

# Gaia DR3: The Extragalactic content

*Gaia* Collaboration

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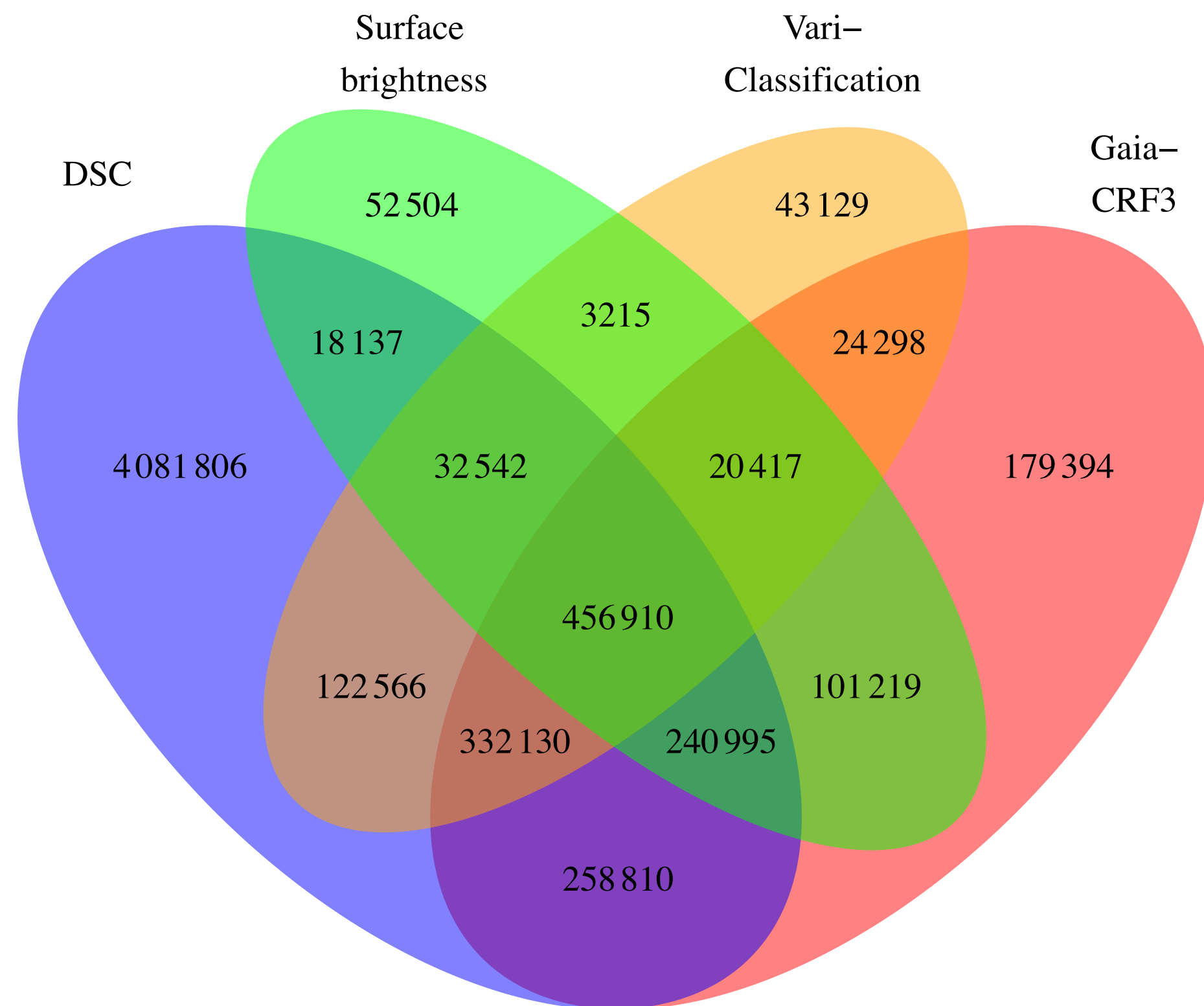
28 September 2022

# Multiple modules deal with extragalactic sources

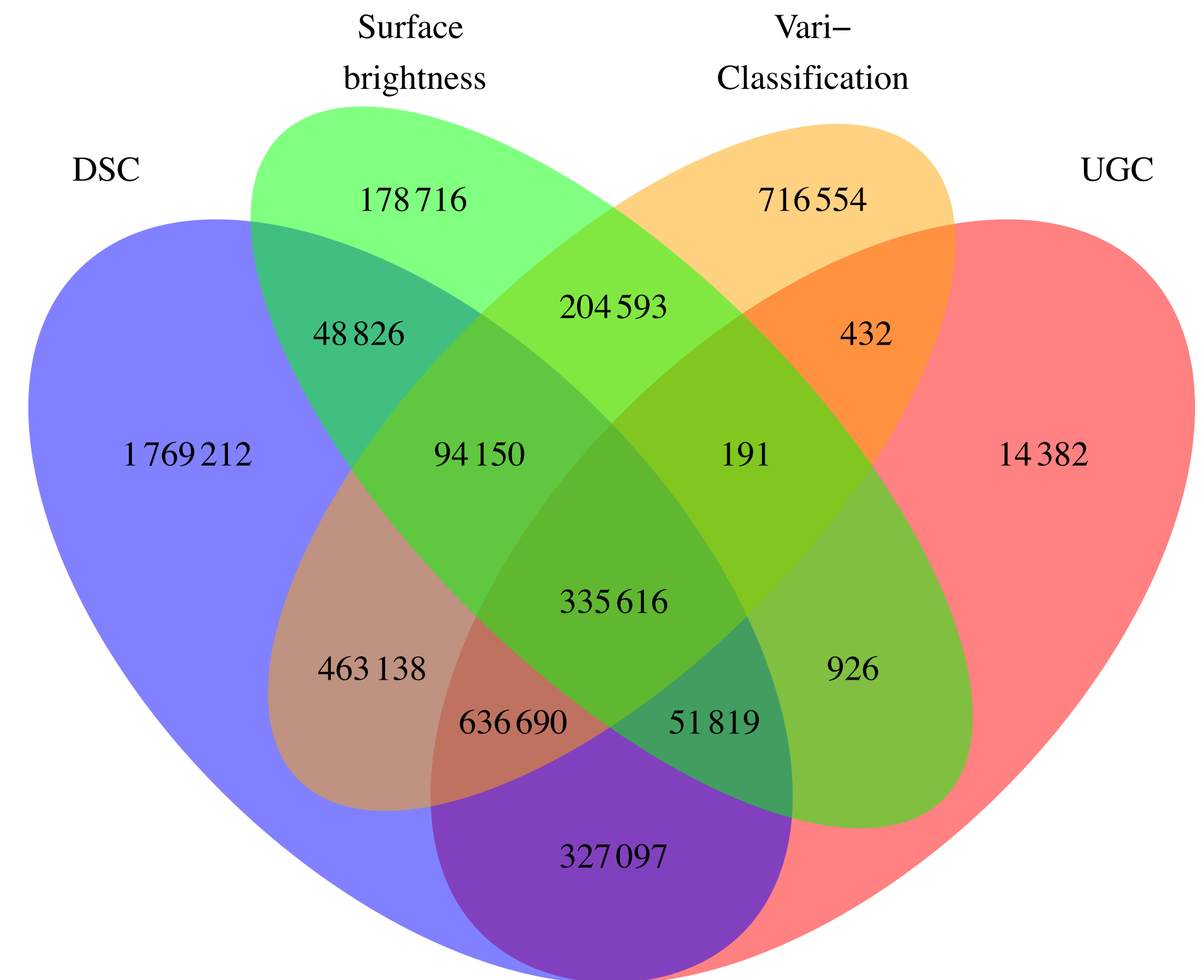
- Classification of Gaia objects
  - ▶ using BP/RP spectrum and astrometry (*Discrete Source Classifier, DSC*)
  - ▶ using photometric light curves (*Vari*)
- Input lists
  - ▶ fit 2D brightness profiles to extended objects (*Extended Objects, EO*)
  - ▶ identify objects from astrometry, similar to Gaia-CRF3
- Redshift estimates
  - ▶ quasars (*QSOC*) and galaxies (*UGC*)

# Contributions to the extragalactic candidate tables

Quasar candidates  
6.6 million, 52% pure



Galaxy candidates  
4.8 million, 69% pure



# Comments on extragalactic candidate tables

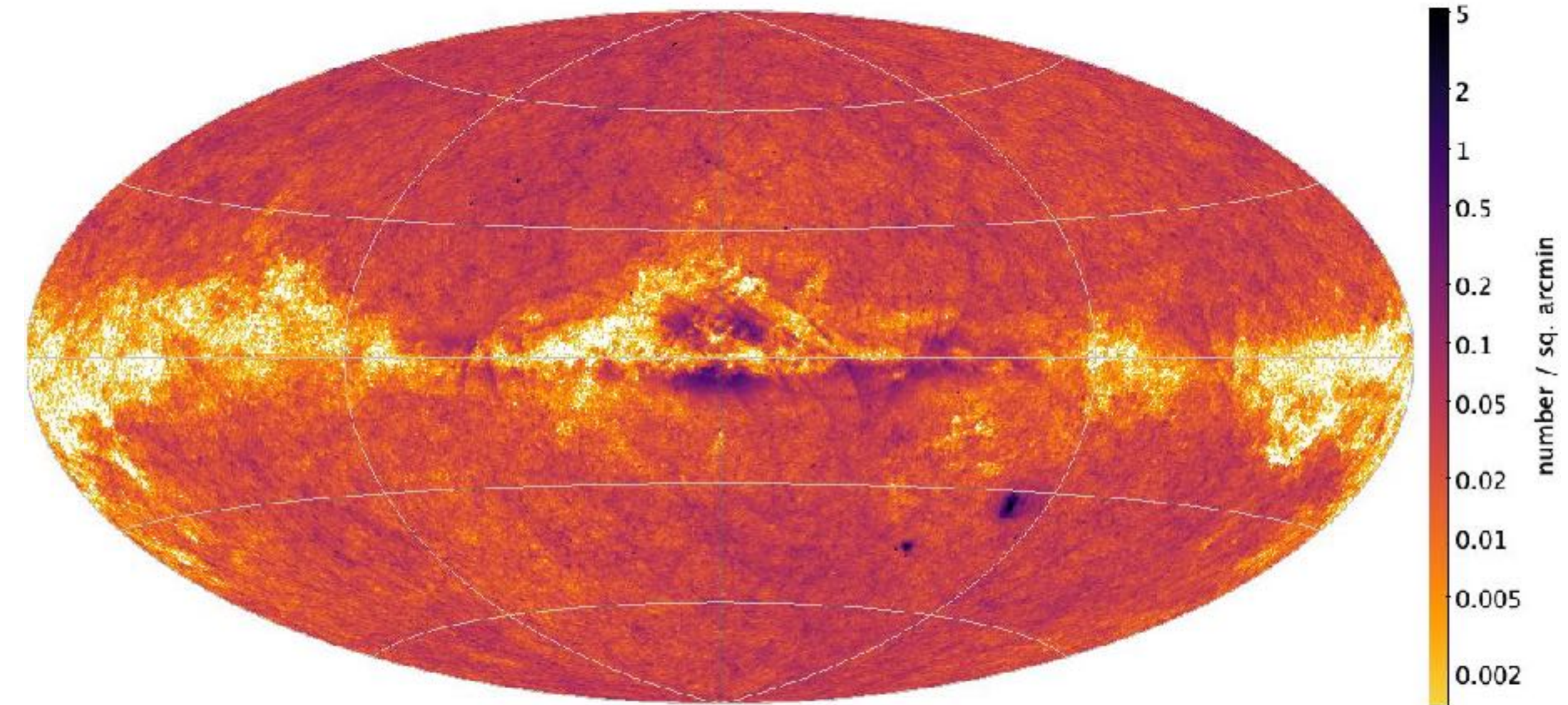
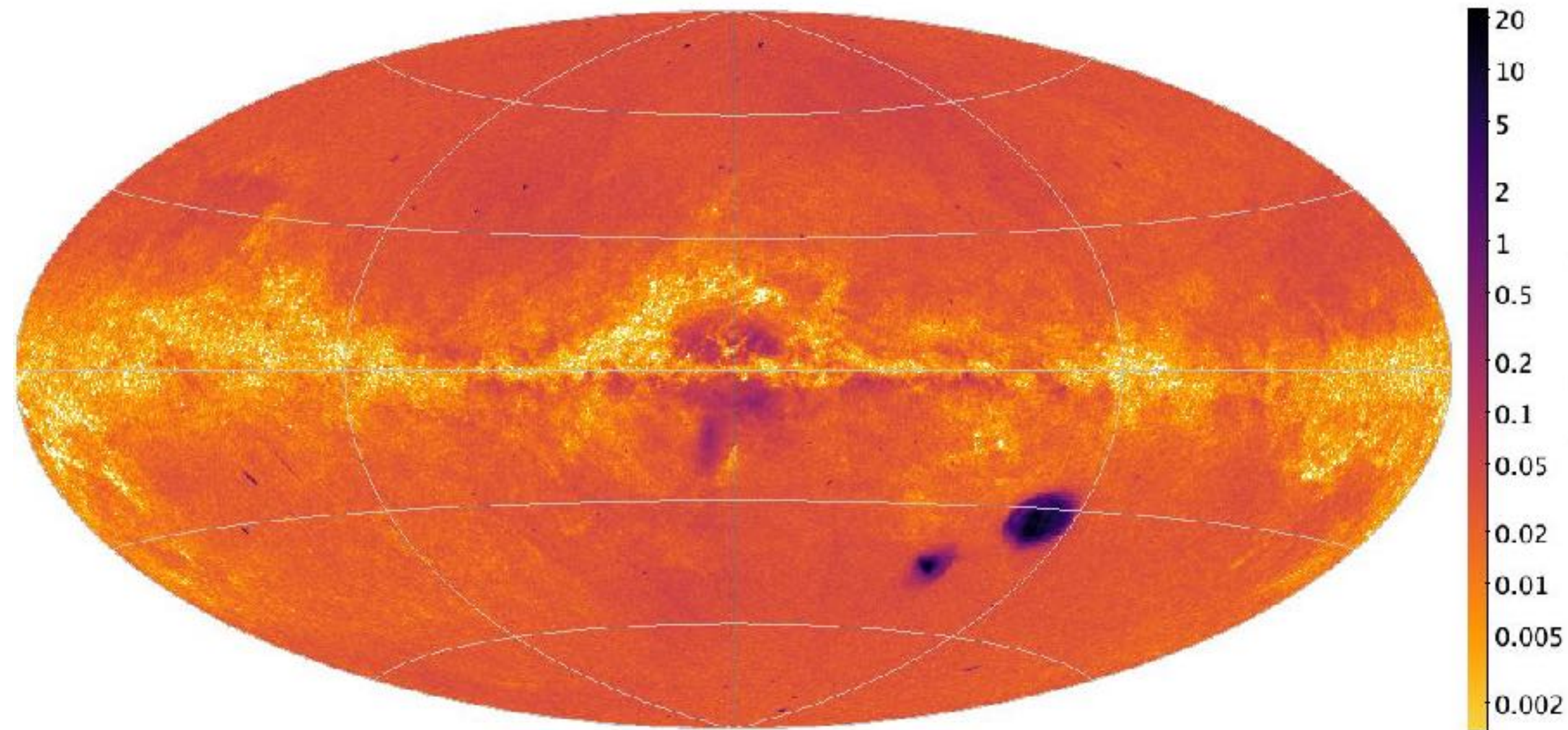
- Heterogeneous sample
  - ▶ no common definition of “quasar” or “galaxy” across the modules
- Purity and completeness varies among subsets contributed by the modules
  - ▶ input lists and Vari driven by purity; DSC driven by completeness
  - ▶ higher purity subset achieved with further selections (at cost of completeness)
- If relative contamination is constant, absolute contamination follows source density
- Classification uses only Gaia data (higher purity expected with additional data)

# Sky distribution of extragalactic candidates

## Full set

Quasar candidates  
6.6 million, 52% pure

Galaxy candidates  
4.8 million, 69% pure

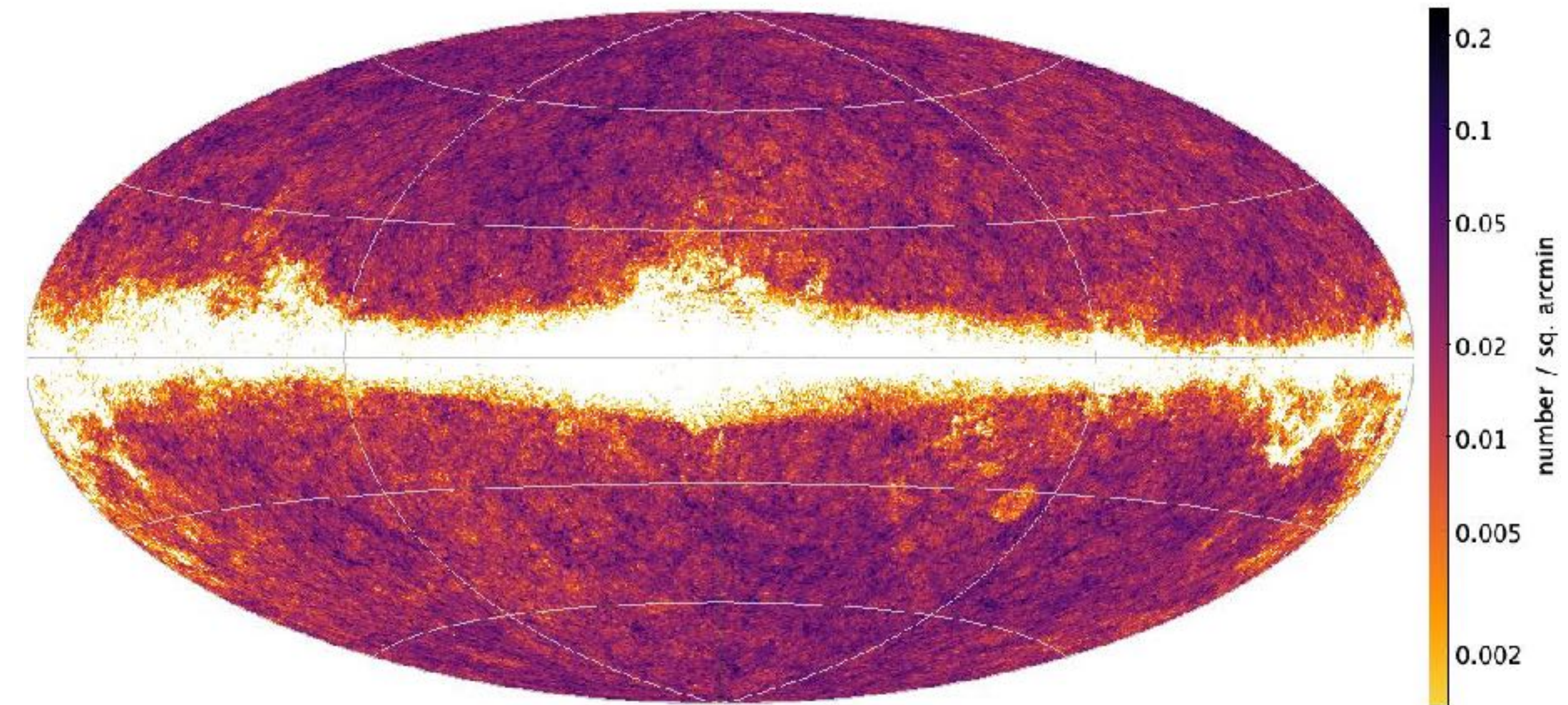
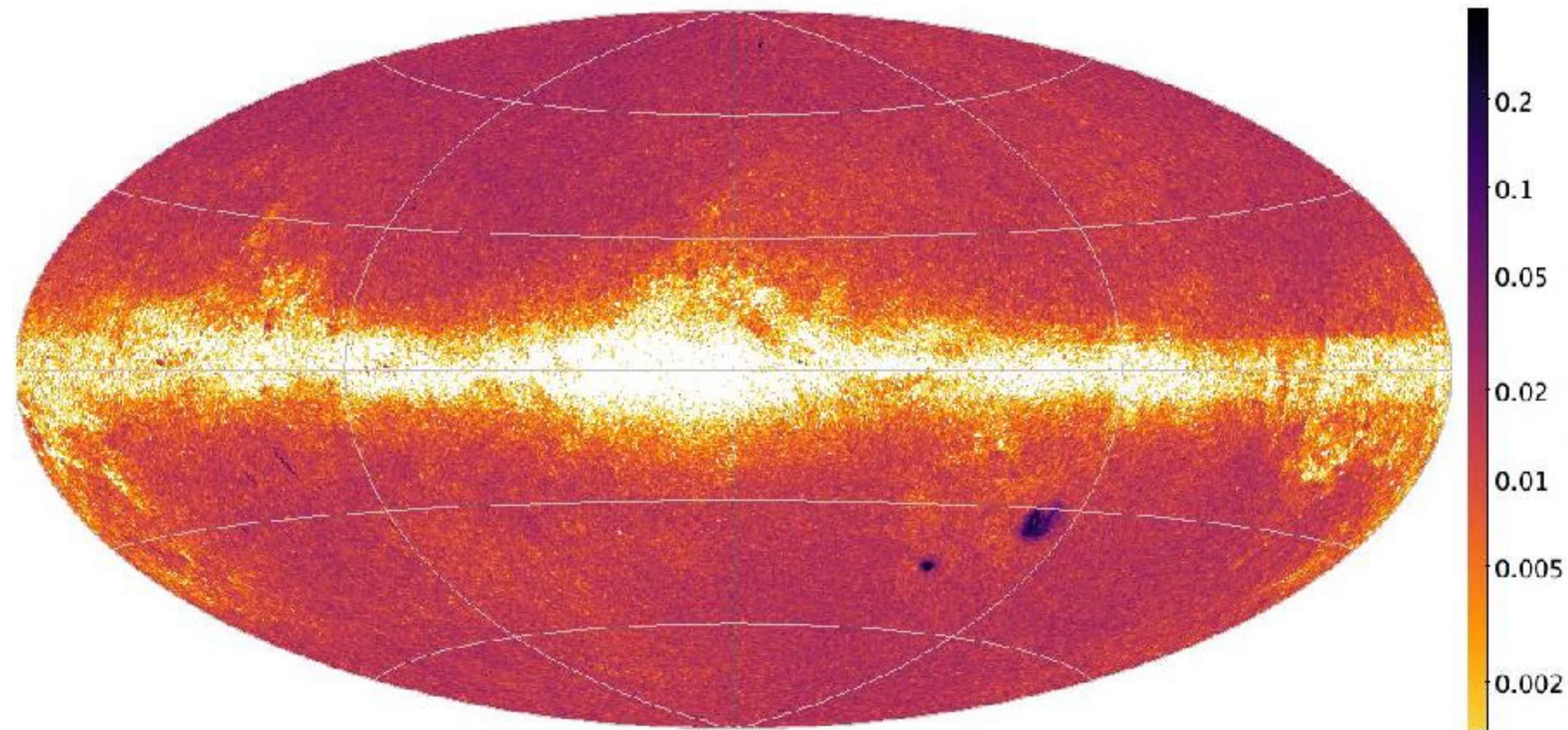


# Sky distribution of extragalactic candidates

## Purer subset

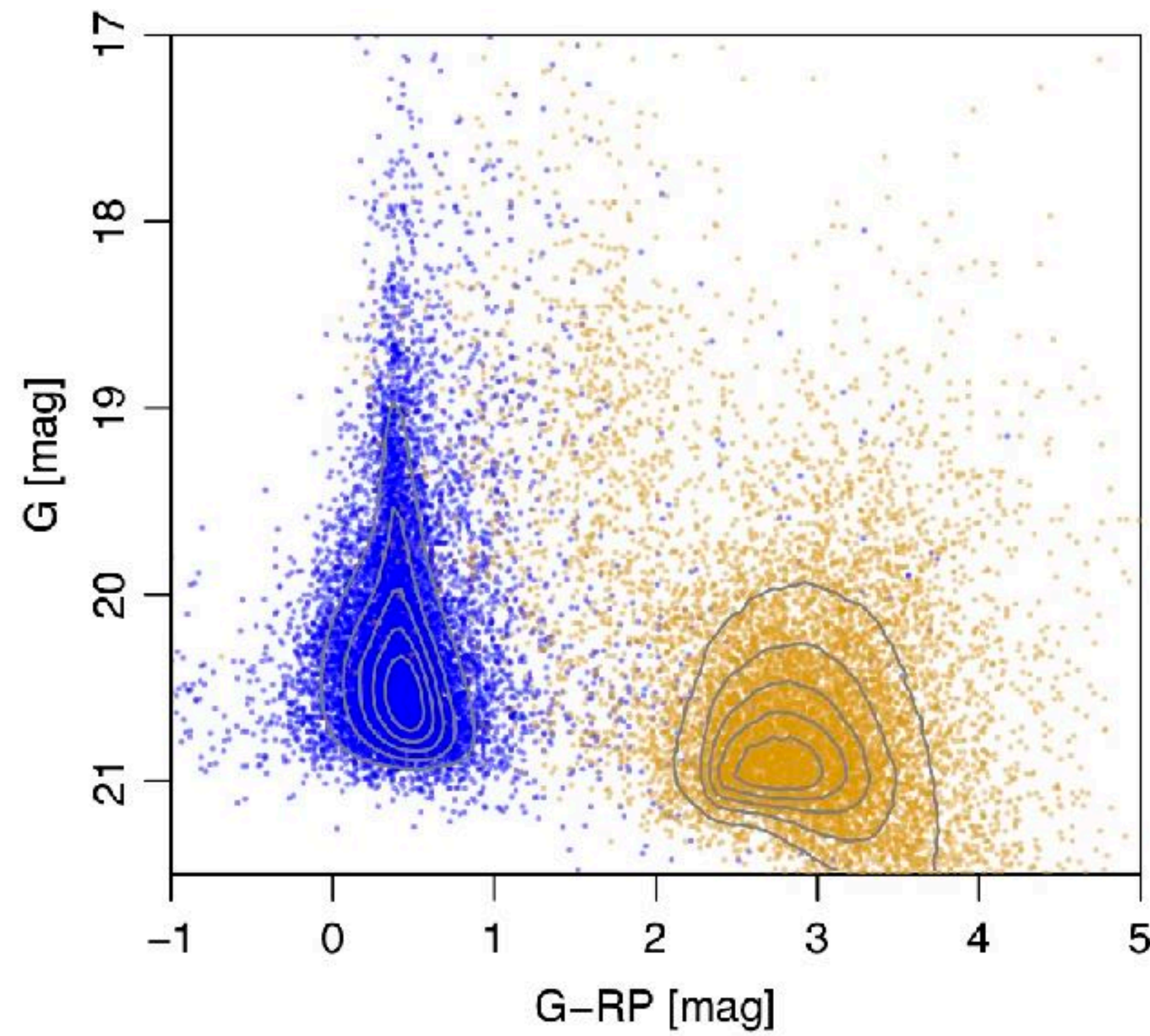
Quasar candidates  
1.9 million, 95% pure

Galaxy candidates  
2.9 million, 94% pure

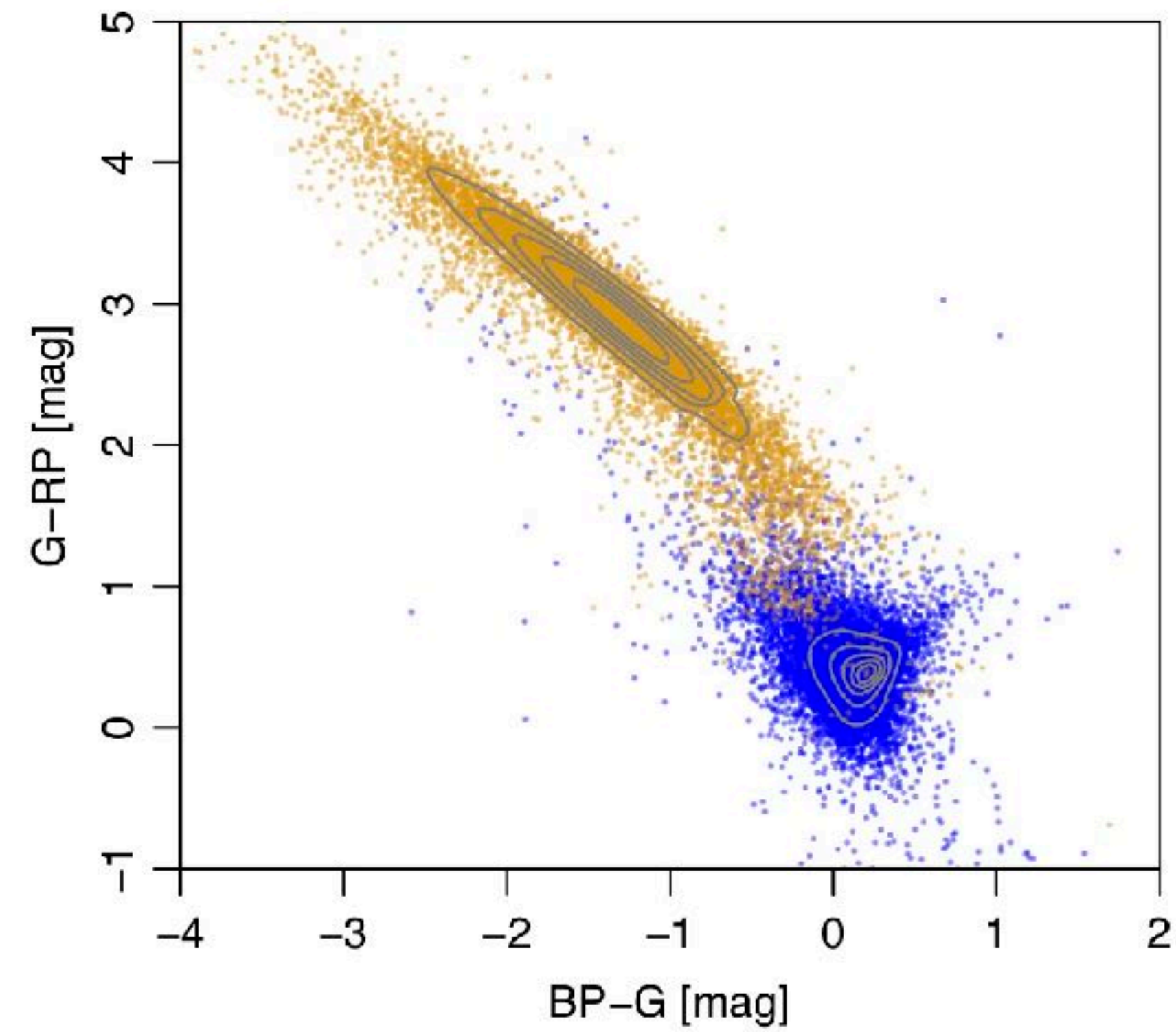


# Colour, magnitude distributions of extragalactic candidates

## Full set



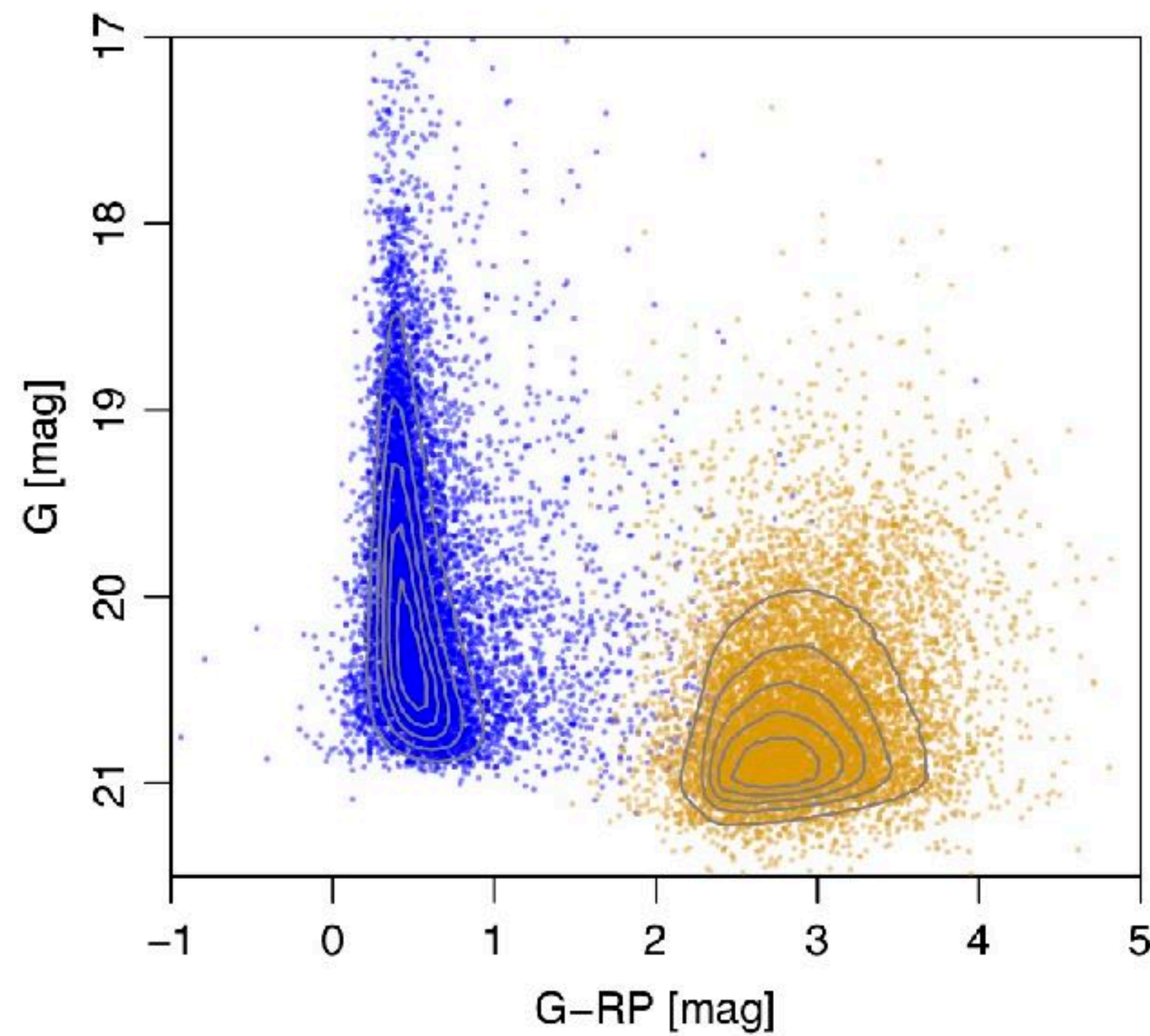
blue = quasars  
orange = galaxies



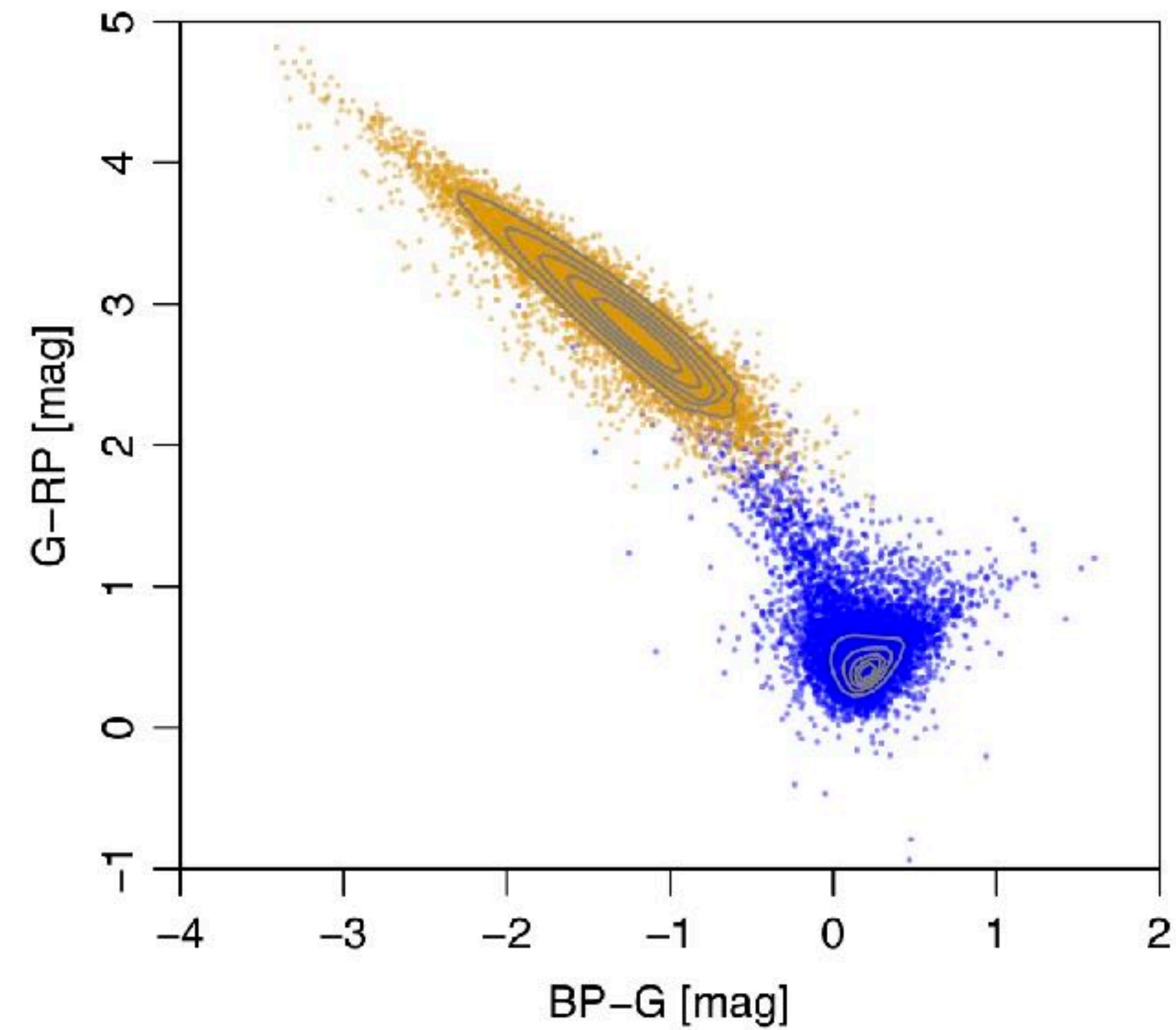
10 000 random sources of each class, linear density contours of full set

# Colour, magnitude distributions of extragalactic candidates

## Purer subset



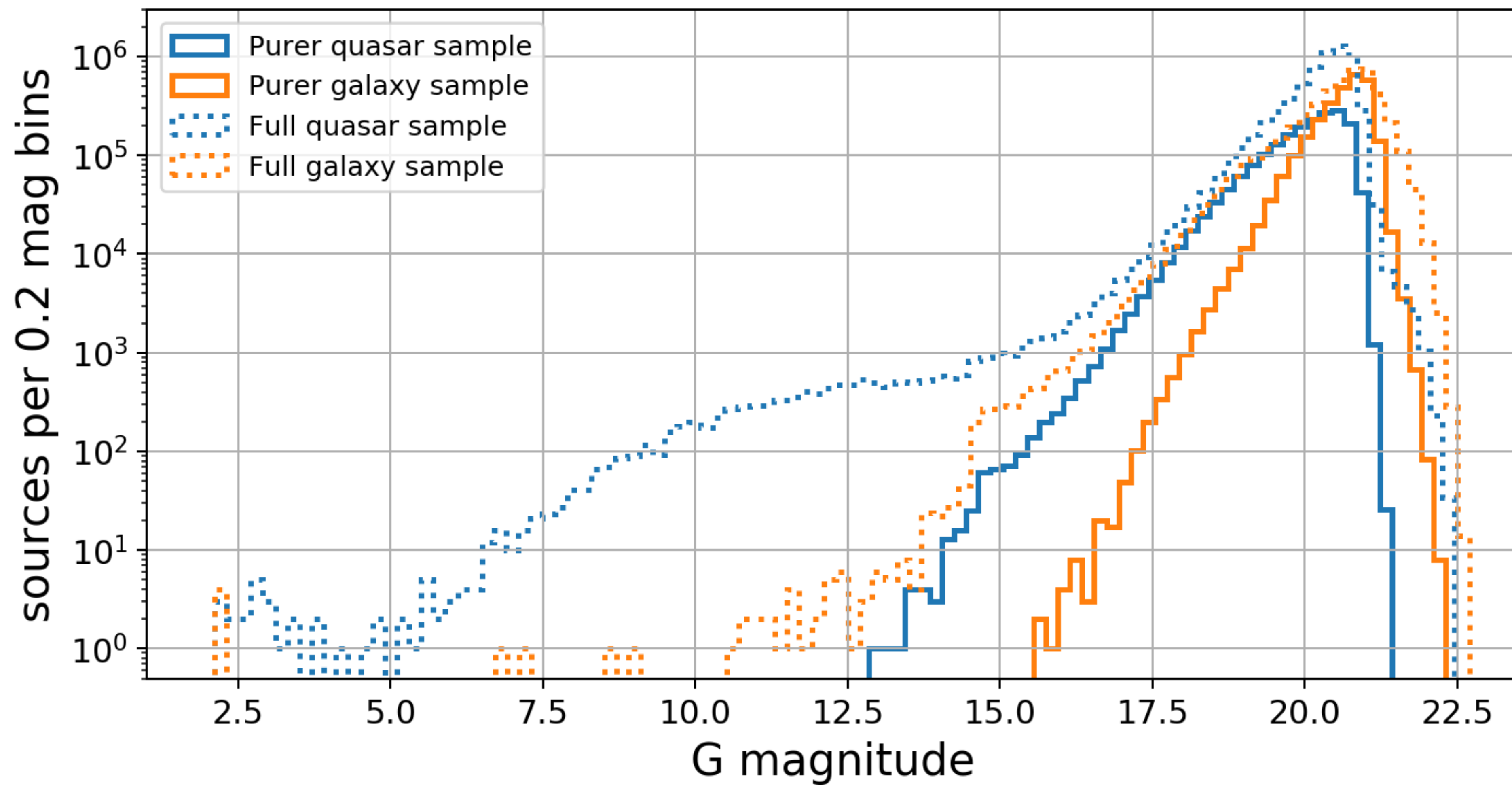
blue = quasars  
orange = galaxies



10 000 random sources of each class, linear density contours of full set

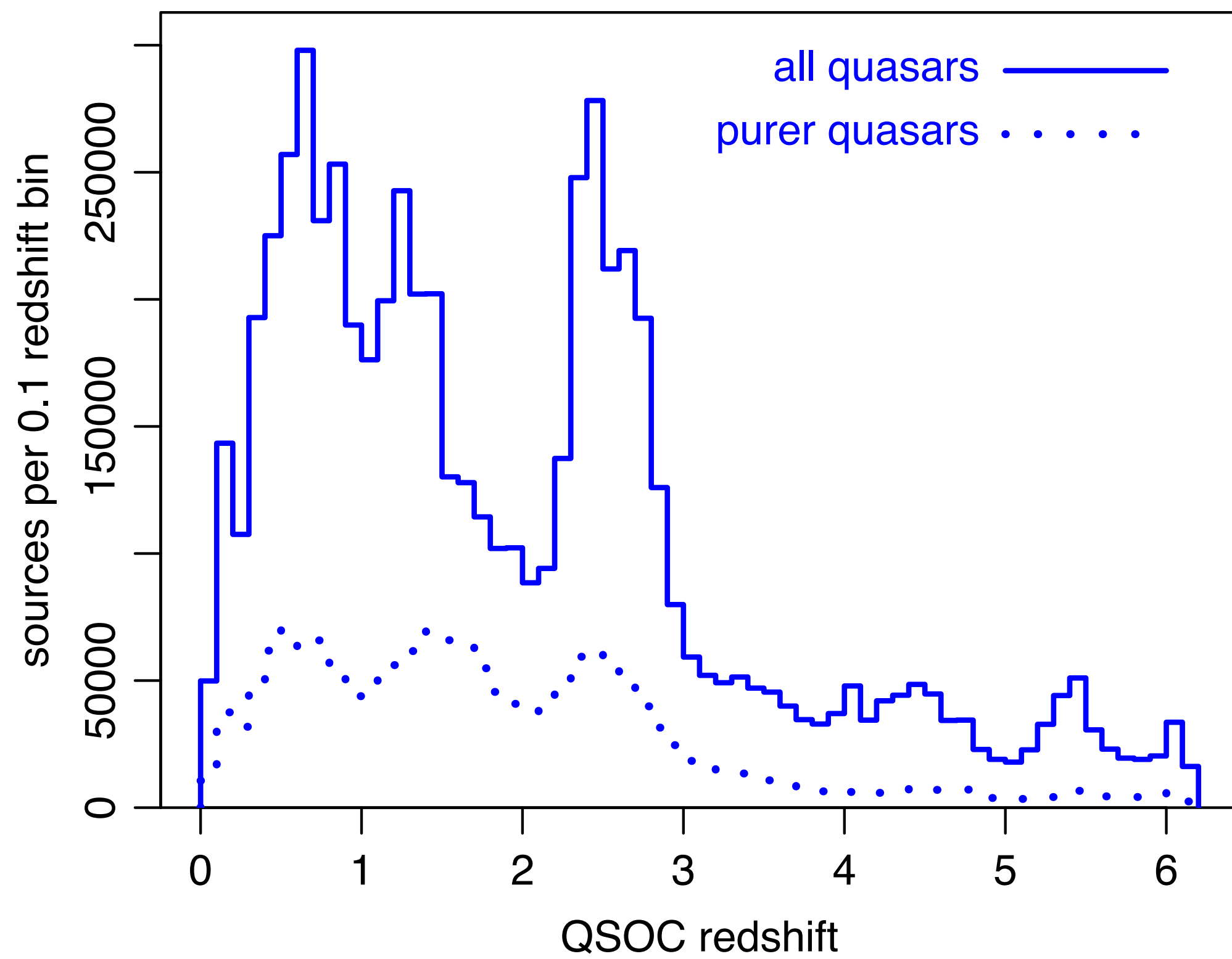


# Magnitude distributions

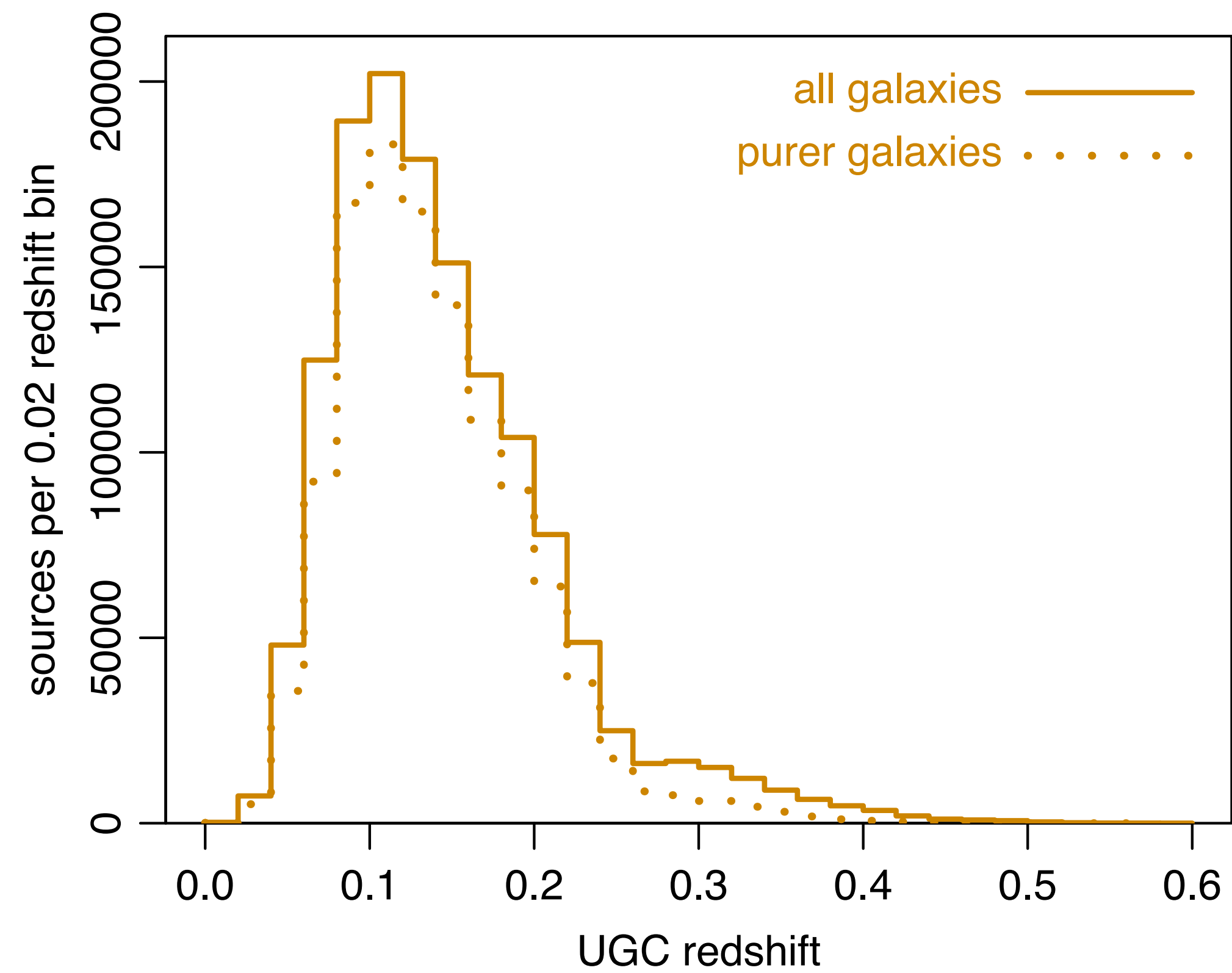


# Redshift distributions

6.4 million and 1.7 million sources



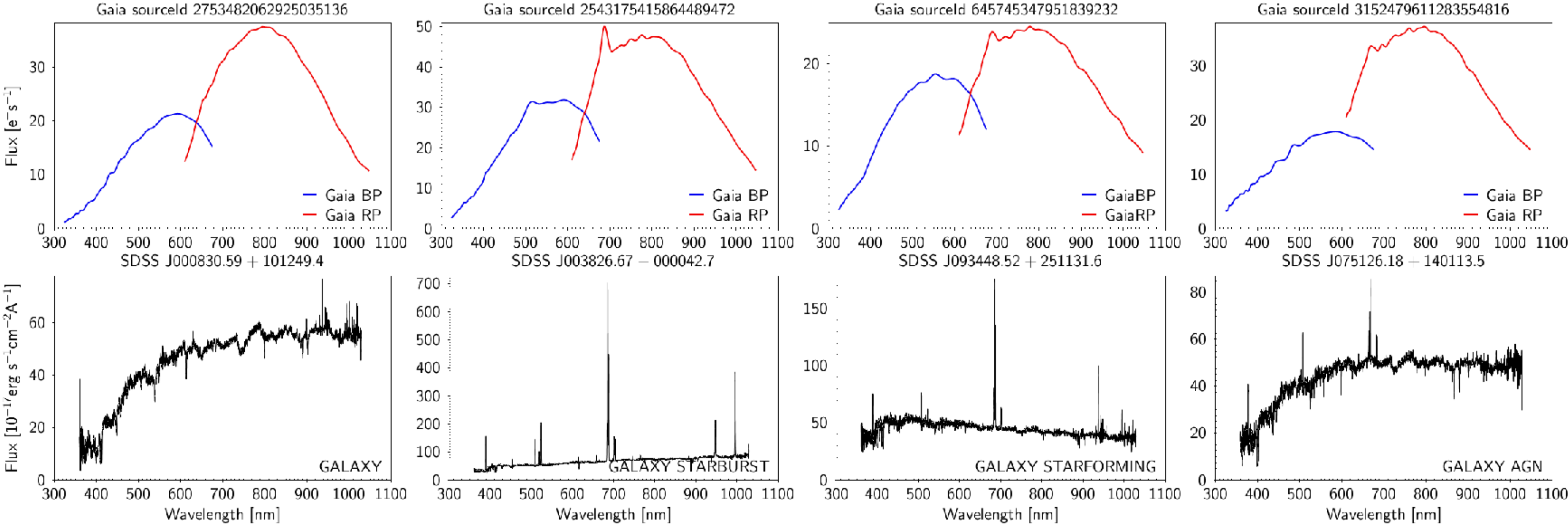
1.4 million and 1.1 million sources



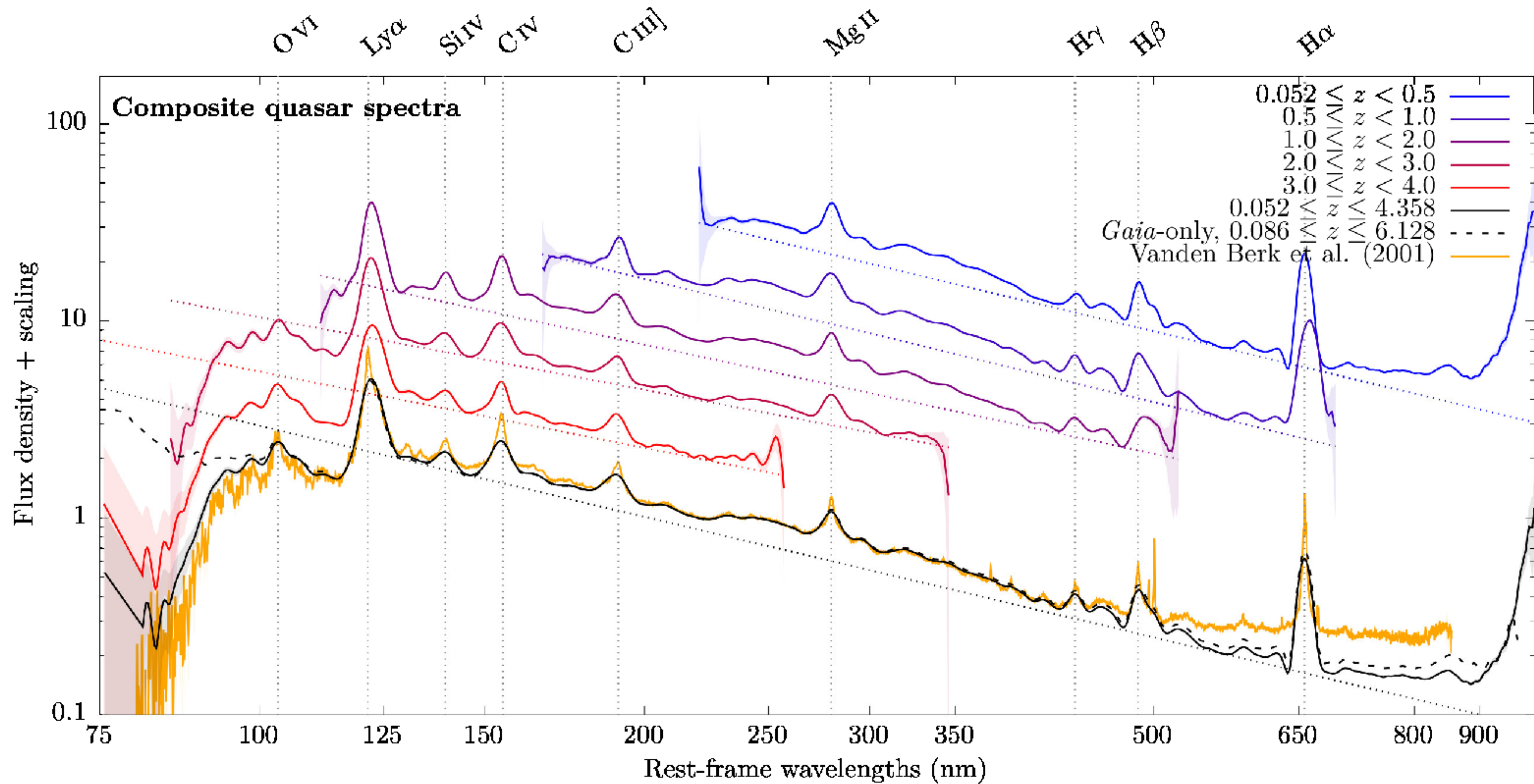
# BP/RP spectra

163 000 quasar candidate spectra published (119 000 in purer subset)  
26 500 galaxy candidate spectra published (12 600 in purer subset)

## BP/RP compared to SDSS for some galaxy candidates

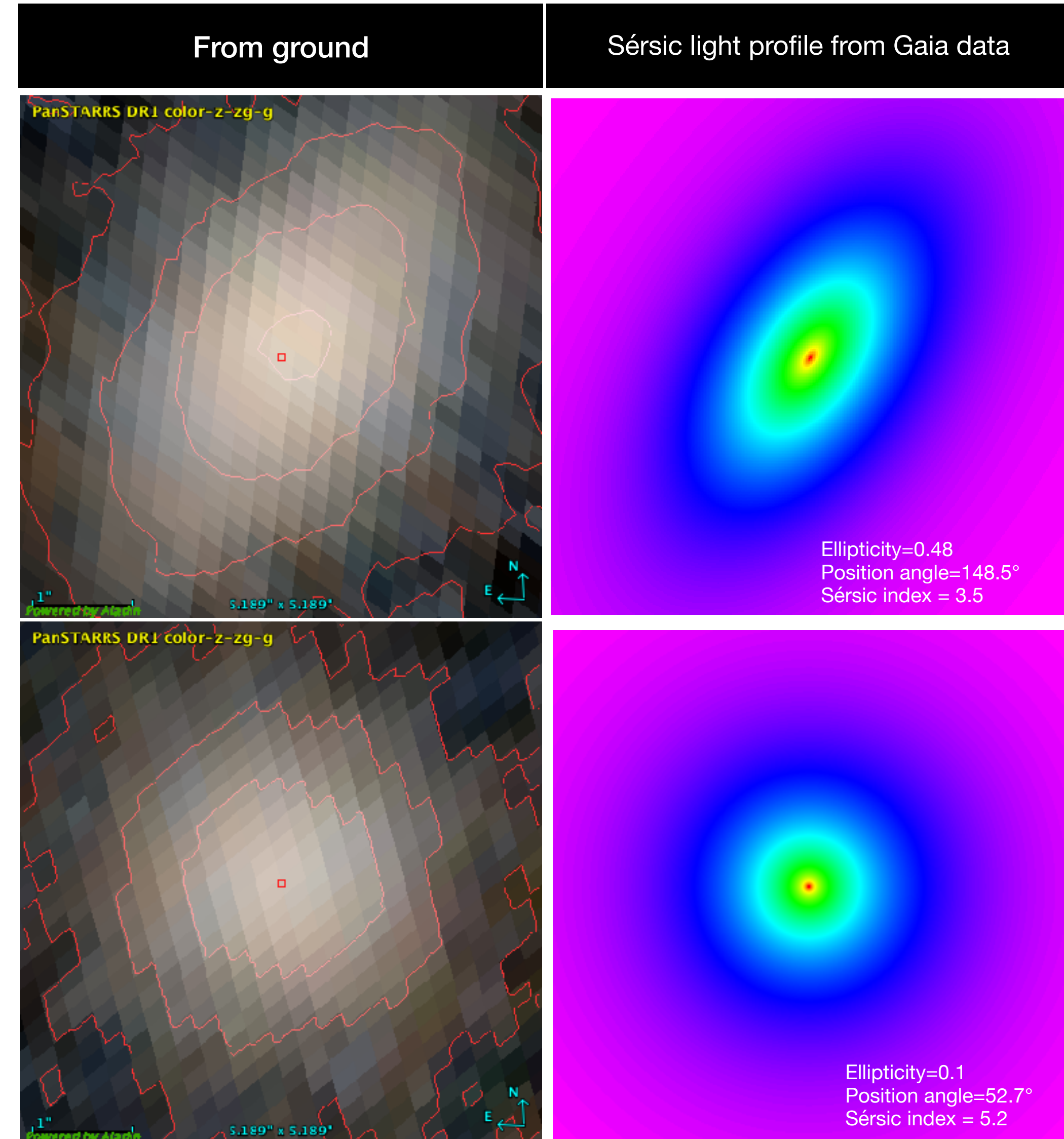


# Quasar composite spectra



# Surface brightness profiles

- 65 000 host galaxies of quasars detected
- 16 000 host galaxies of quasars with a fitted Sérsic profile
- 915 000 galaxies with fitted Sérsic and de Vaucouleurs profiles



# Summary

- Candidate tables are a mixture of input lists and Gaia data classification
- Complete tables
  - ▶ 6.6 million quasar candidates, 4.8 million galaxy candidates
  - ▶ 50 - 70% pure
- Purer subset (using a simple ADQL query)
  - ▶ 1.9 million quasar candidates, 2.9 million galaxy candidates
  - ▶ 95% pure
- Classifications, BP/RP spectra, redshifts, and 2D spatial profile fits