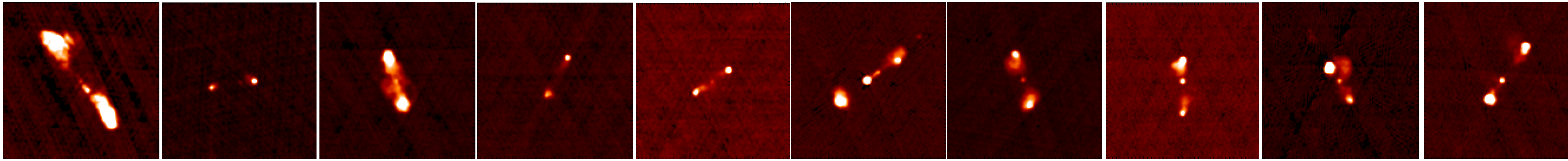


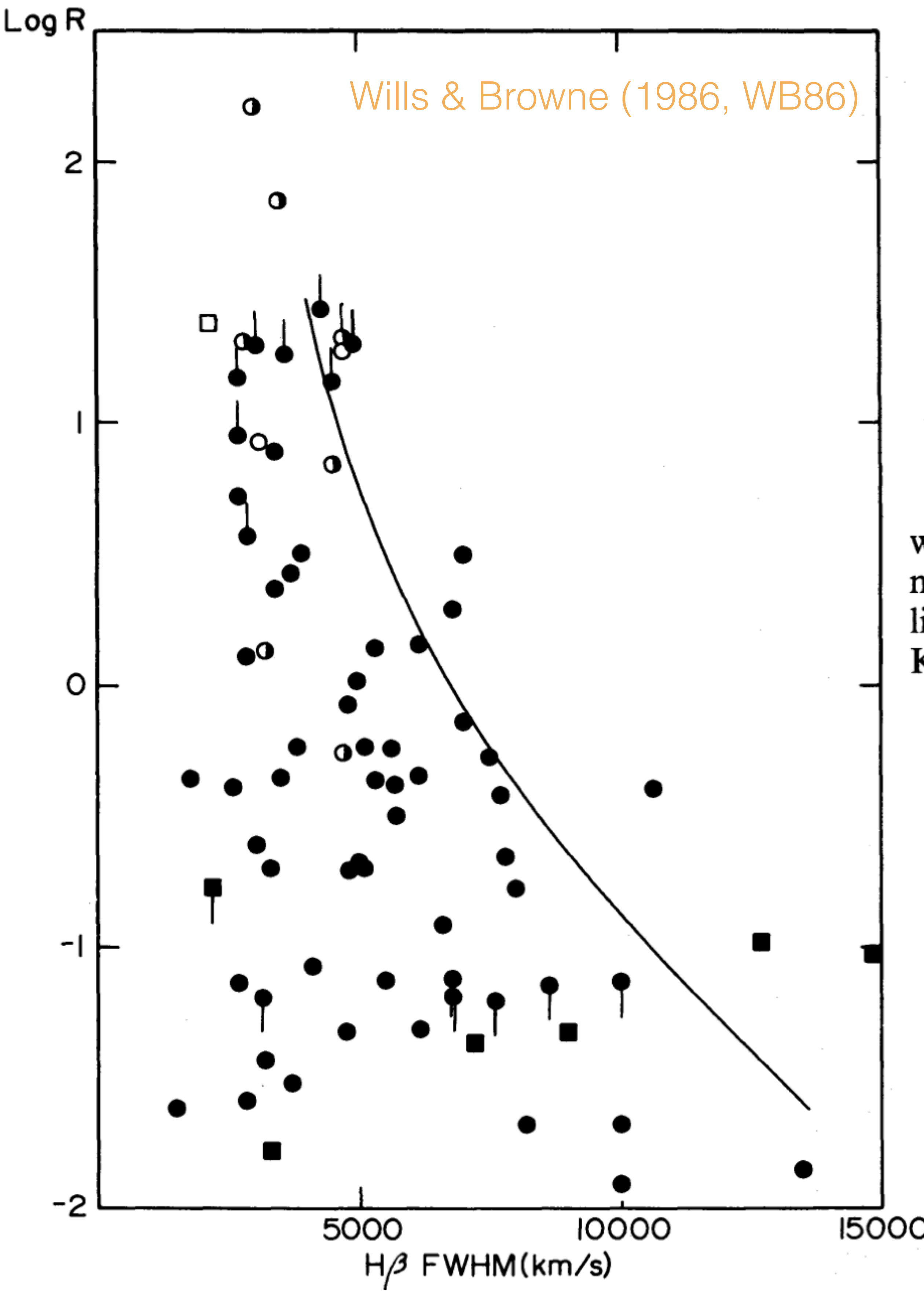
Orientation and optical spectral properties in a new sample of quasars

Jessie Runnoe

The Univ. of Texas at Austin, September 12, 2014

Collaborators: Todd Boroson
Thanks to: Mike Brotherton, Mike Eracleous, Mike DiPompeo, Bev Wills, and Zhaohui Shang

Motivation and goals



I. INTRODUCTION

Are core-dominated radio sources end-on extended doubles with their cores Doppler-boosted? The idea that they are has many attractive features and has been widely discussed in the literature (e.g., Scheuer and Readhead 1979; Blandford and Königl 1979). Consideration of the radio data alone shows that

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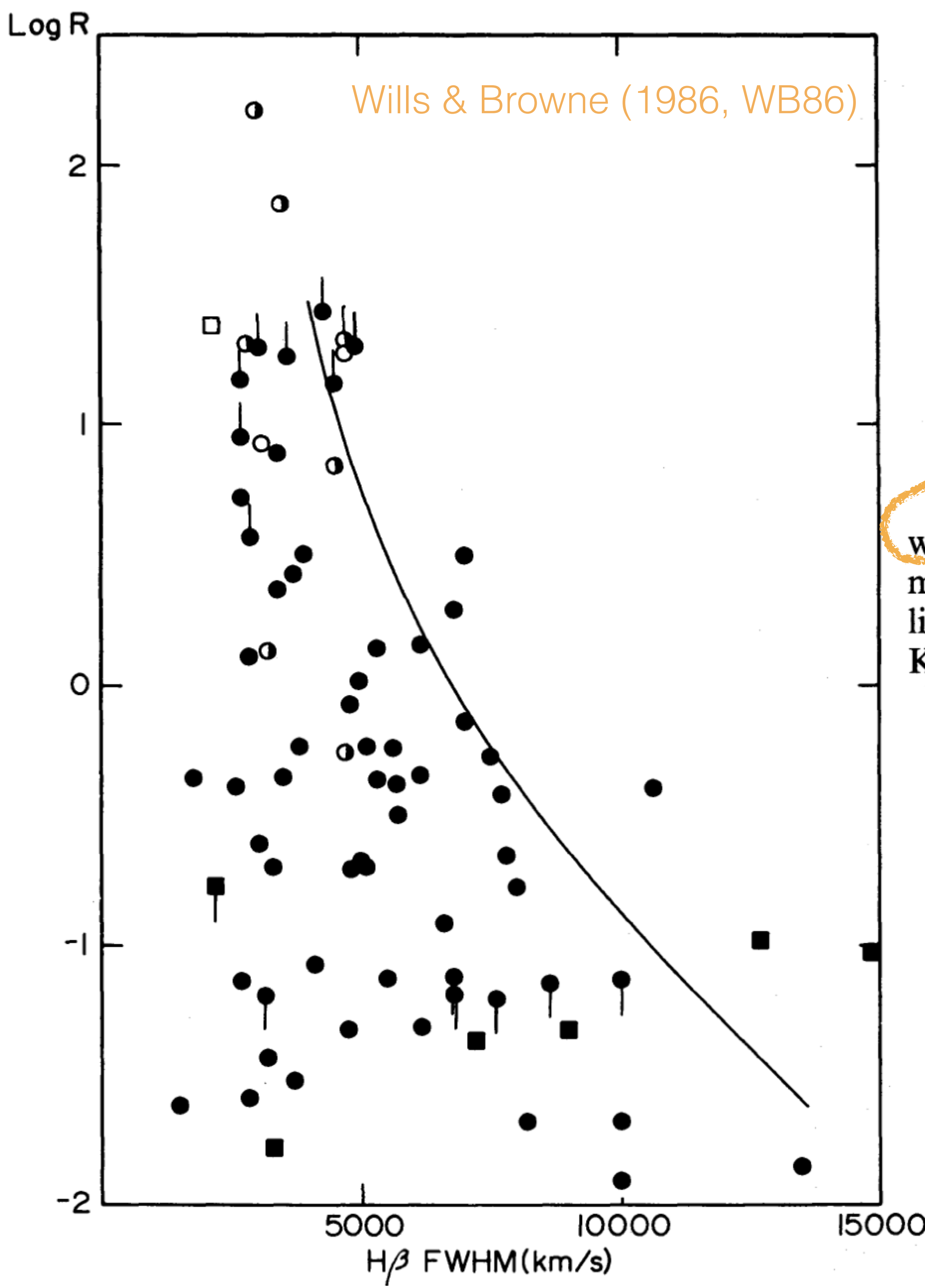

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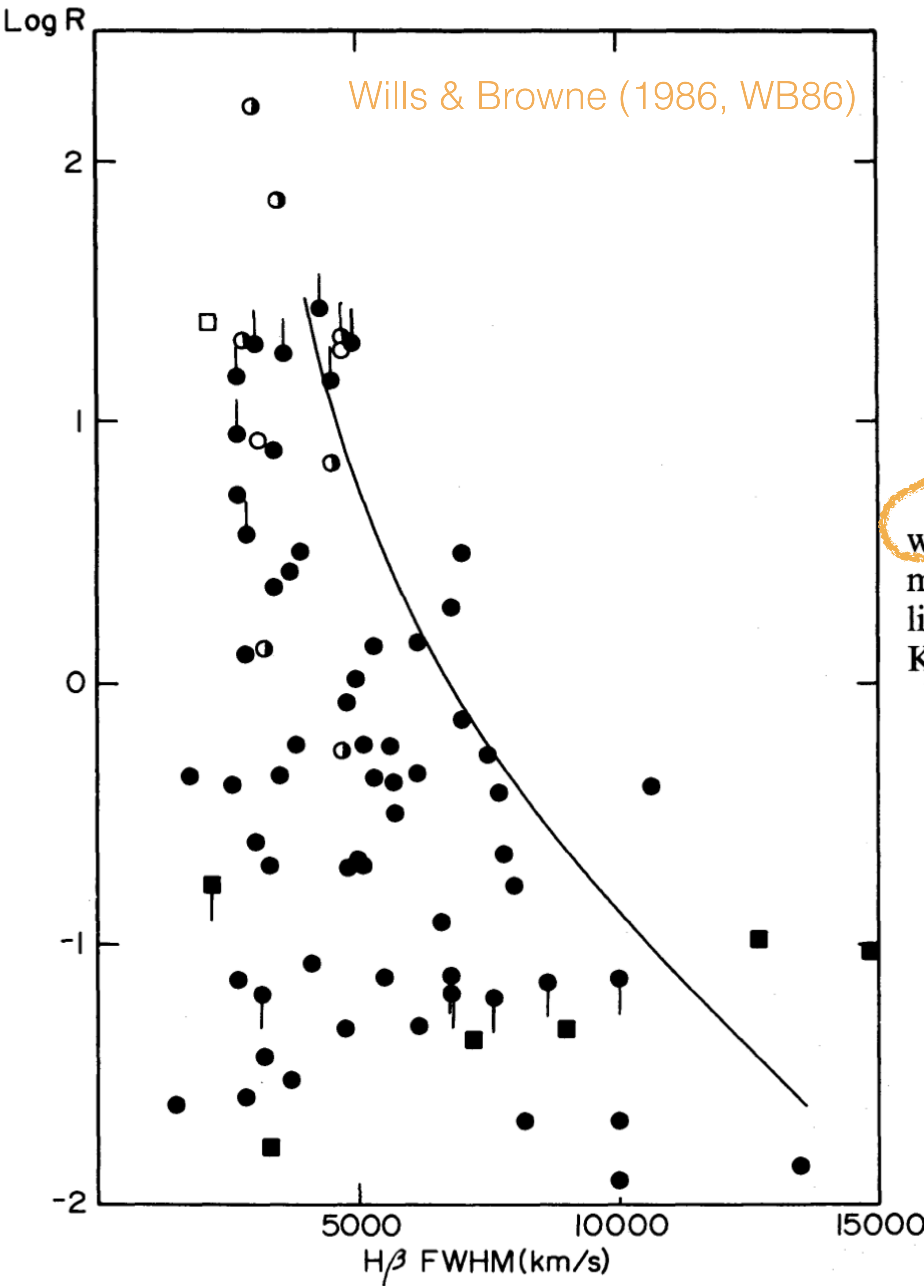

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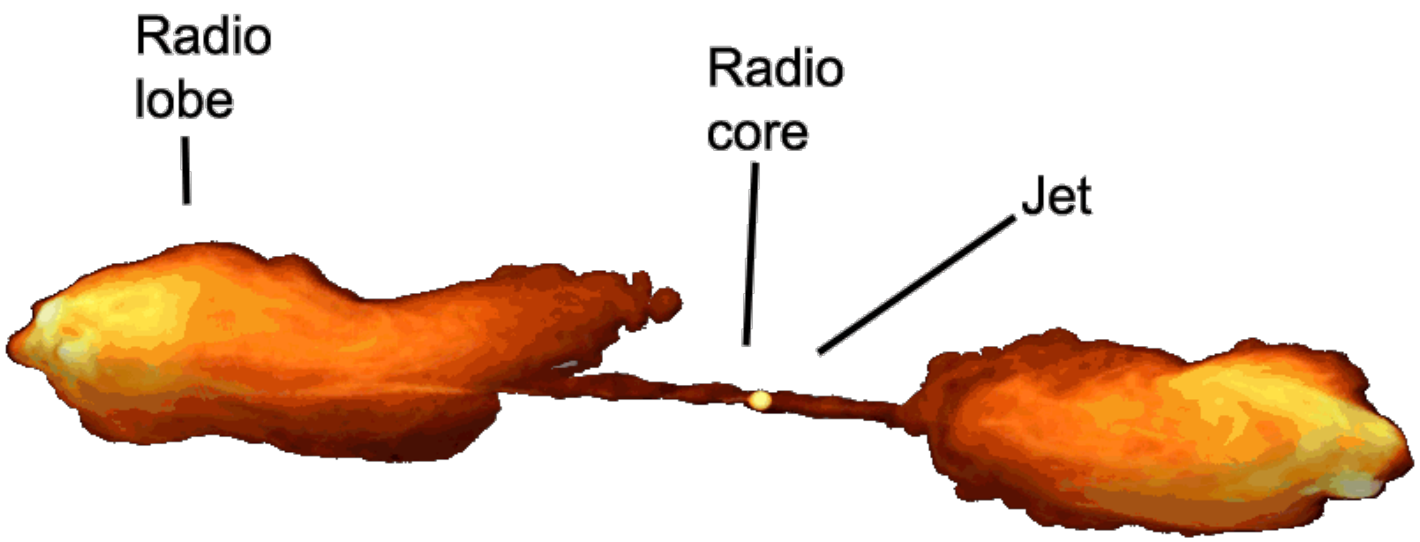
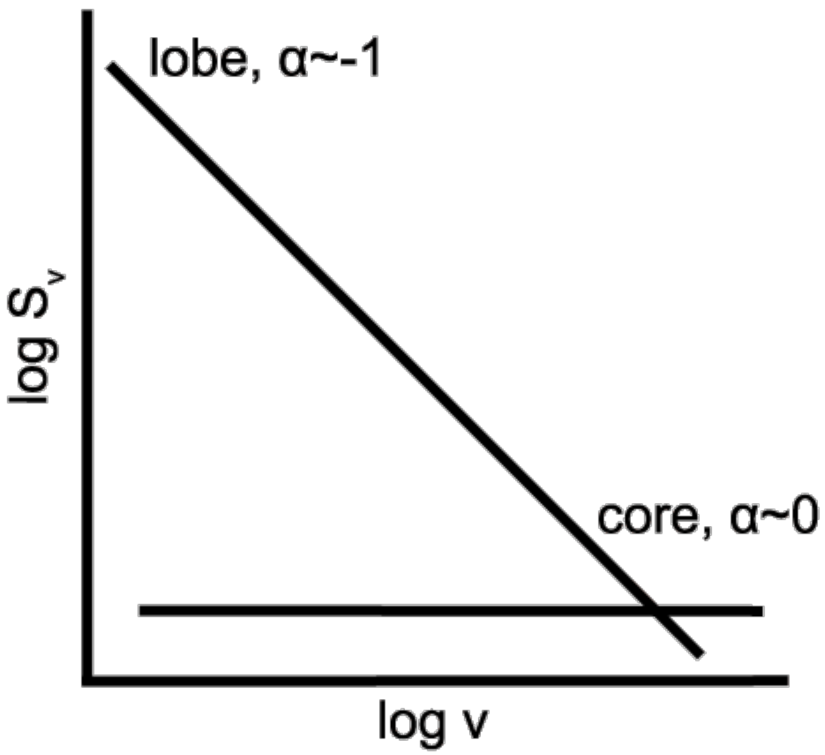
- Our goal: define a set of objects for studying orientation effects whose properties are representative.

Radio orientation indicators

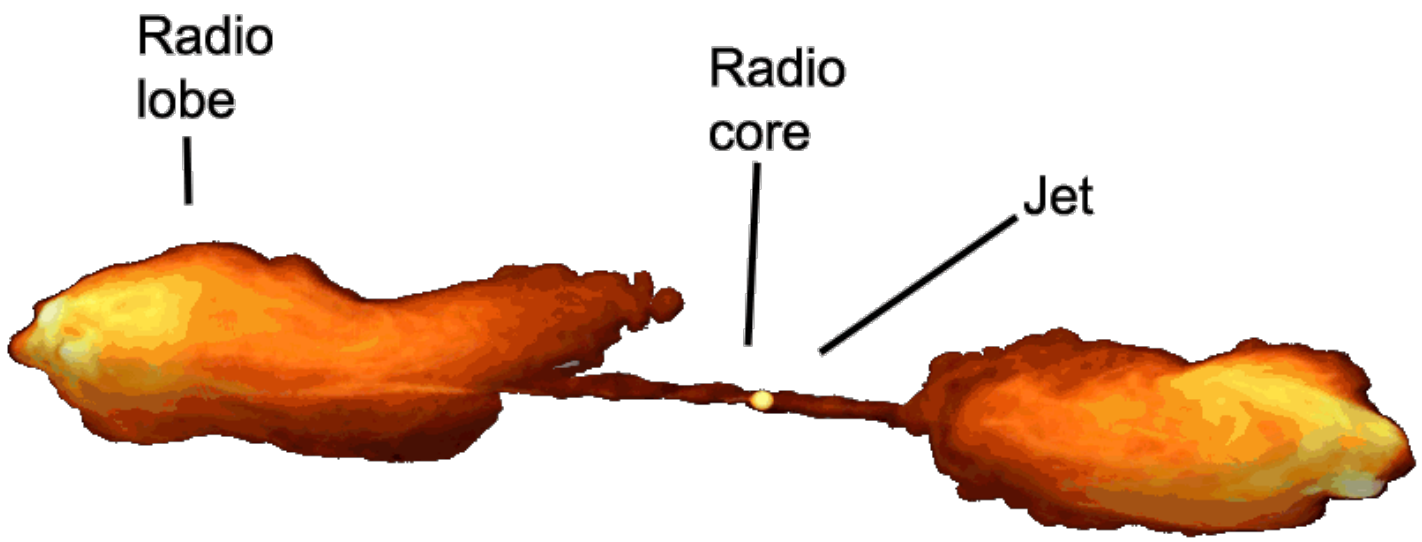


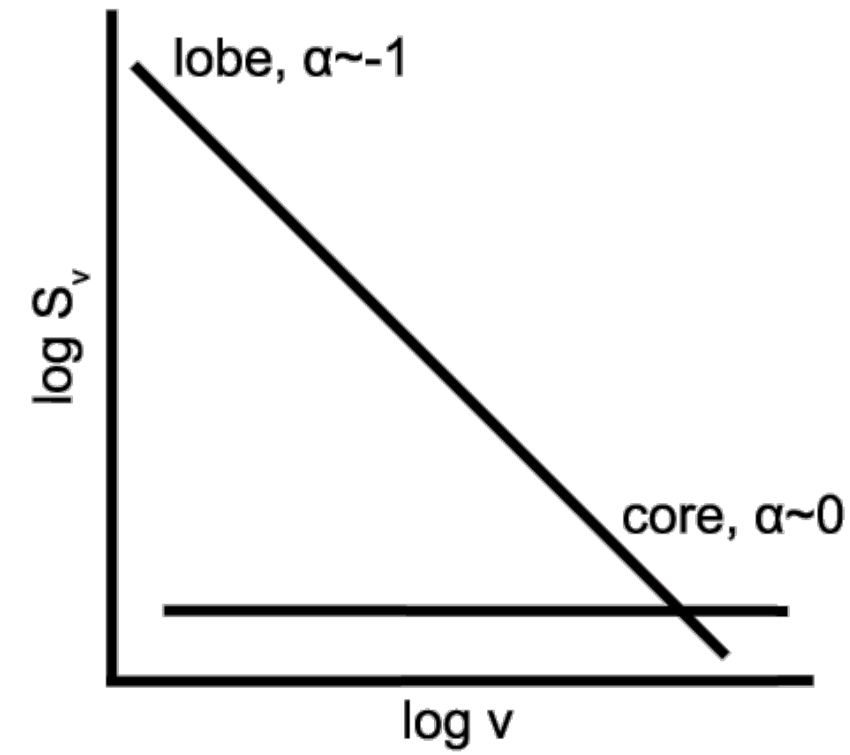


Radio spectral index:

$$S_\nu \propto \nu^\alpha$$

Radio orientation indicators





Radio spectral index:

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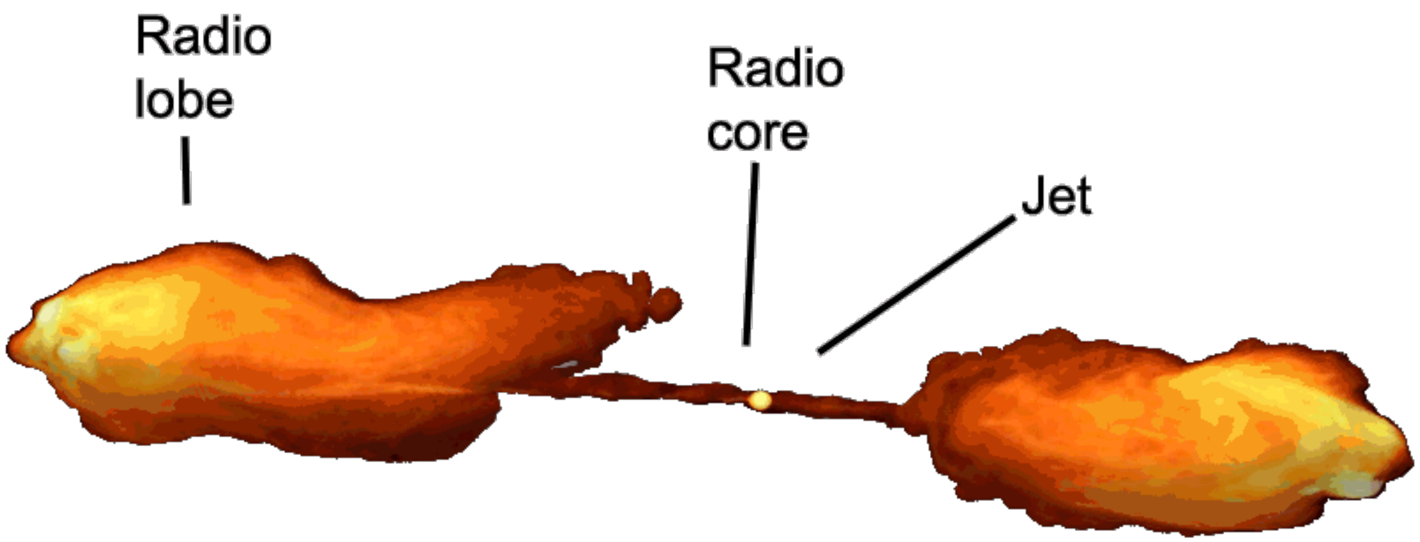
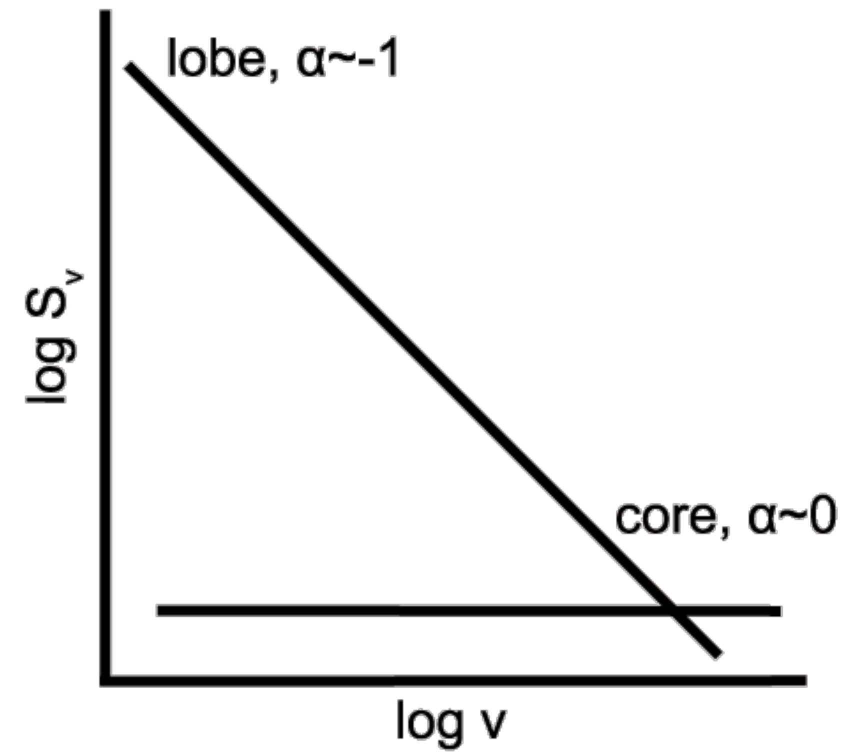


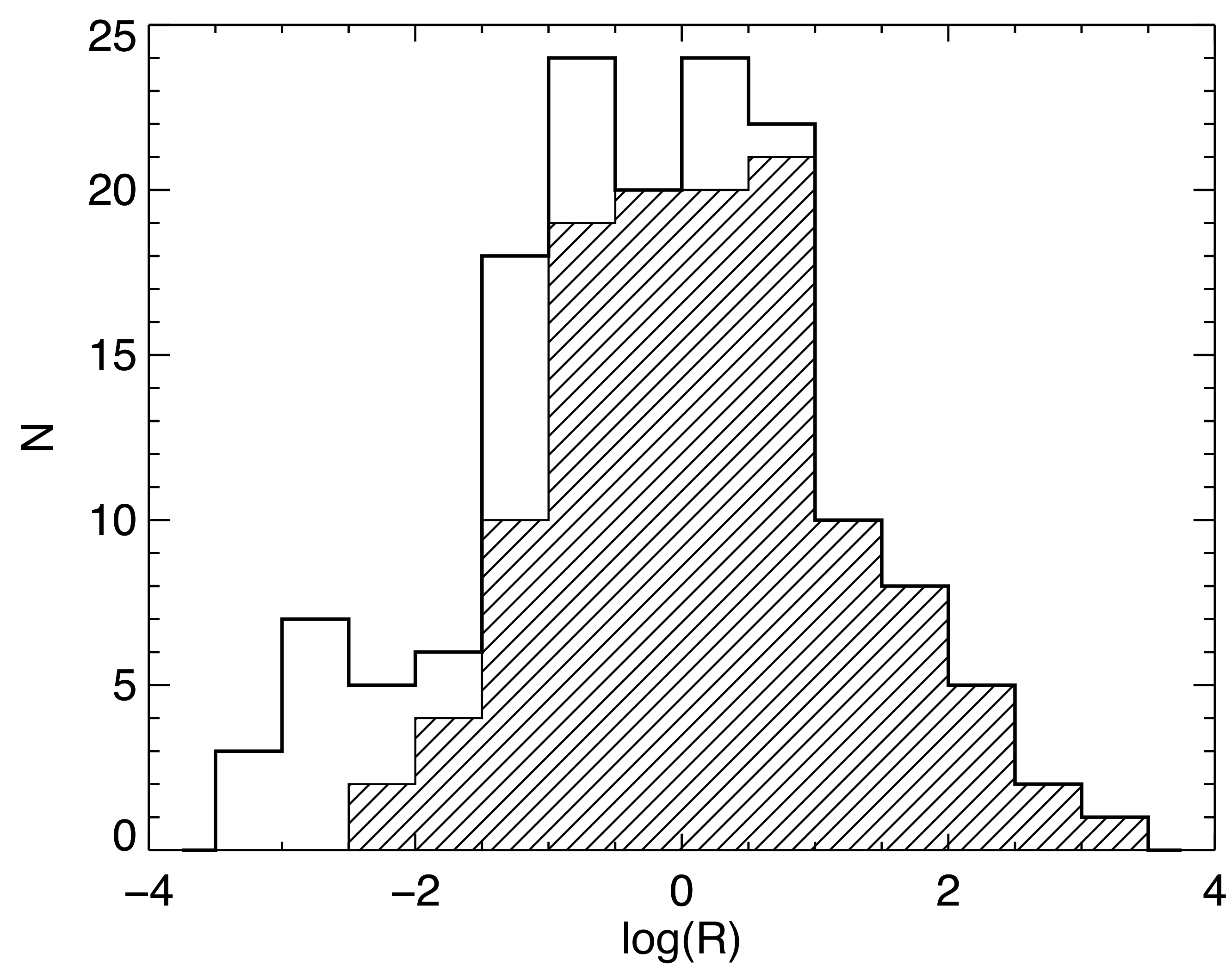


Radio core dominance:

$$\log R = \log(L_{core}/L_{ext})$$

Sample selection

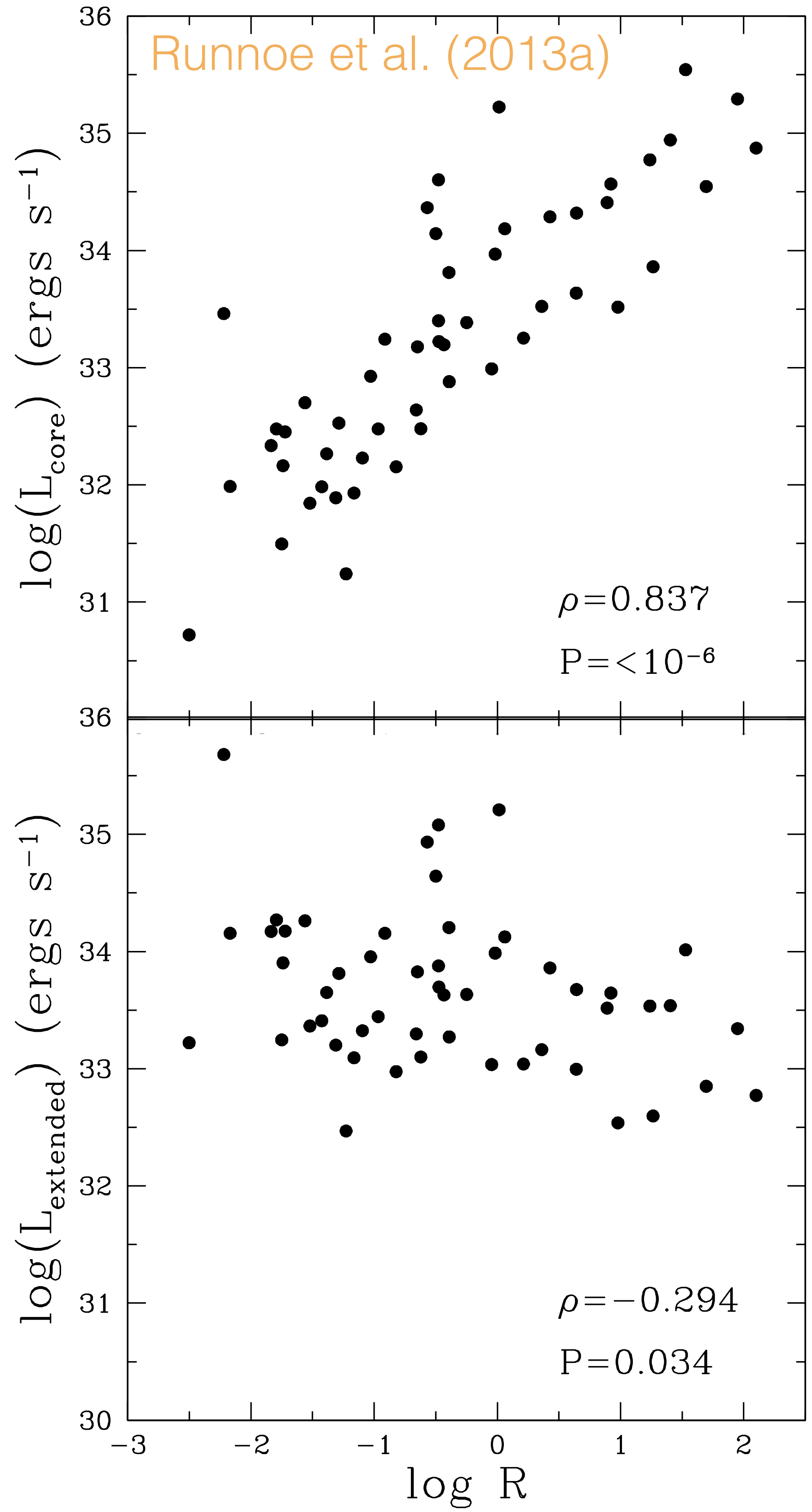
- SDSS DR7 quasar catalog
- 0.1 < z < 0.6
- Match to WENSS (325 MHz)
  - Core within 30”
  - Lobes within 1100” and:
    - Flux ratio of lobes < 2.
    - Within 30 degrees of being opposite each other.
- log L(325 MHz) > 26.0 W Hz^{-1}
- Visual inspection (FIRST, NVSS, WENSS, SDSS).
- Complete sample of 156 objects.



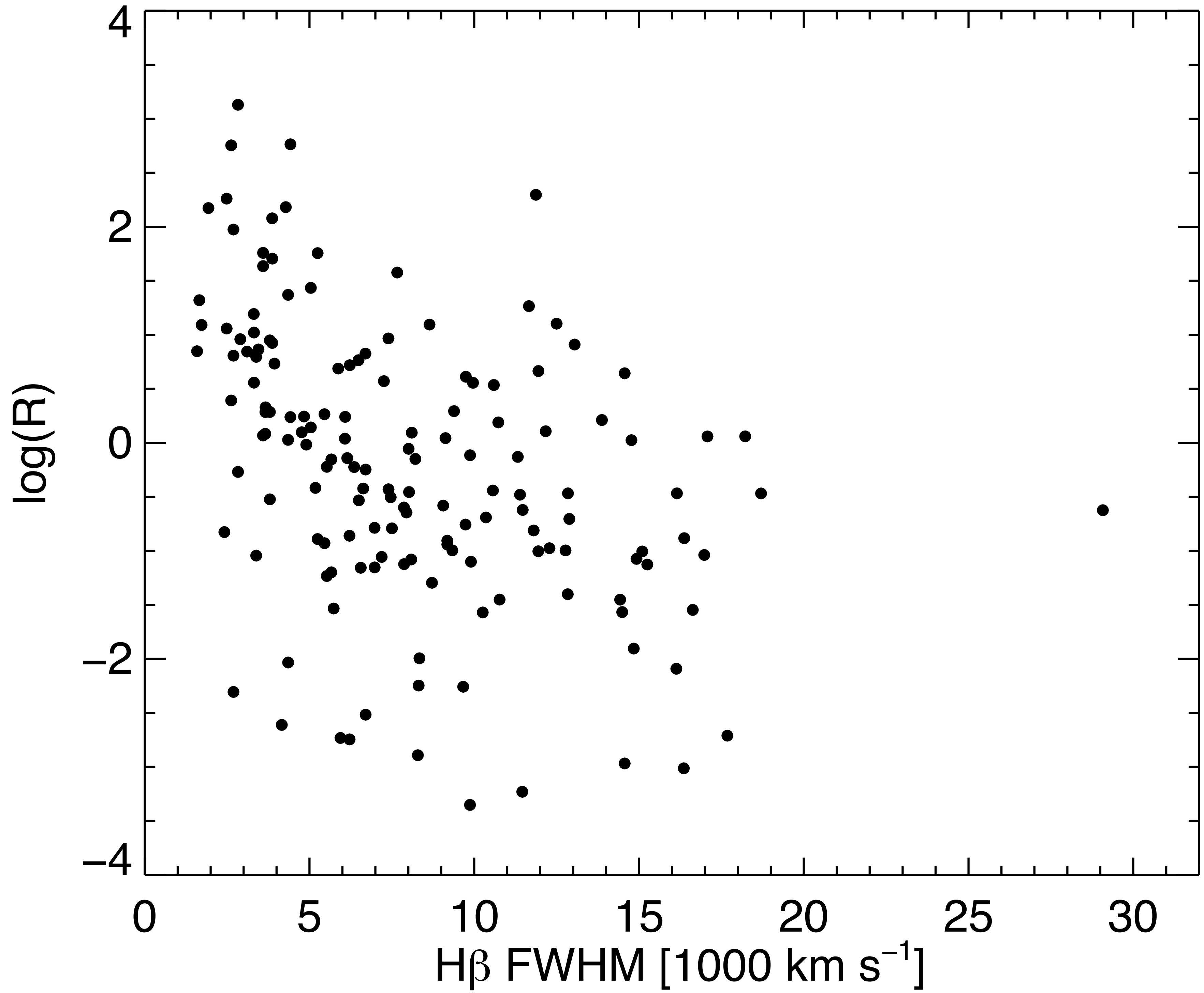
The RL SED sample

- Selected from 3CR to have similar extended radio luminosities.
- $0.16 < z < 1.4$
- Had to substitute some bright objects for some faint ones.
- Blazars excluded from sample.
- Sample of 52 objects designed to isolate orientation effects.

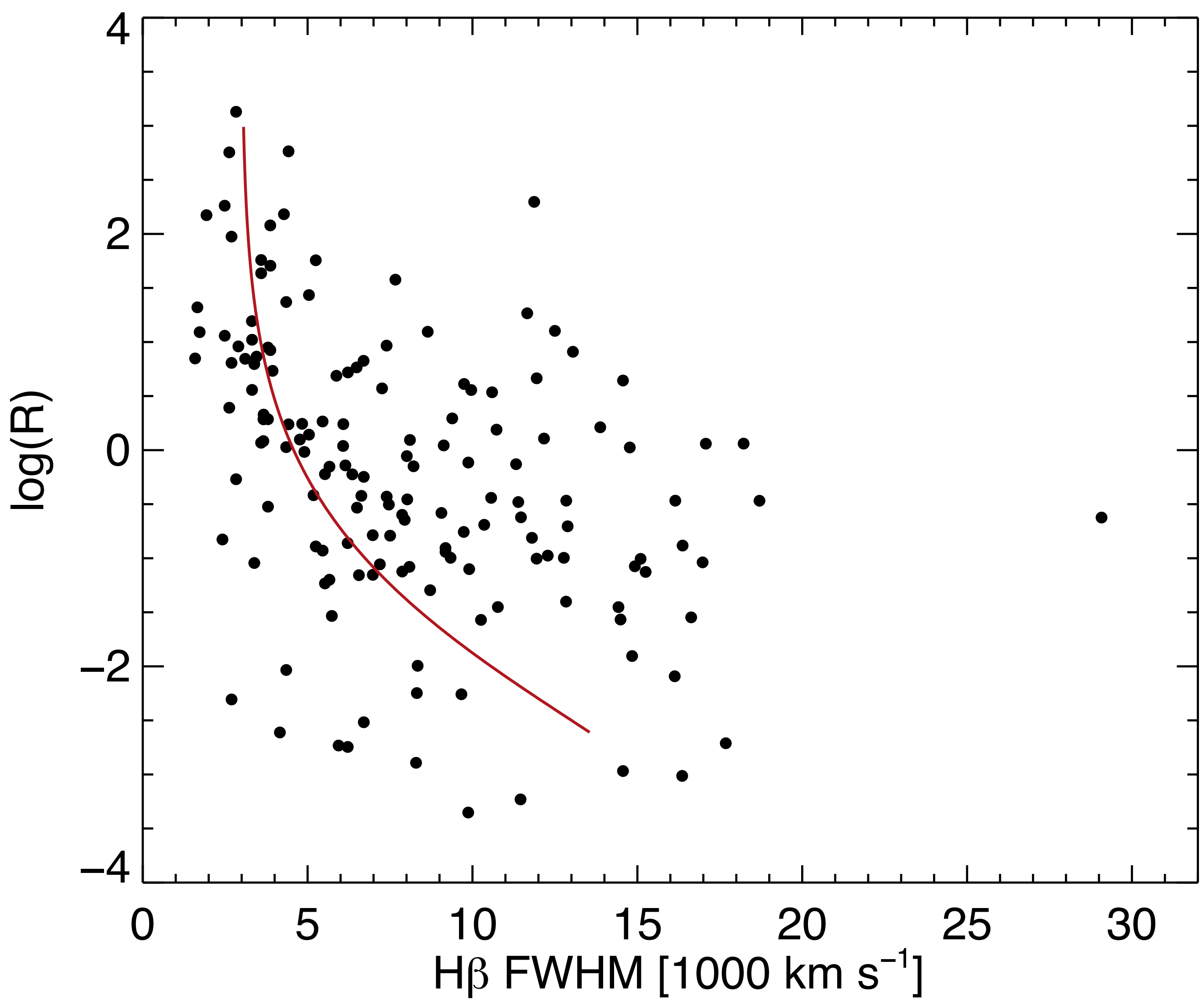
Wills et al. (1995), Shang et al. (2011)



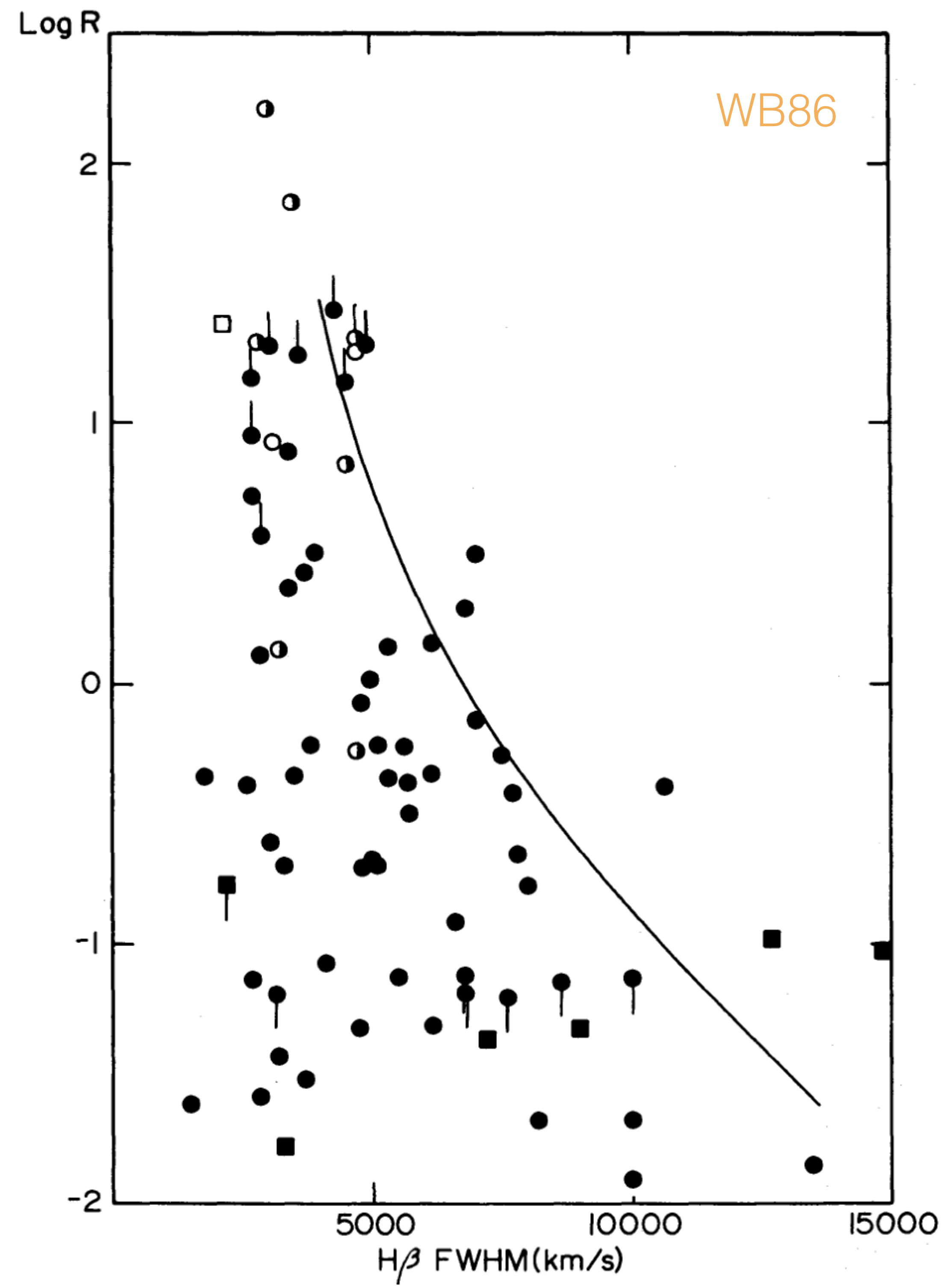
Results



How does this compare?



WB86 sample.



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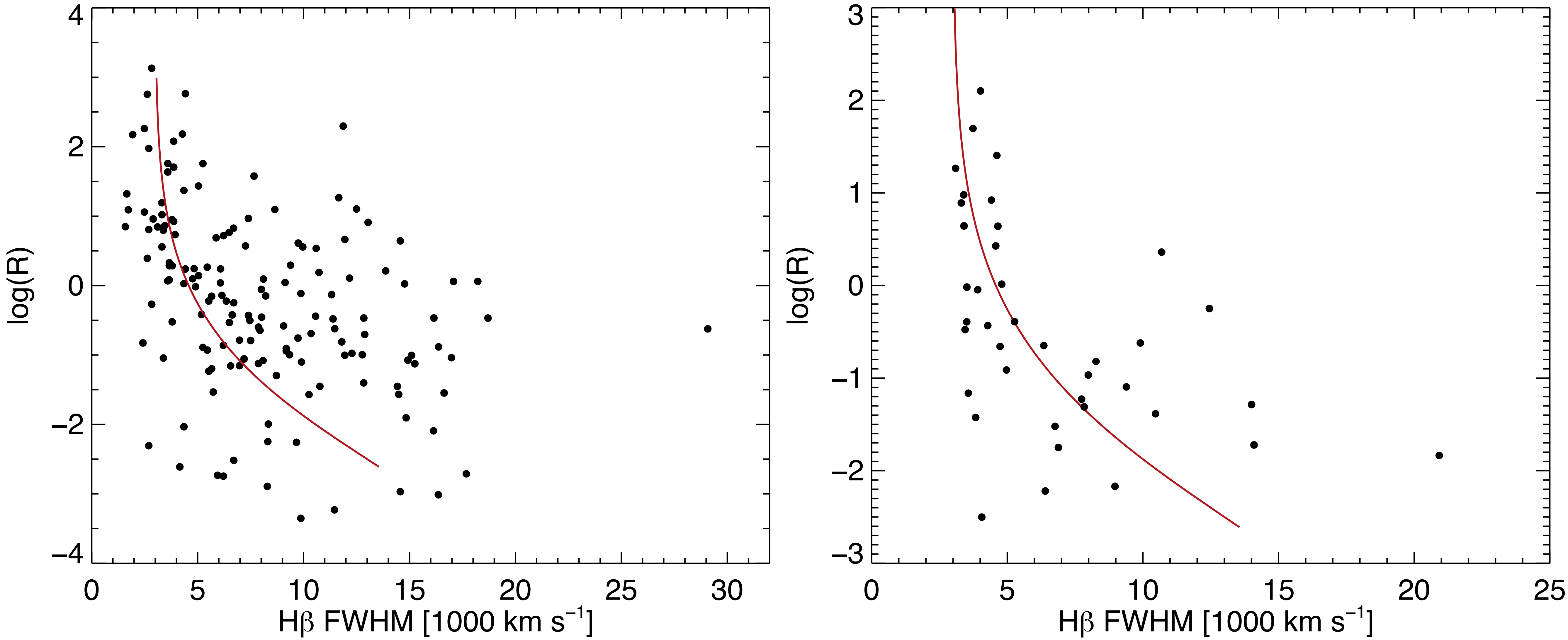
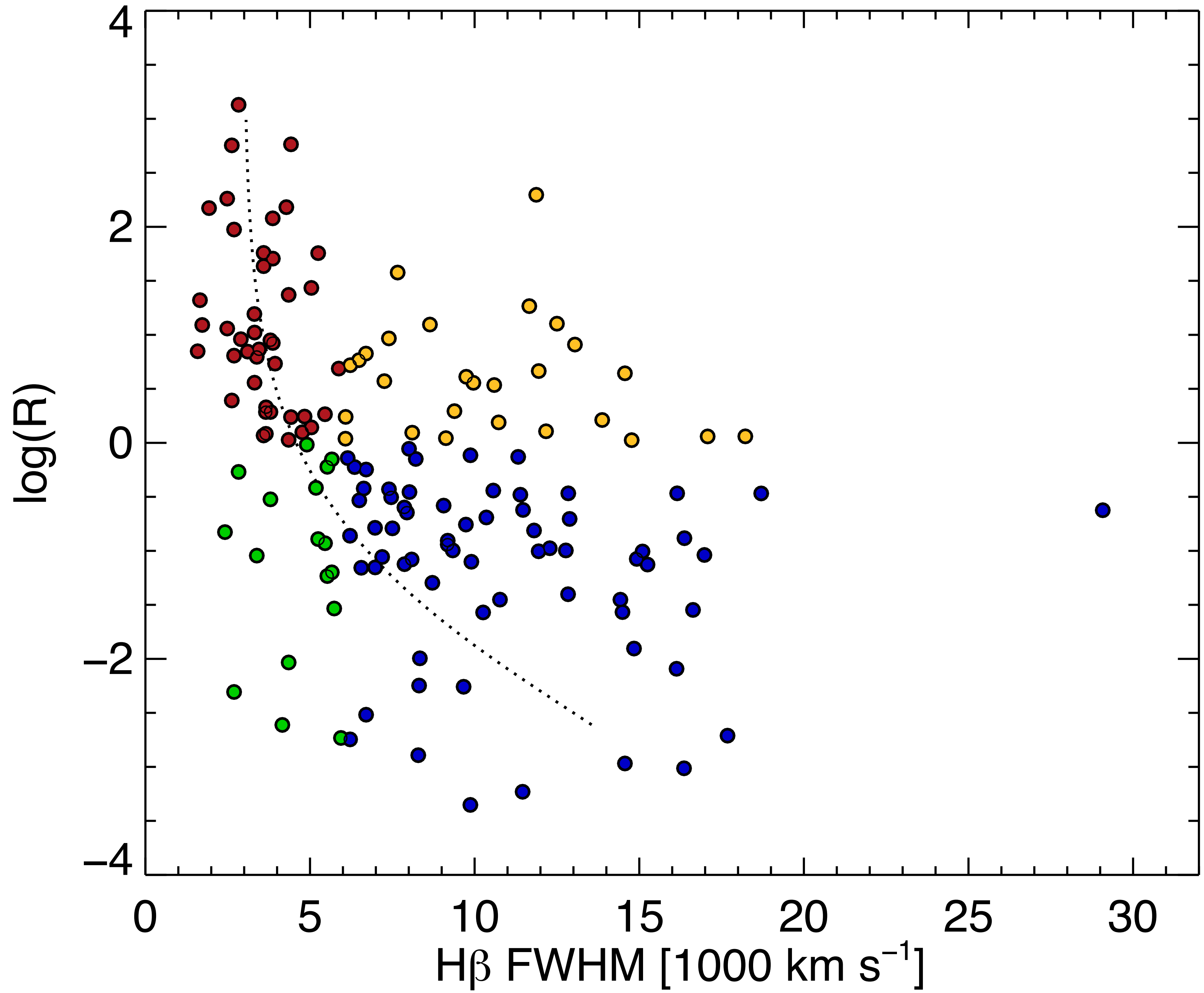
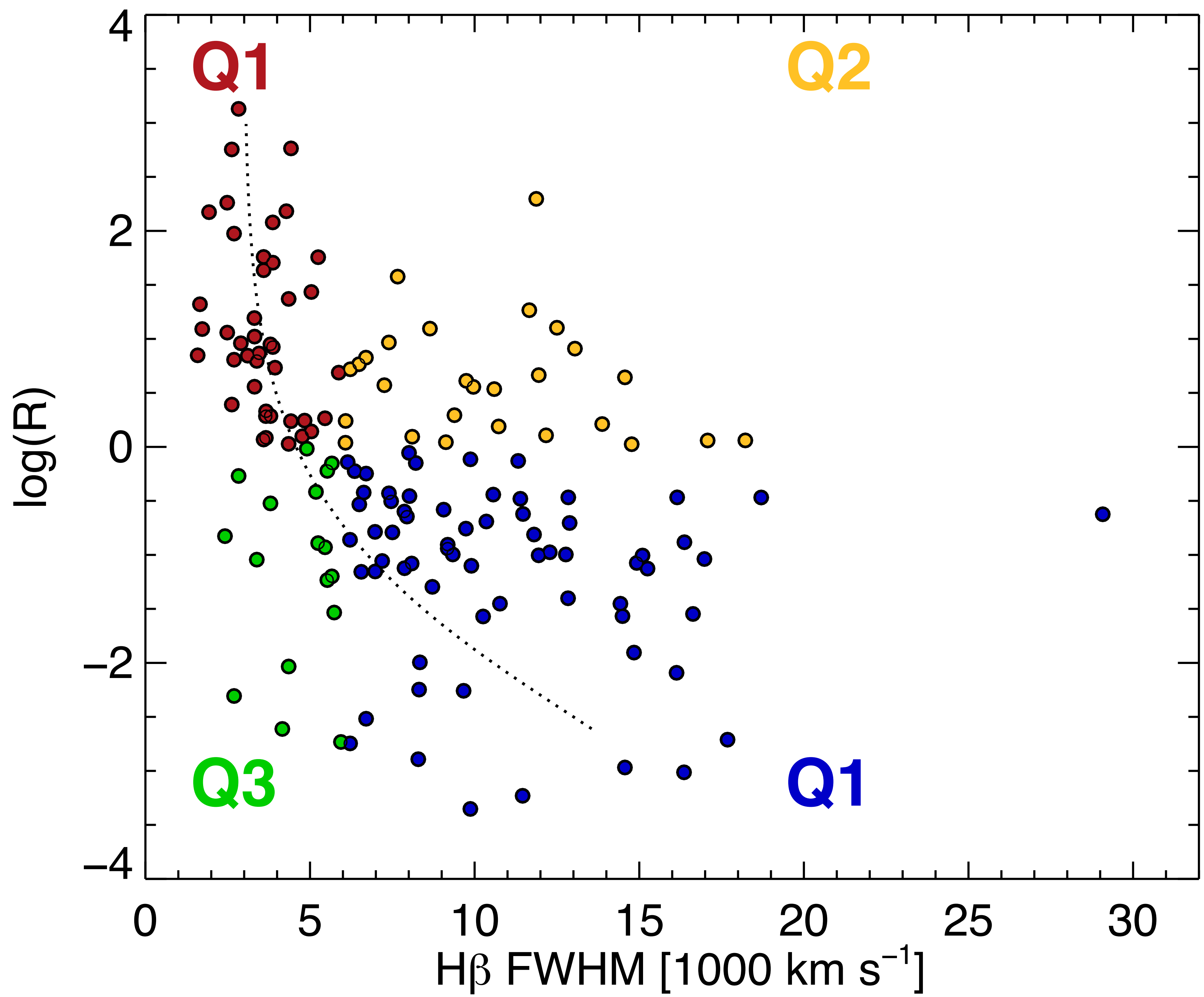


RL SED sample.

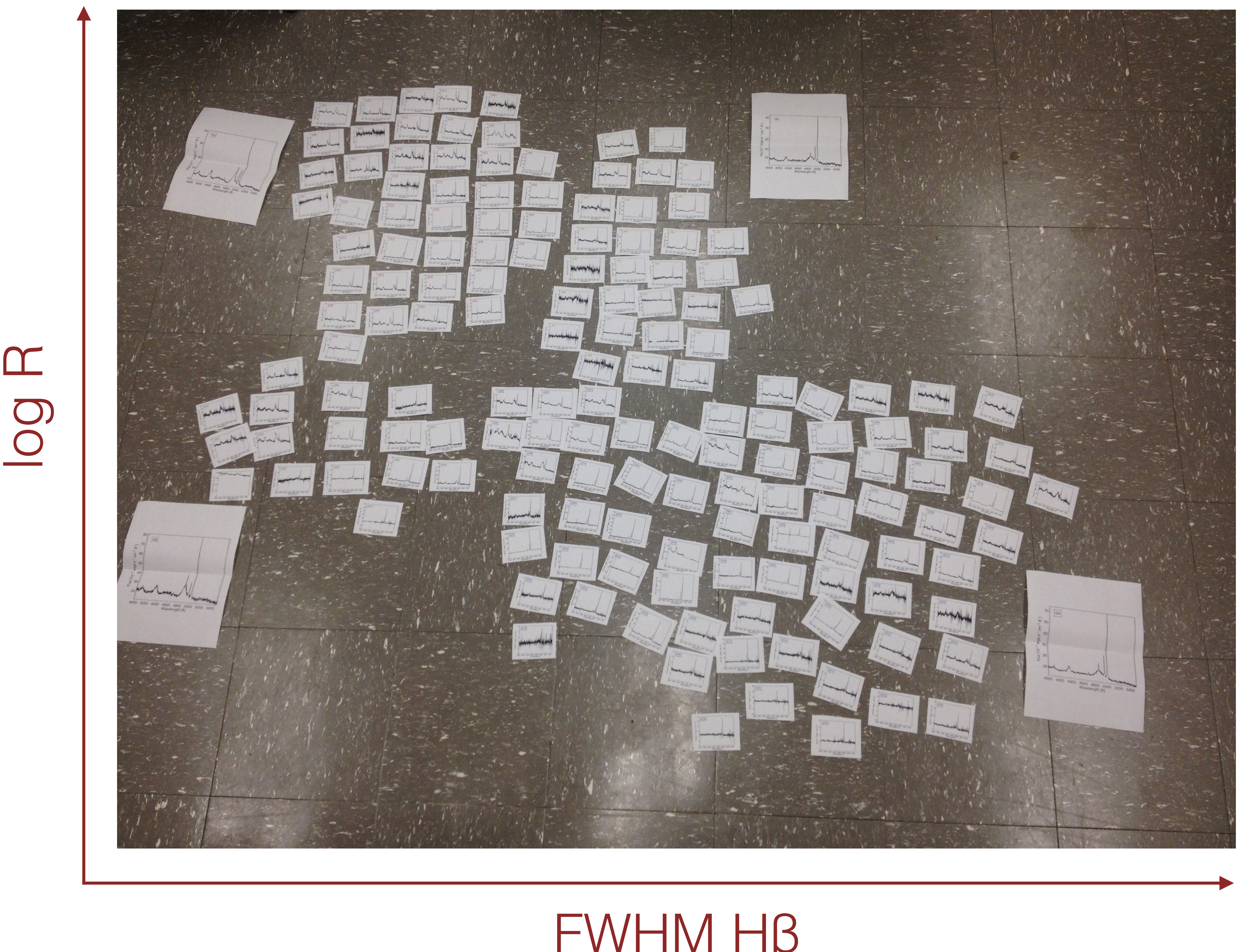
What's populating log R - FWHM(Hβ) space?



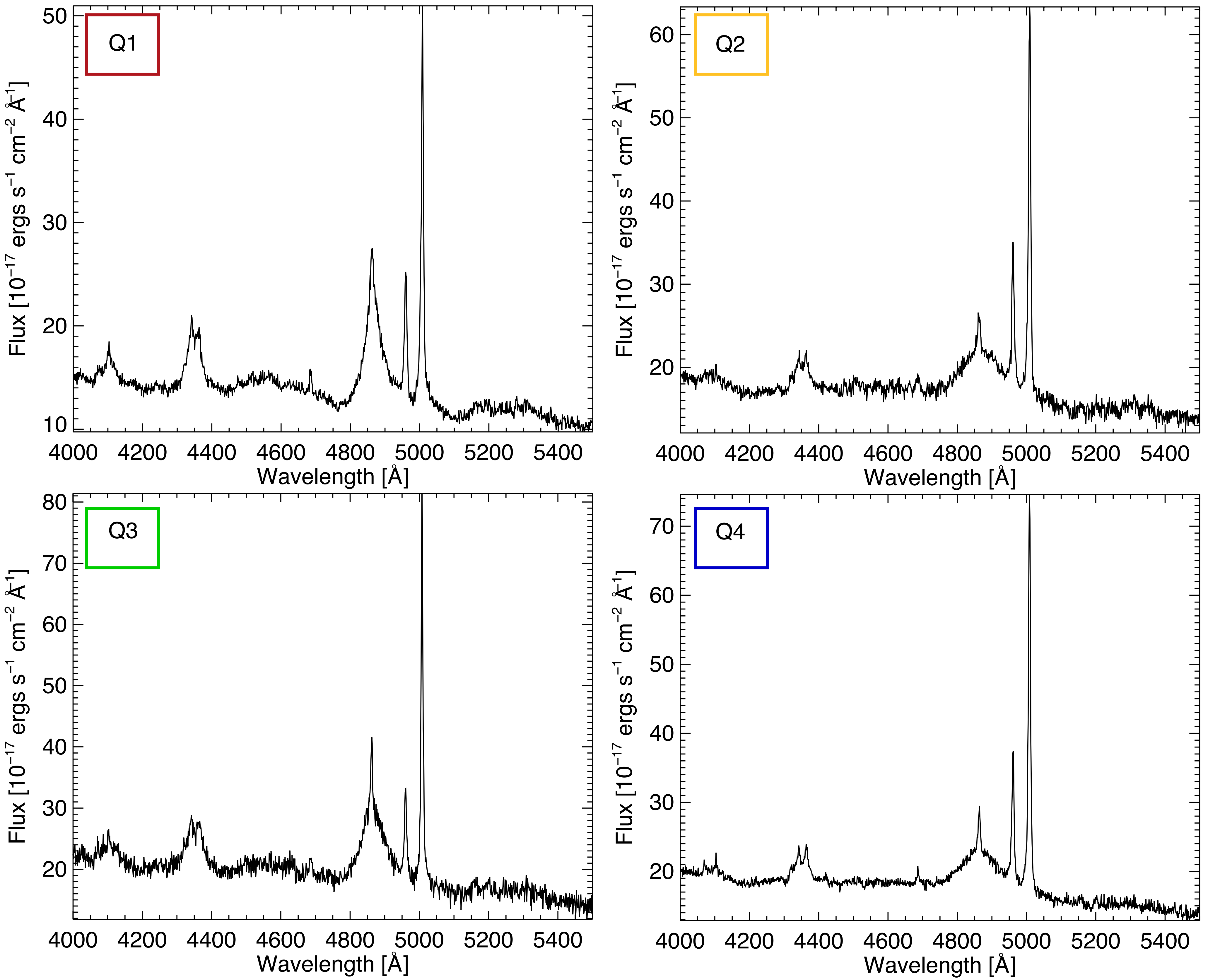
What’s populating log R - FWHM(Hβ) space?



“Floor” plot

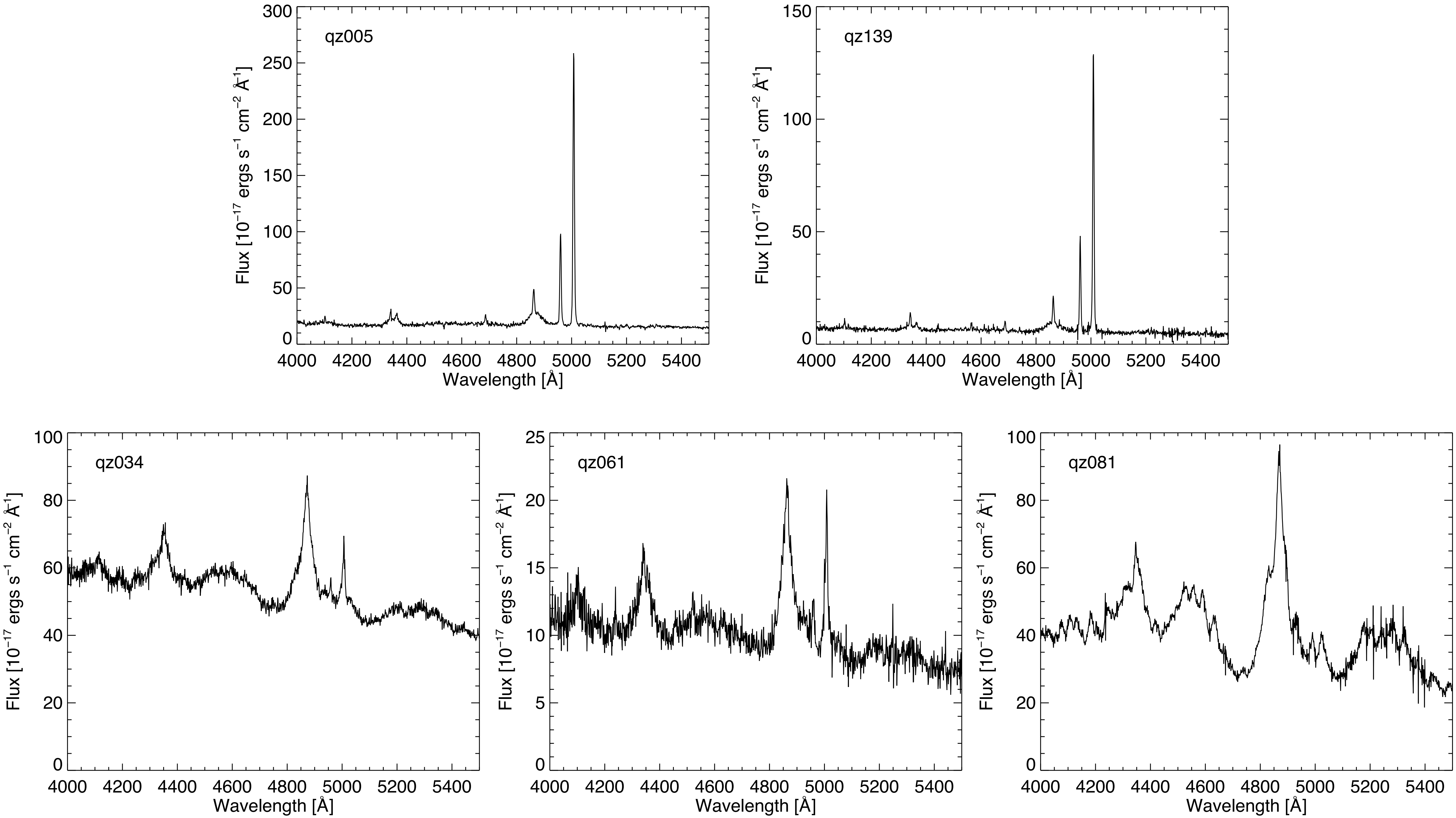


Composites



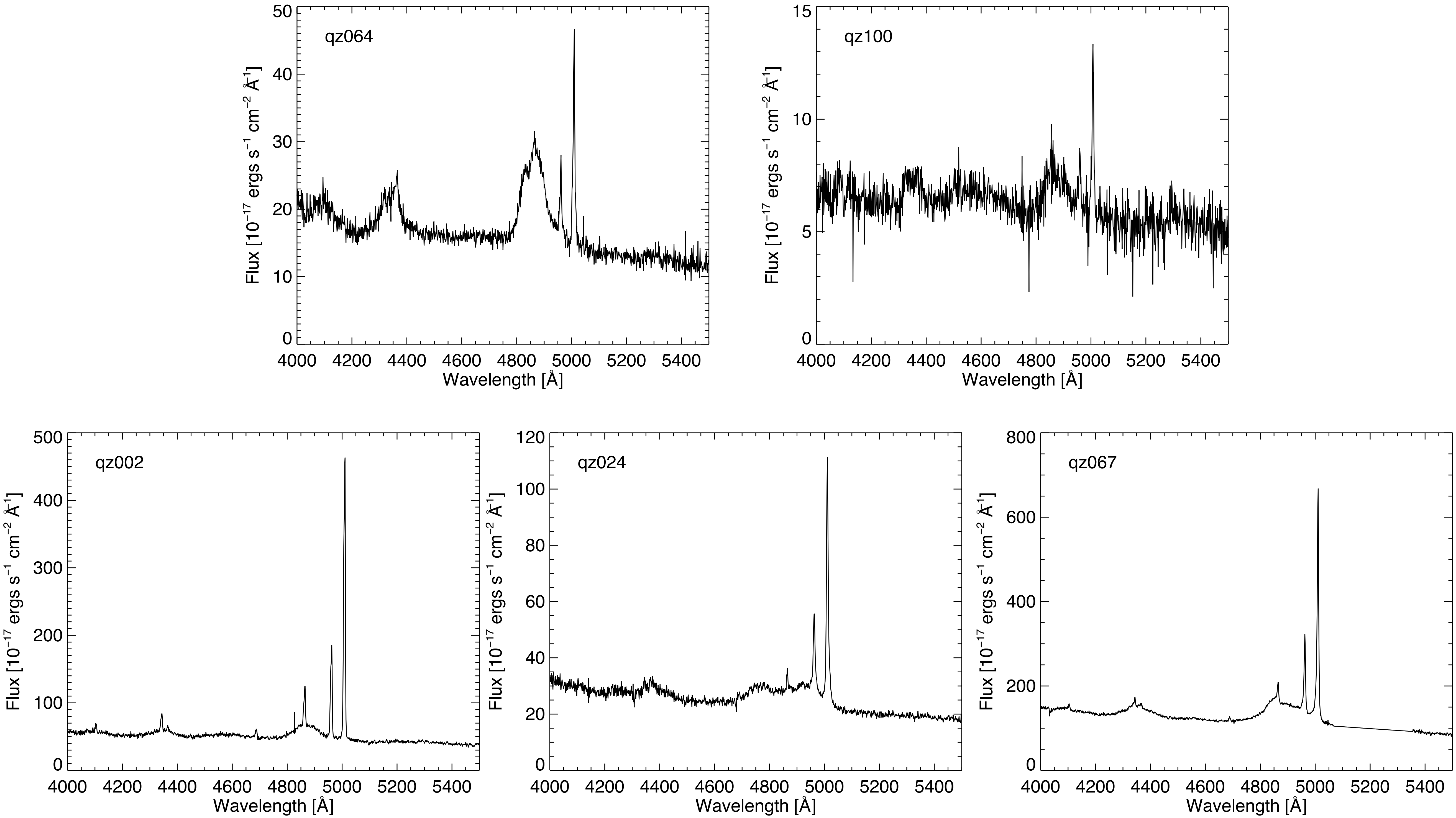
Q1
Q2
Q3
Q4
Flux [10^{-17} ergs s^{-1} cm^{-2} Å^{-1}]
Wavelength [Å]
4000
4200
4400
4600
4800
5000
5200
5400
10
20
30
40
50
60
70
80

Q1 Spectra



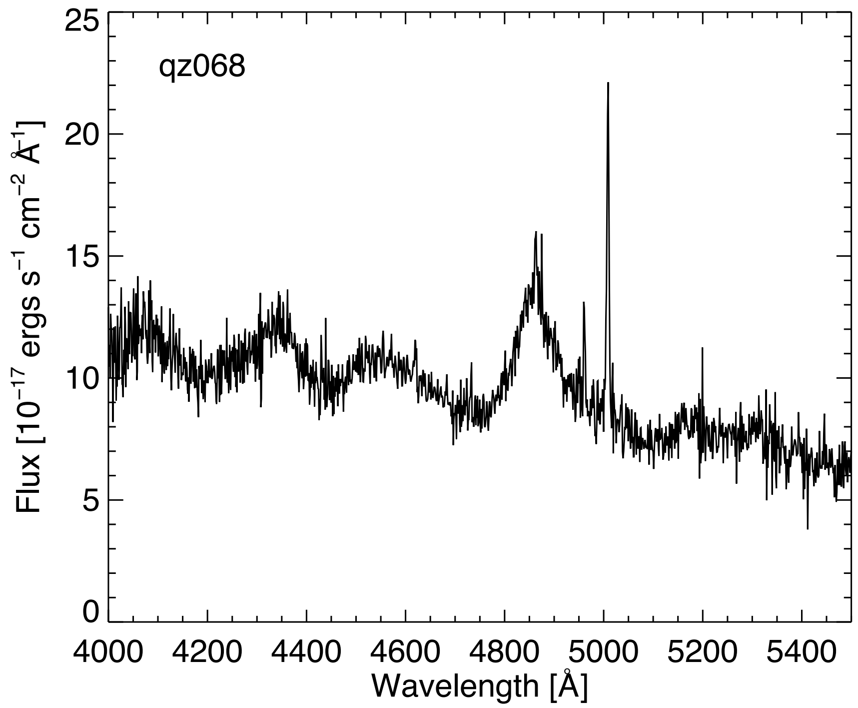
log R > 0, FWHM(Hβ) < 6000 km s^{-1}

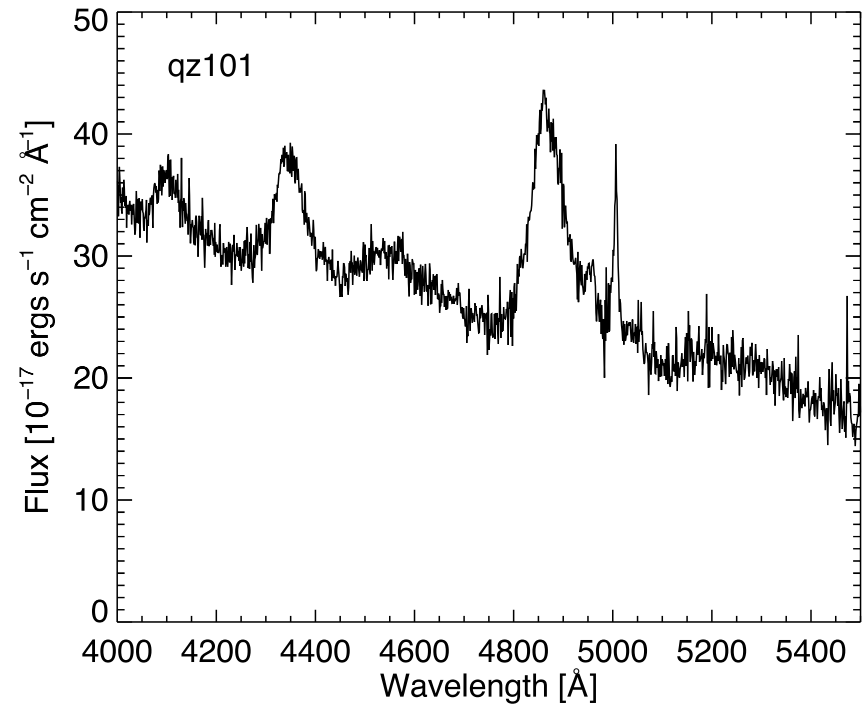
Q2 Spectra

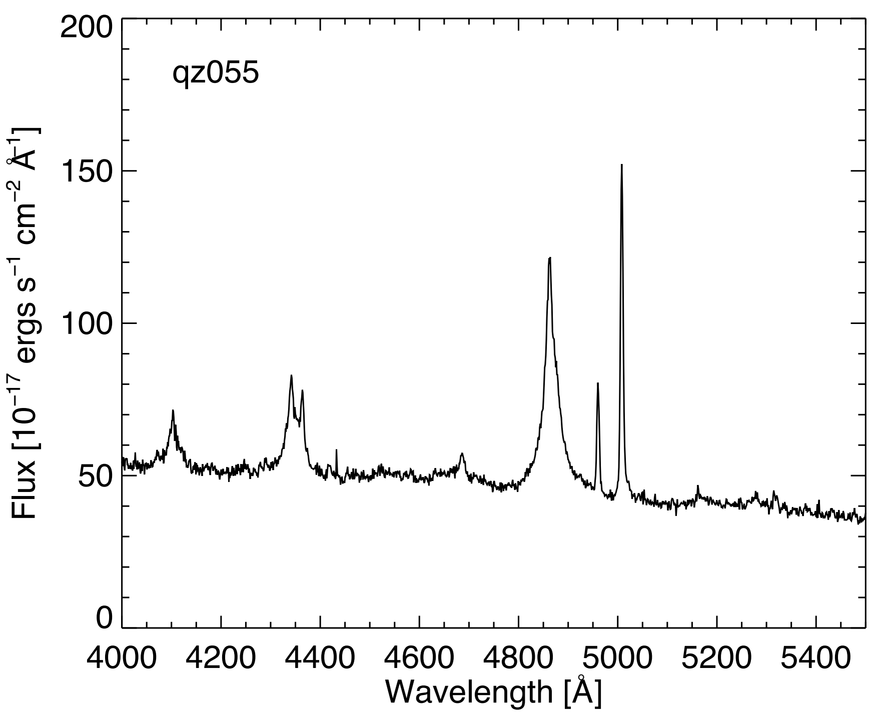


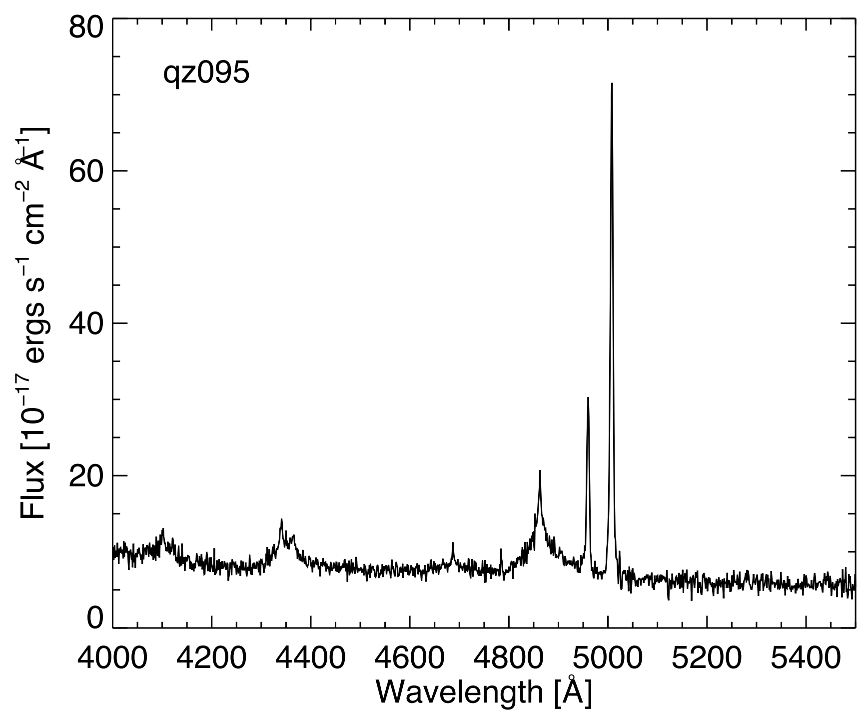
log R > 0, FWHM(Hβ) > 6000 km s^{-1}

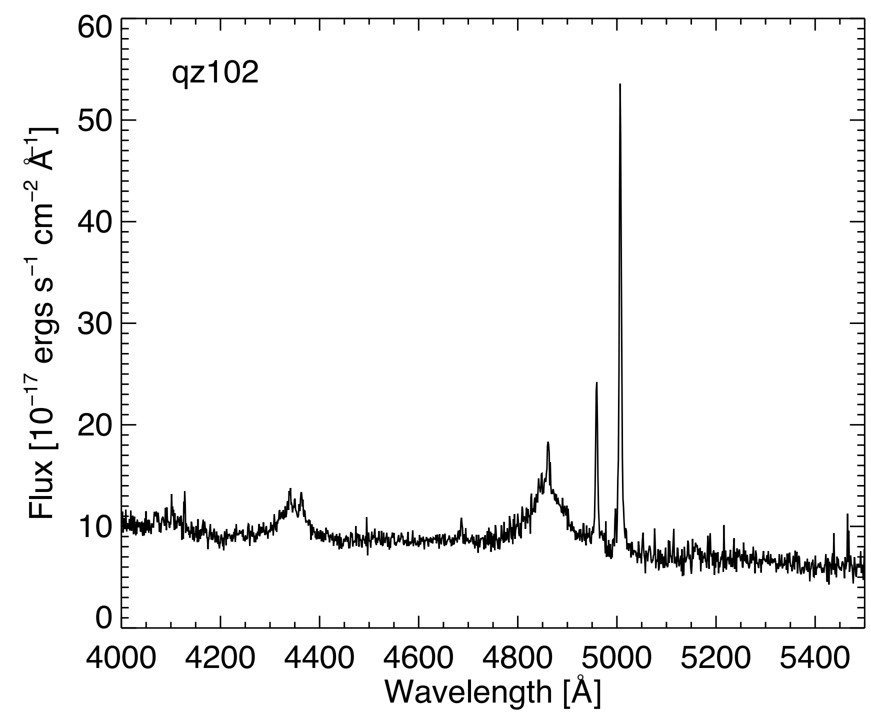
Q3 Spectra





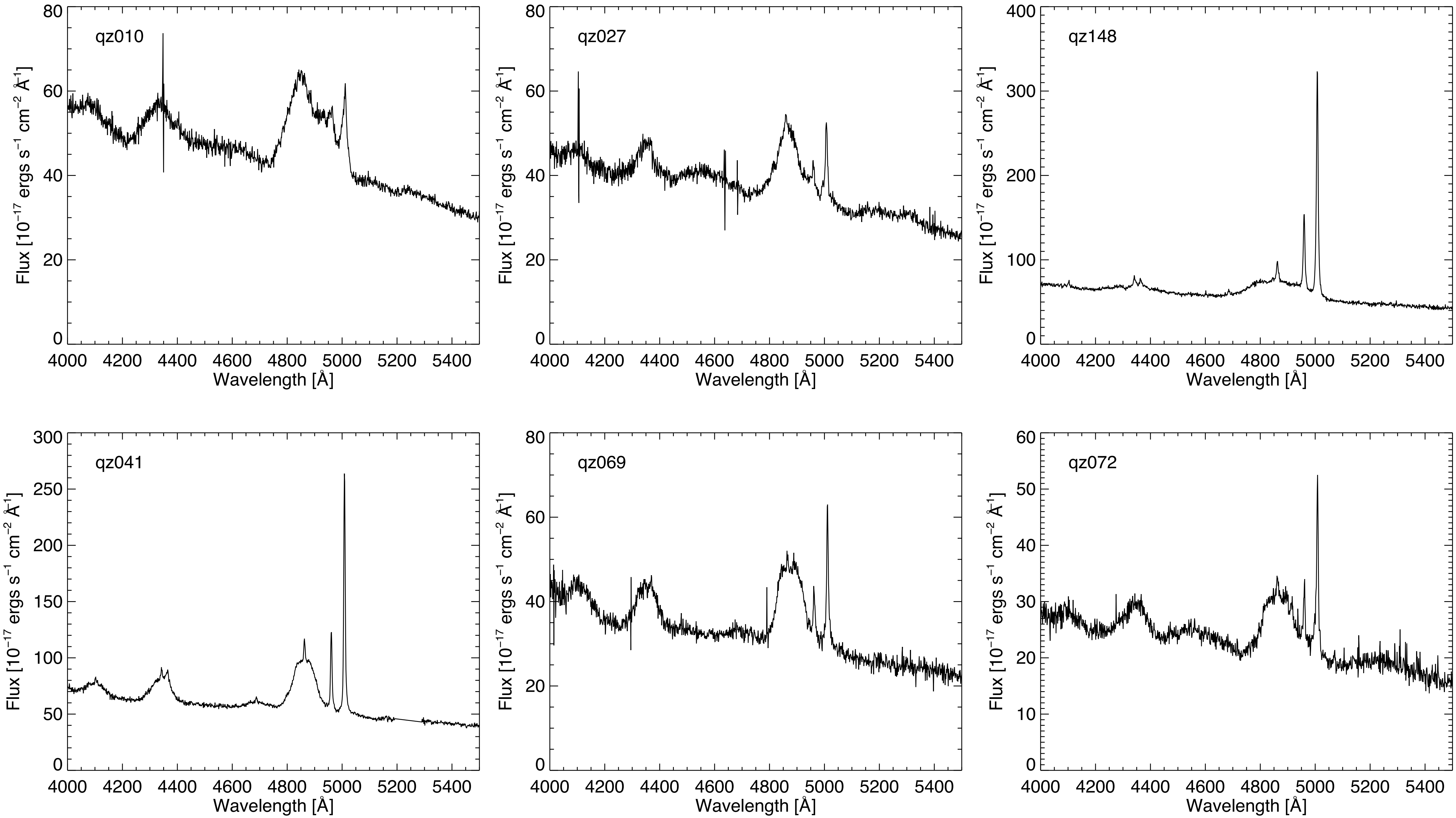






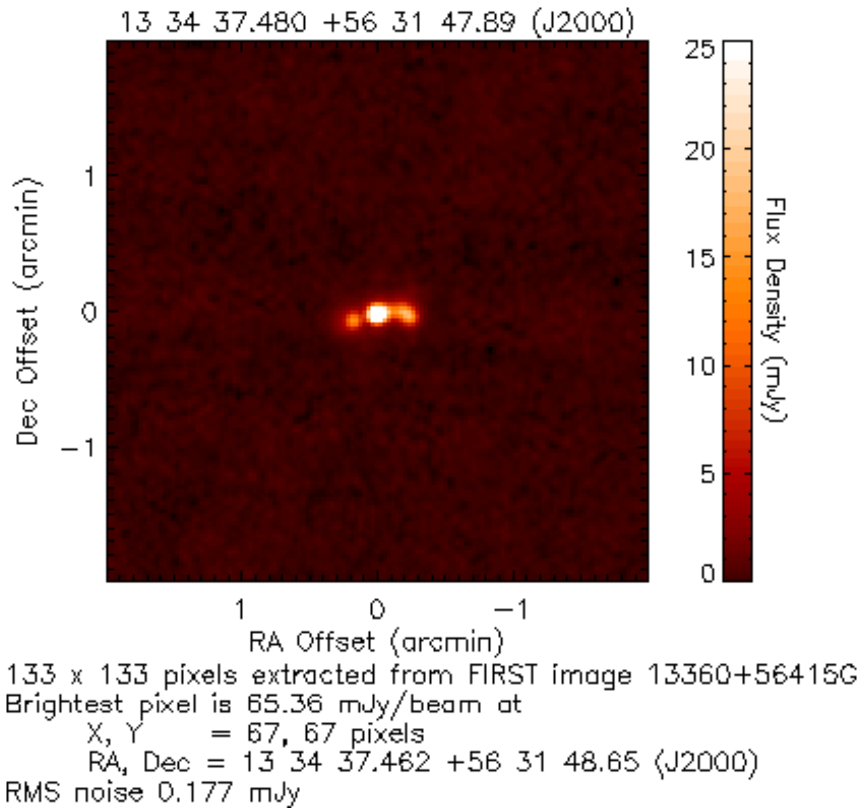
$\log R < 0$, FWHM(Hβ) < 6000 km s^{-1}

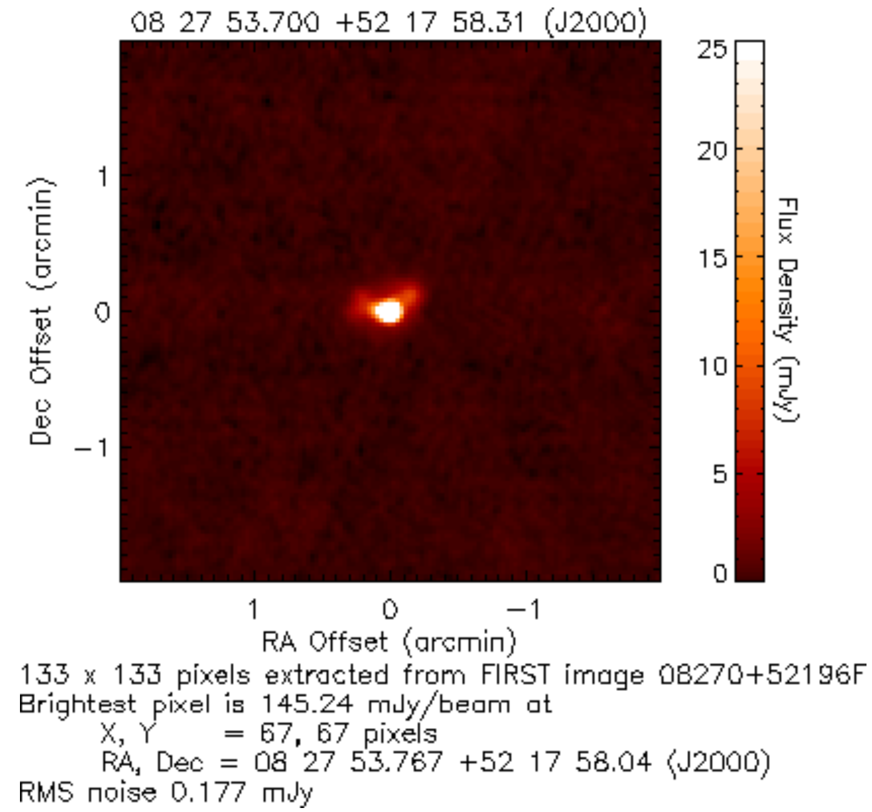
Q4 Spectra

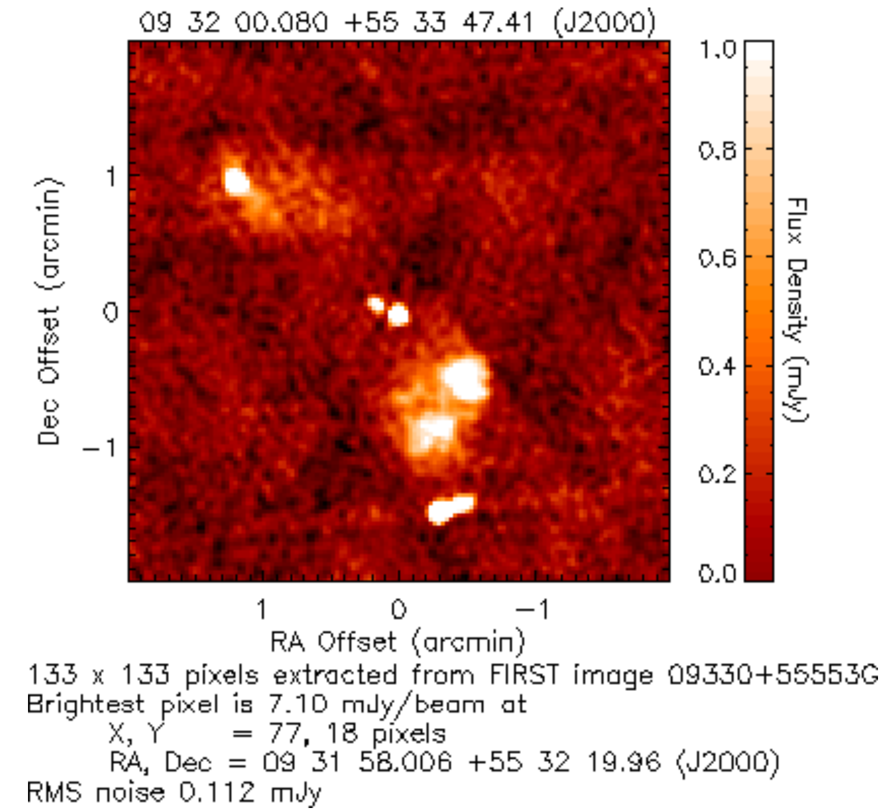


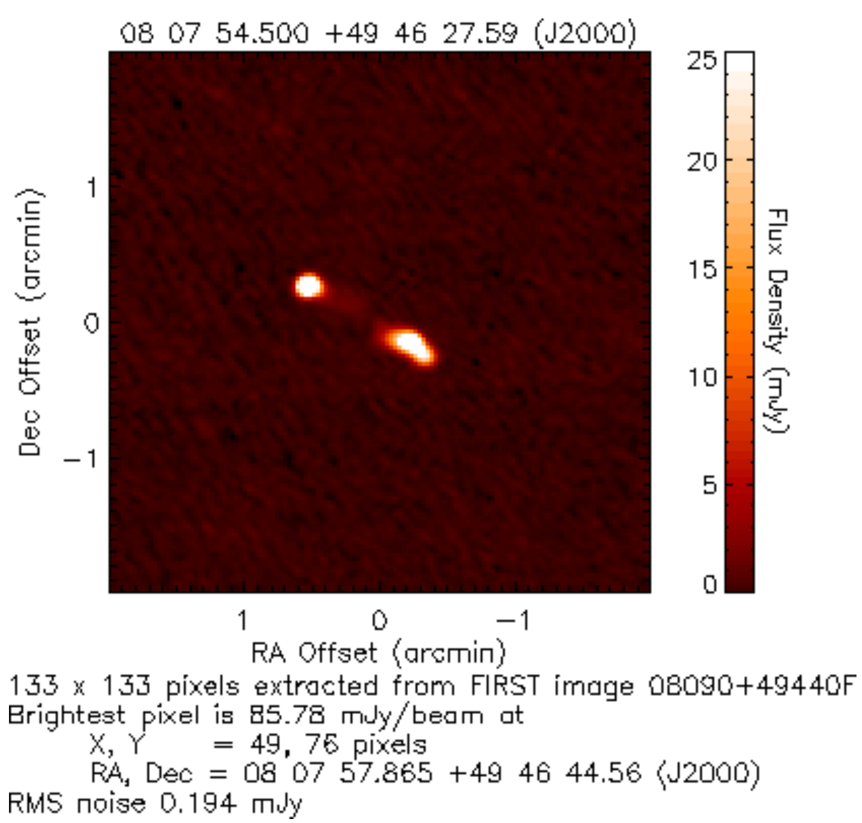
log R < 0, FWHM(Hβ) > 6000 km s^{-1}

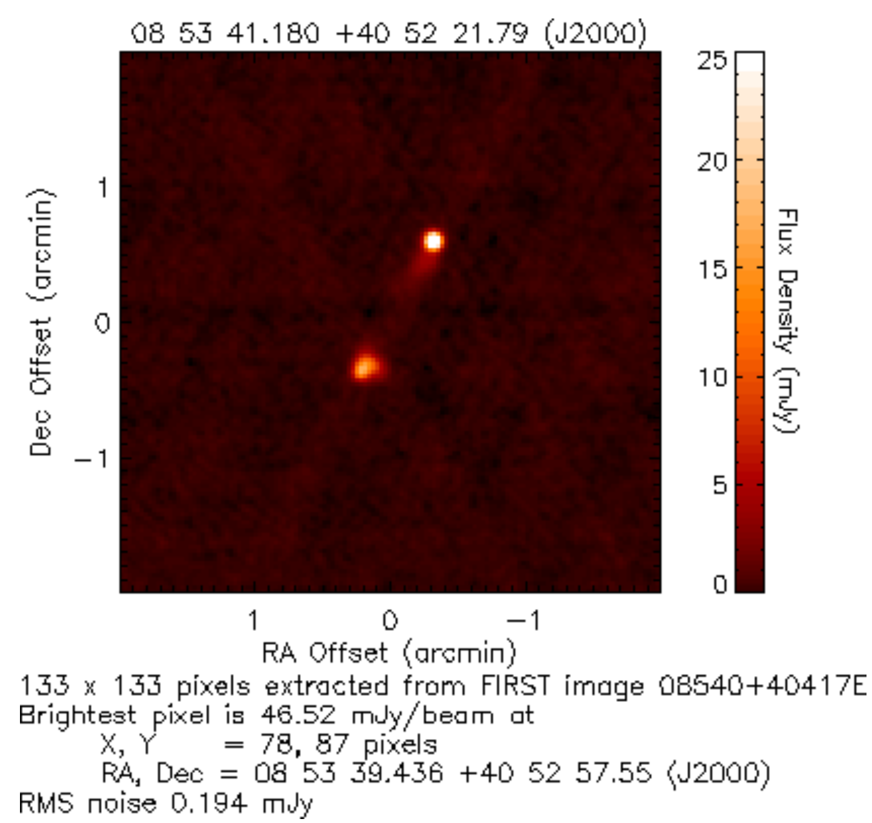
Radio morphologies

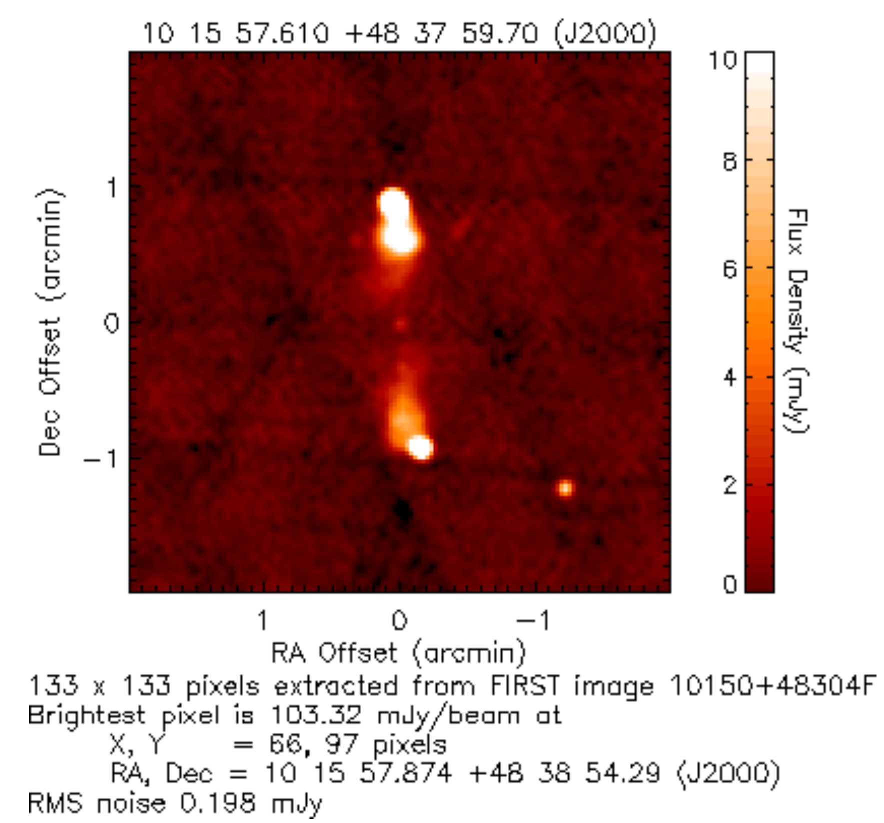




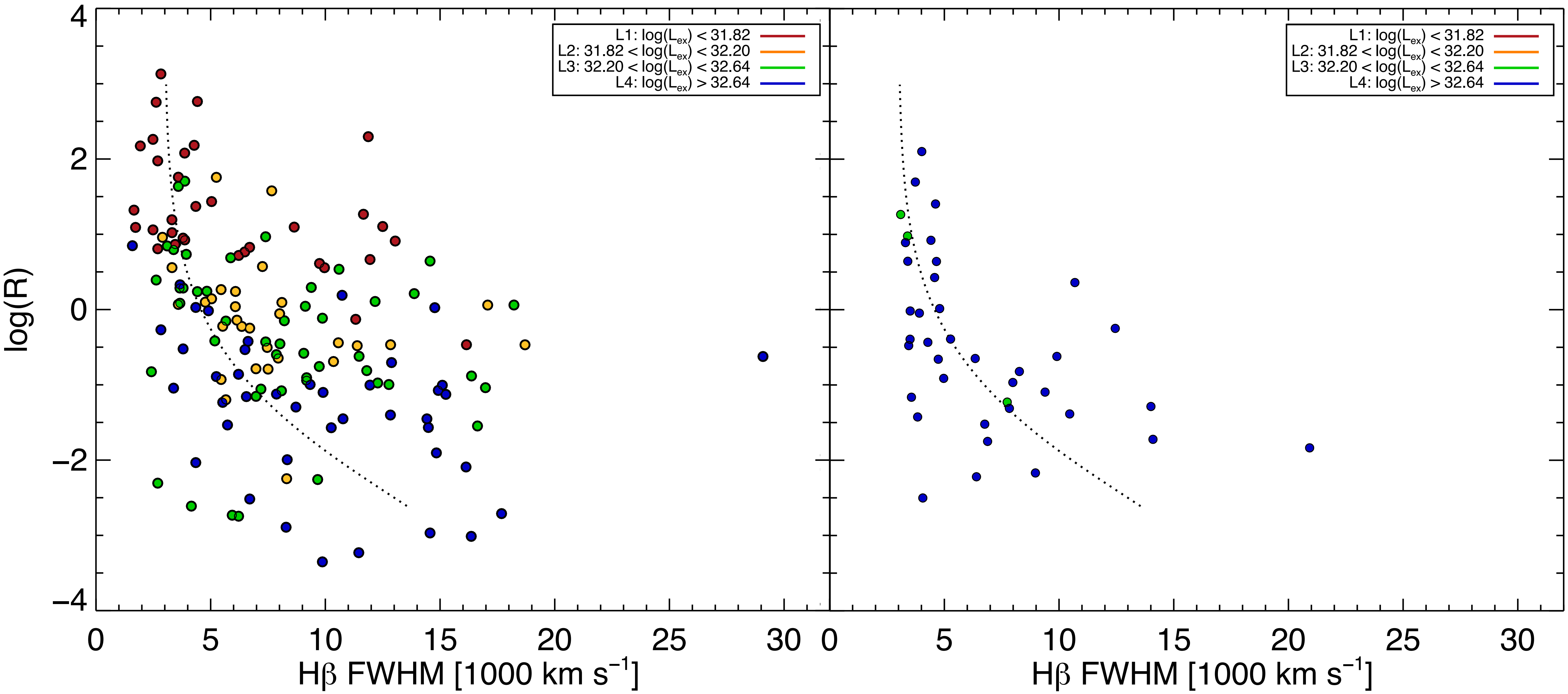








Extended radio luminosity



- Why don't we find core-dominated, high L_{ext} objects?
  - They're rare!

Summary

- Complete sample of 156 DR7 SDSS quasars with $0.1 < z < 0.6$ and $\log L(325\ \mathrm{MHz}) > 26\ \mathrm{W\ Hz^{-1}}$, including some with no radio cores.
- Objects are diverse in optical spectral properties and radio morphologies.
- Includes core-dominant population with broad FWHM(Hβ).
- Range in properties indicates importance of other physical parameters in addition to orientation.