the Eigenvector 1 (E1) sequence as the extreme Population A (**xA**) sources located at the high FeII end. These objects are characterized by strong optical Fe II emission with respect to Hβ ($R_{FeII} \gtrsim 1$), weak [O III], and often significant high-ionization line blueshifts, indicating powerful radiation-driven winds. Along E1, increasing R_{FeII} is interpreted as a proxy for increasing Eddington ratio, so the sources at the sequence extreme represent the highest accretion states. Their spectrum is easily distinguishible by eye in AGN samples.



Radio-loudness and γ ray emission among super-Eddington AGN candidates: γ-rays are produced through inverse Compton scattering in highly relativistic, non-thermal particle populations moving within collimated jets. Such jets are also responsible for the strong synchrotron emission observed at radio wavelengths, which defines the radio-loud class. RQ AGN do not generate sustained γ-ray emission at comparable levels. Therefore, γ-ray detection effectively identifies a jetted source and thus confirms its RL nature. One jetted source (following the strict criterion of Zamfir et al. 2008) was found in the xA sample of Gendron-Marsolais et al. (2026). At least 4 sources with highly-distinguishable xA spectra were found in a sample of low-z, γ-ray emitting NLSy1s (Dalla Barba et al. 2026).



Conclusion – super-Eddington + relativistic jets can coexist: in a sample of SE candidates, we unambiguously identify jetted (radio-loud) sources. Conversely, among γ-ray-selected NLSy1s, we find objects consistent with SE accretion. This overlap may suggest a connection between high accretion rates and γ-ray: dense BLR/torus photon fields in high-Eddington systems may enhance external Compton emission, in spite of mass loading and radiative drag. If our selection truly isolates SE accretion, the results imply that jetted SE accretors can exist, even if reproducing them is challenging for current numerical siulations.

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