The blazar sequence revised

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Abstract

We propose and test an idea that could account for the blazar sequence: all jets are launched with similar energy per baryon, independently of their power. FSRQs manage to accelerate to high bulk Lorentz factor. As a result, the emission region will have a rather modest magnetization which will induce a steep particle spectra, and a soft spectrum in the γ-rays. For BL Lac objects, the opposite holds true; i.e., the jet does not achieve a very high bulk Lorentz factor, leading to more magnetic energy available for non-thermal particle acceleration and harder emission spectra. Our results are compared and contrasted with observations.

Observations

- Radio: FR I and FR II radio galaxies show different in morphologies, and BL Lacs and FSRQs show different apparent speeds.
- γ-rays: BL Lacs are quieter than FSRQs, but with a harder spectrum.
- OUV: the core of FSRQs is obscured by gas with broad emission lines, while BL Lacs usually do not show these features.

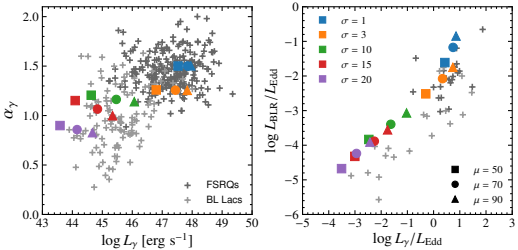
Problem

- AGNs unification and the *blazar sequence* have been of strong observational and theoretical interest with no definite consensus.

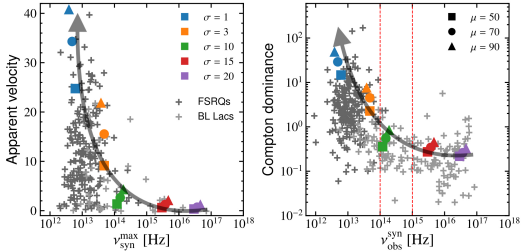
Treatment

- All blazar jets are launched with similar baryon loading $\mu = \Gamma(1 + \sigma)$
- There is a simple relation between the luminosity of the jet $L_{\rm j}$ and the bulk Lorentz factor of the emission region Γ

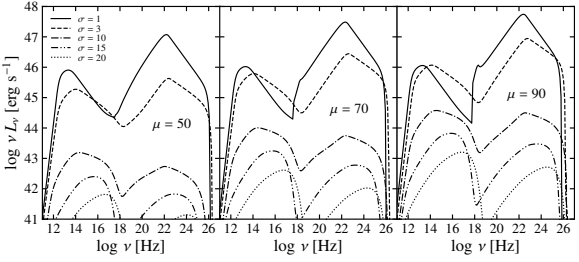
γ-rays spectral index and luminosity, and BLR luminosity



Apparent velocity, Compton dominance and synchrotron peak



Spectral energy distributions



$\mu\sigma\Gamma$ sorority