[OIII] lines properties in two samples of radio-emitting narrow-line Seyfert 1 galaxies

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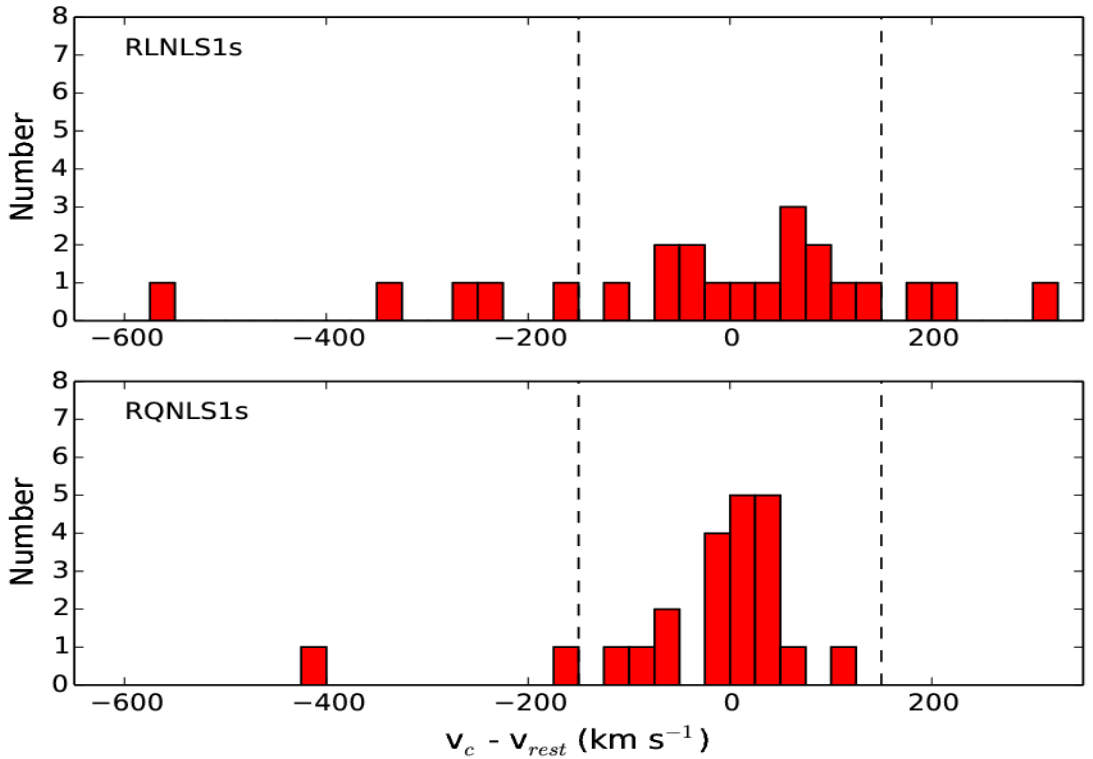
Abstract

In this work we investigate the phenomenon of blue outliers in two complete samples of radio-emitting narrow-line Seyfert 1 galaxies (NLS1s), one radio-loud and one radio-quiet. By analysing their optical spectra and decomposing the [OIII] lines, we investigate the different properties of the narrow line region (NLR) in the samples. This provides in turn useful information on the jet formation mechanism, and on its interaction with the NLR.

Blue outlier: $v_c([OIII]) \leq -150 \text{ km s}^{-1}$

Red outlier: $v_c([OIII]) \geq 150 \text{ km s}^{-1}$



Blue outliers distributions in RL and RQNLS1s.

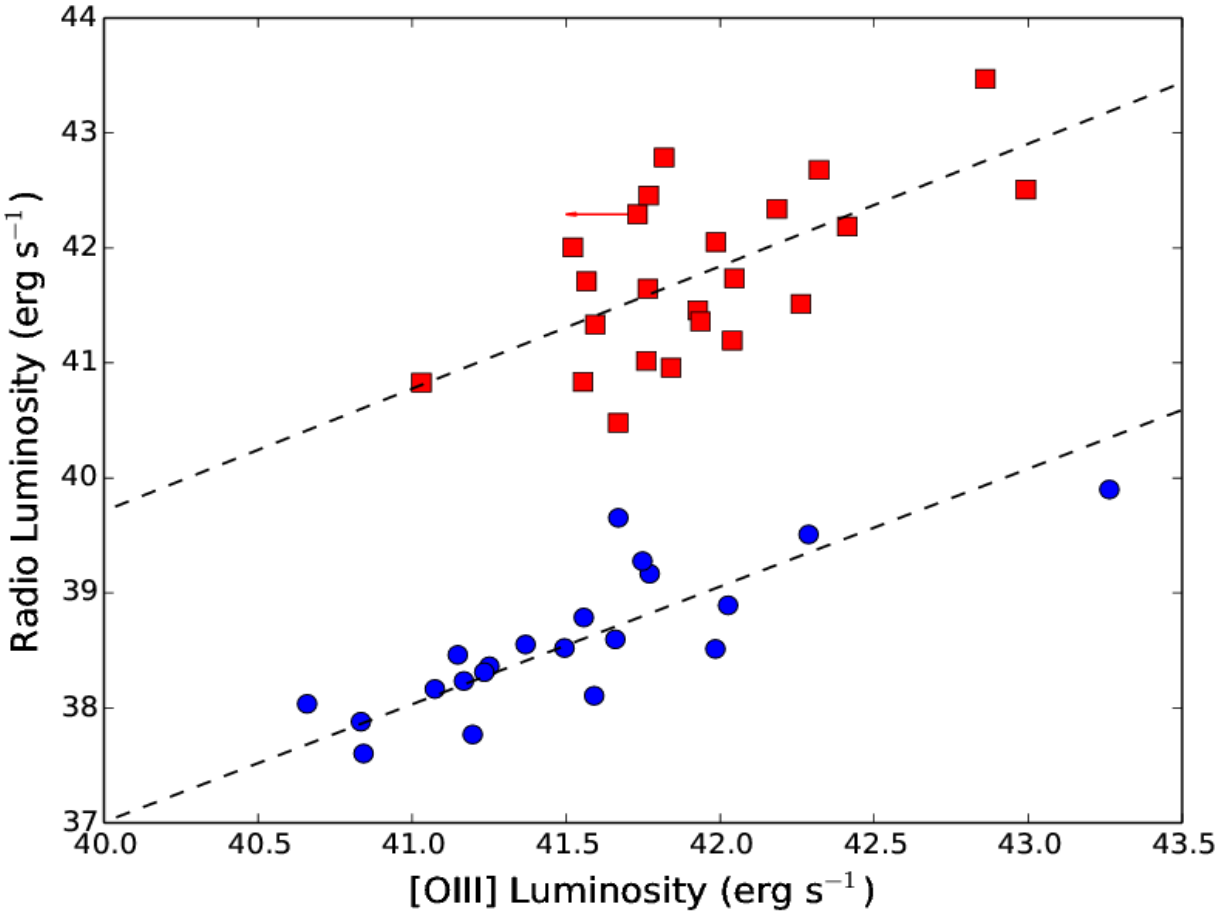
The RL sample is definitely more perturbed than RQ one.

A likely explanation for this is a feedback between the relativistic jet and the NLR in RLNLS1s.

In RQNLS1s instead the feedback is not active: low power jet or no jet at all?

The peak of [OIII] core was measured with respect to narrow Hbeta. We calculated it also with respect to [OII], and the results are in agreement.

Radio vs [OIII]



[OIII] luminosities are different because of a selection effect: RLNLS1s are farther than RQNLS1s.

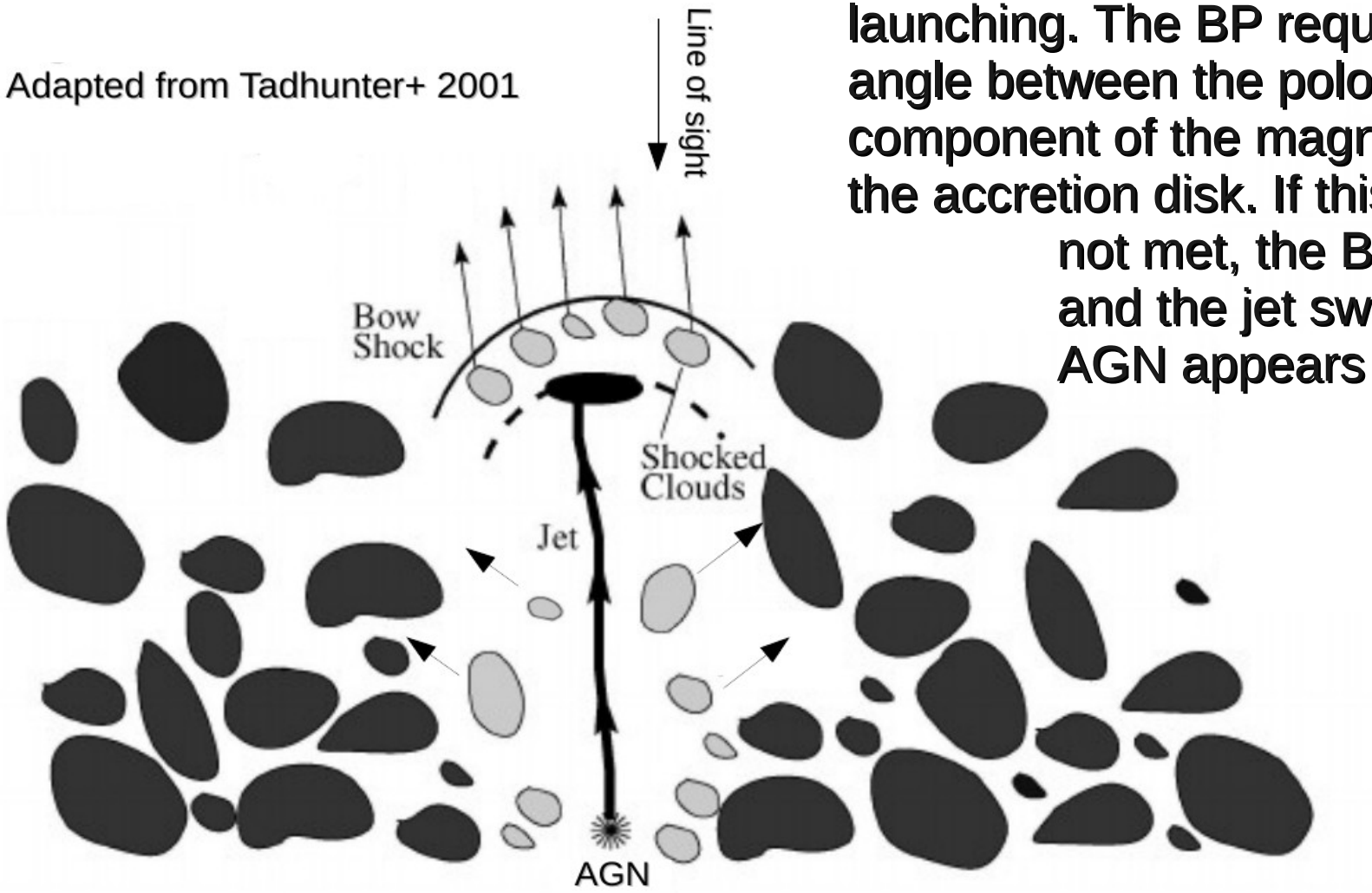
In radio the difference is not only a selection effect. The emission mechanism is likely not the same.

RLNLS1s: dominated by non-thermal photons from the jet.

RQNLS1s: dominated by thermal photons from the disk, but a weak non-thermal component is present. Why?

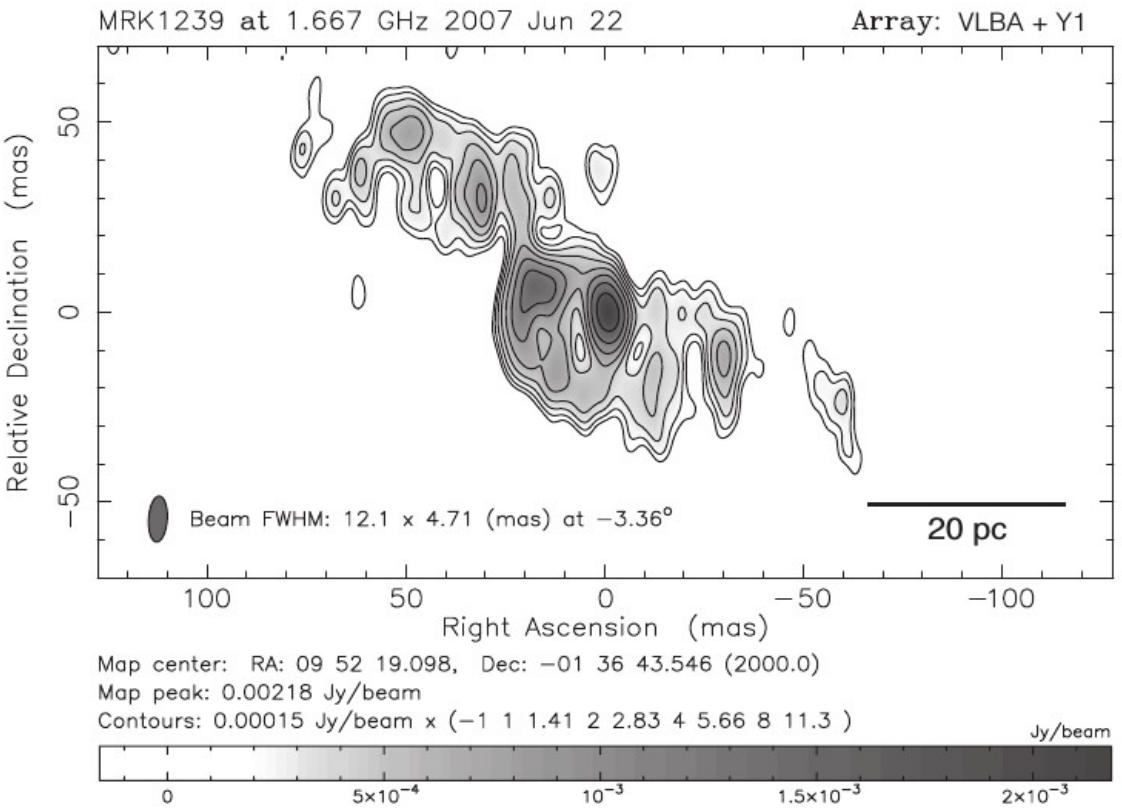
RLNLS1s: the jet accelerates the clouds in all directions. Those moving radially with respect to the line of sight appear as blue-shifted or red-shifted. The jet activity is not constant, but strongly variable.

A possible reason for this is the Blandford-Payne mechanism of jet launching. The BP requires a critical angle between the poloidal component of the magnetic field and the accretion disk. If this condition is not met, the BP is not active and the jet switches off. The AGN appears as radio-quiet.



RQNLS1s: the BP is not active likely because the critical angle condition is not met. The non-thermal component might be originated in a jet-base (Falcke & Biermann 1994). The jet-base is pressure driven, and it might originate strong winds (non relativistic) that can produce, in few cases, blue outliers.

Fig. from Doi+ (2015)



The angle between the magnetic field and the disk can anyway change with time. A source that right now is radio-quiet possibly was radio-loud in the past.

Therefore jets can be present in radio-quiet sources: see Mrk 1239.