Polarization of active galactic nuclei with significant VLBI-Gaia displacements

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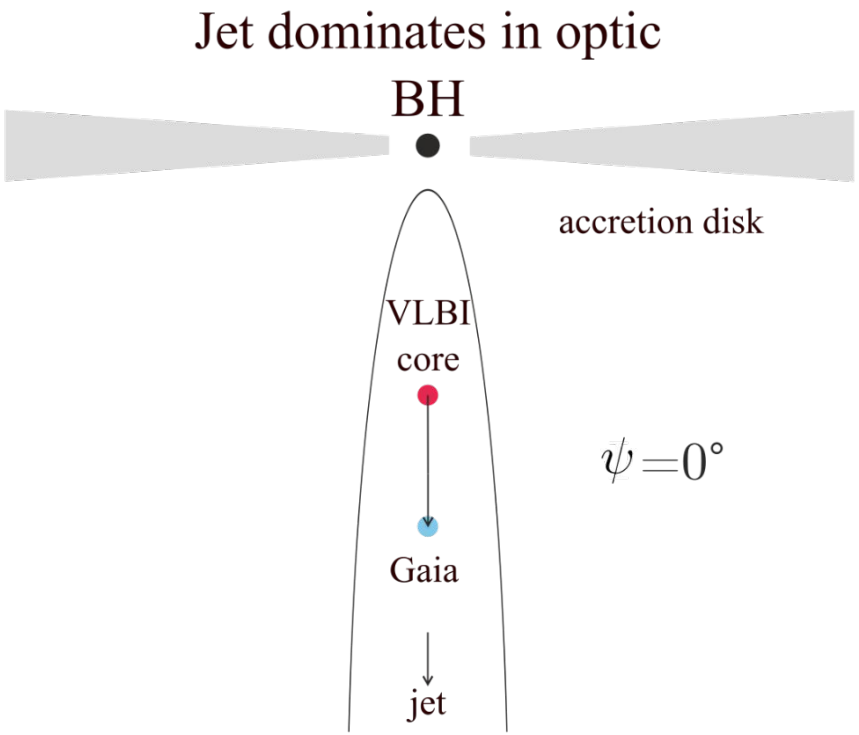
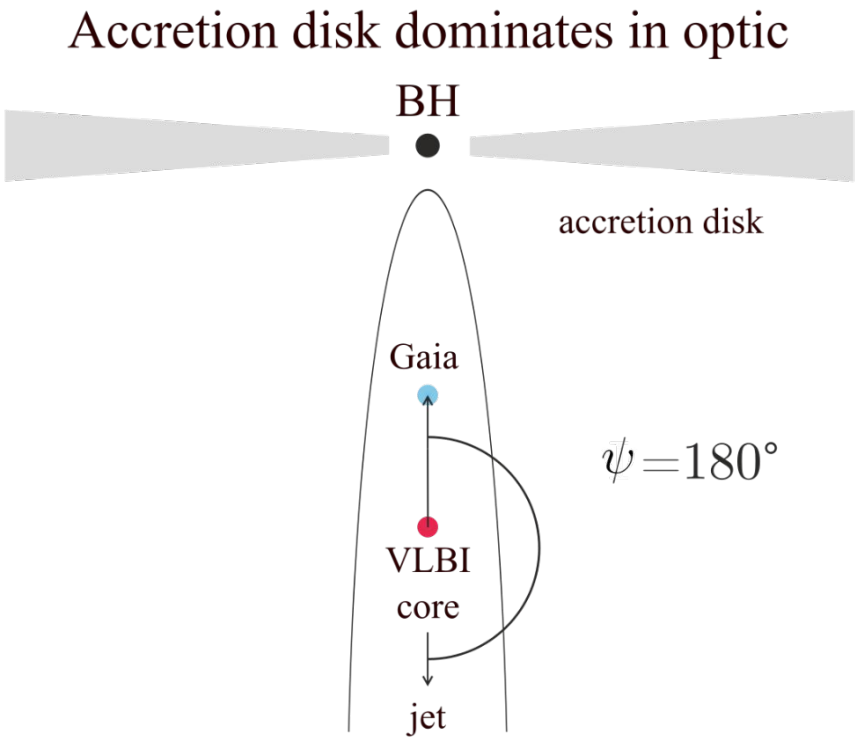
Introduction

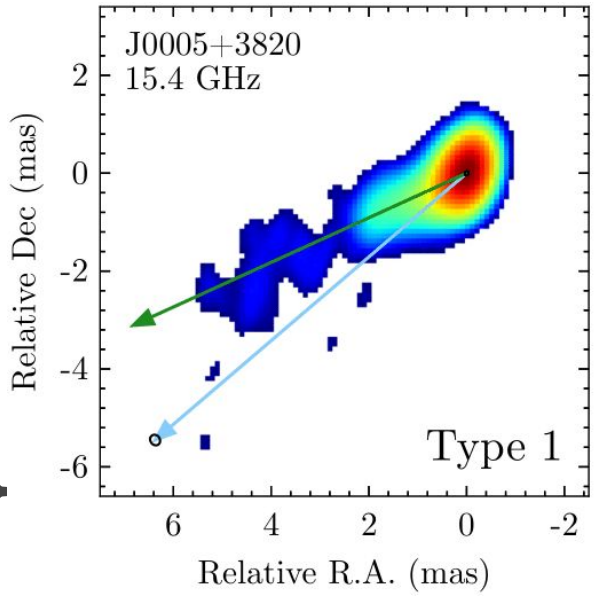


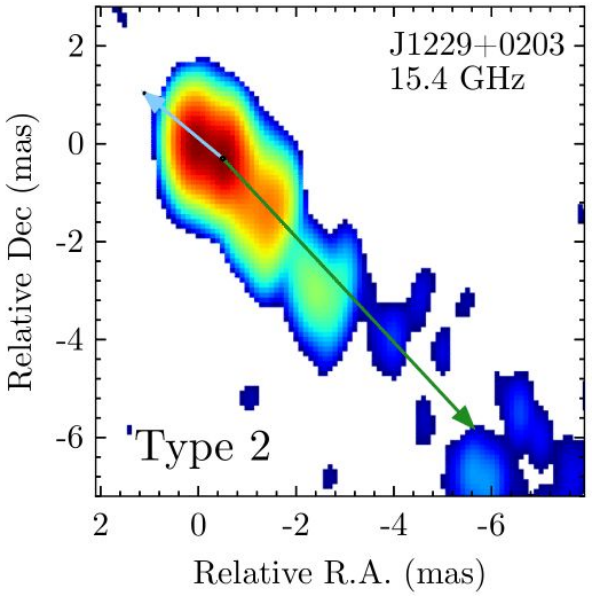


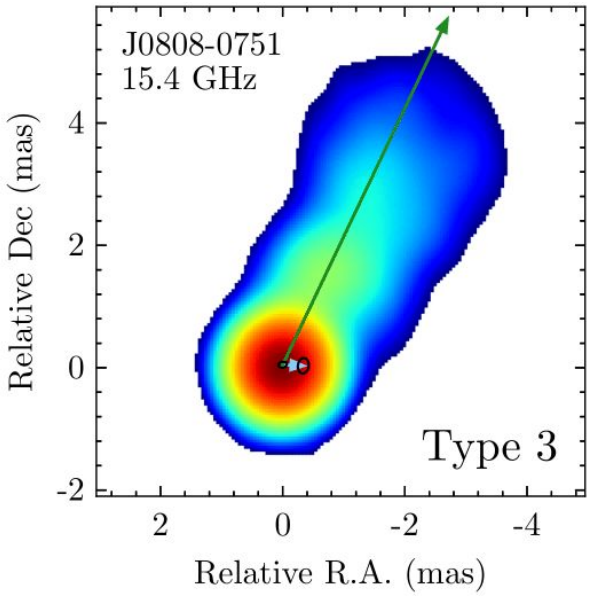
Astrometric data

radio catalogues: **ICRF3, OPA2023a** and **RFC2022c**

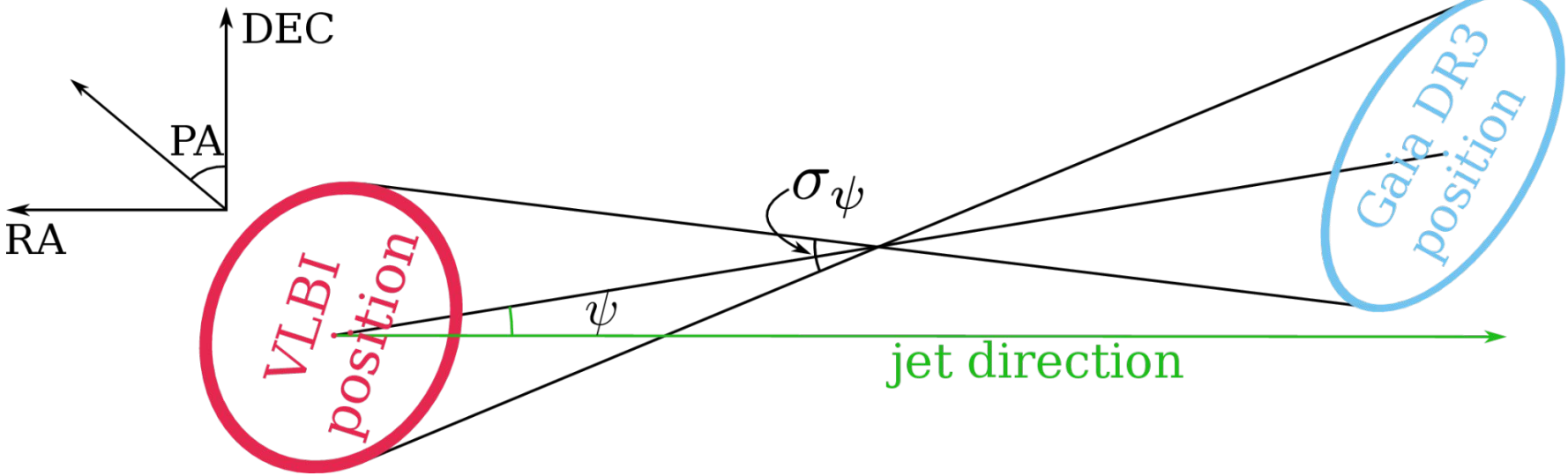
optical catalogue: **Gaia DR3**







Determining significant offsets



Optical polarimetric observations

One-band data:

- **47** objects: utilizing FOcal Reducer/low dispersion Spectrograph 2 FORS2 at the Very Large Telescope (VLT) of the European Southern Observatory (ESO), between November 2019 and March 2020
- **92** objects: with the RoboPol polarimeter at the 1.3-m telescope of the Skinakas Observatory in Greece, between July 2017 and July 2022

Two-bands data:

- **21** objects: with the RoboPol polarimeter at the 1.3-m telescope of the Skinakas Observatory in Greece, between July 2017 and July 2022
- **18** objects: utilizing the multimode optical instrument Calar Alto Faint Object Spectrograph (CAFOS) at the 2.2-meter telescope at the Calar Alto Observatory (CAHA) in Spain, the observations were performed on the nights of November 28 and 29 and December 30, 2019

Archival data

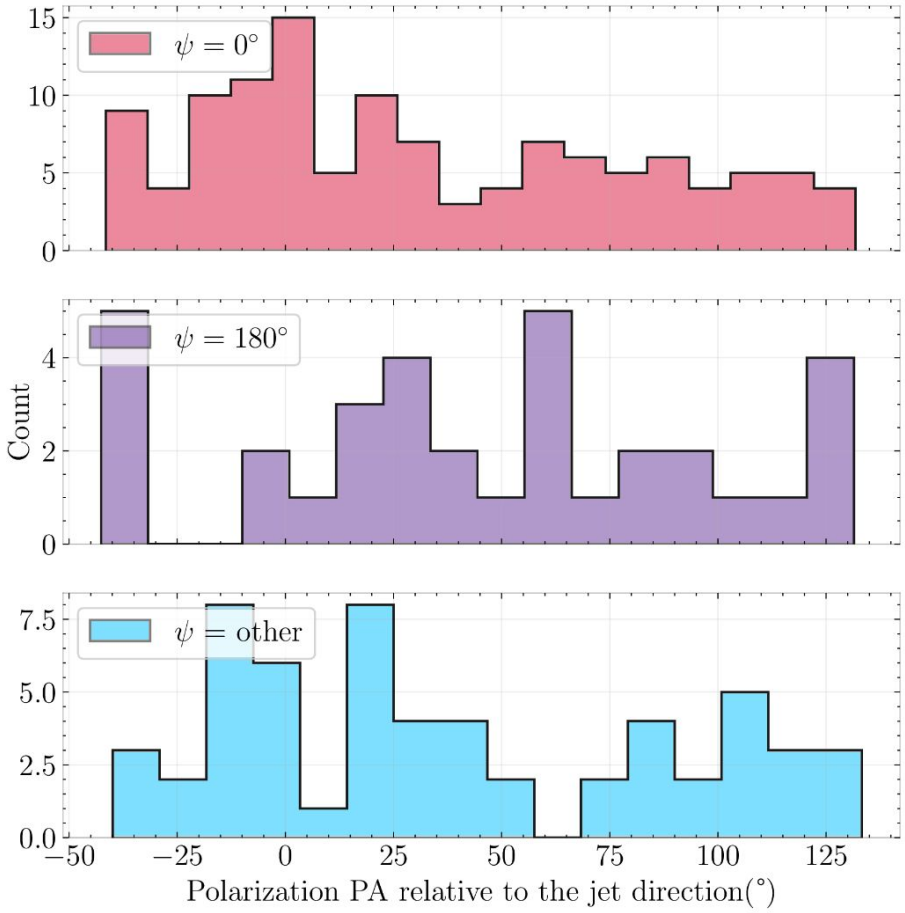
Our observing data were complemented with archival optical polarization data collected and analyzed by:

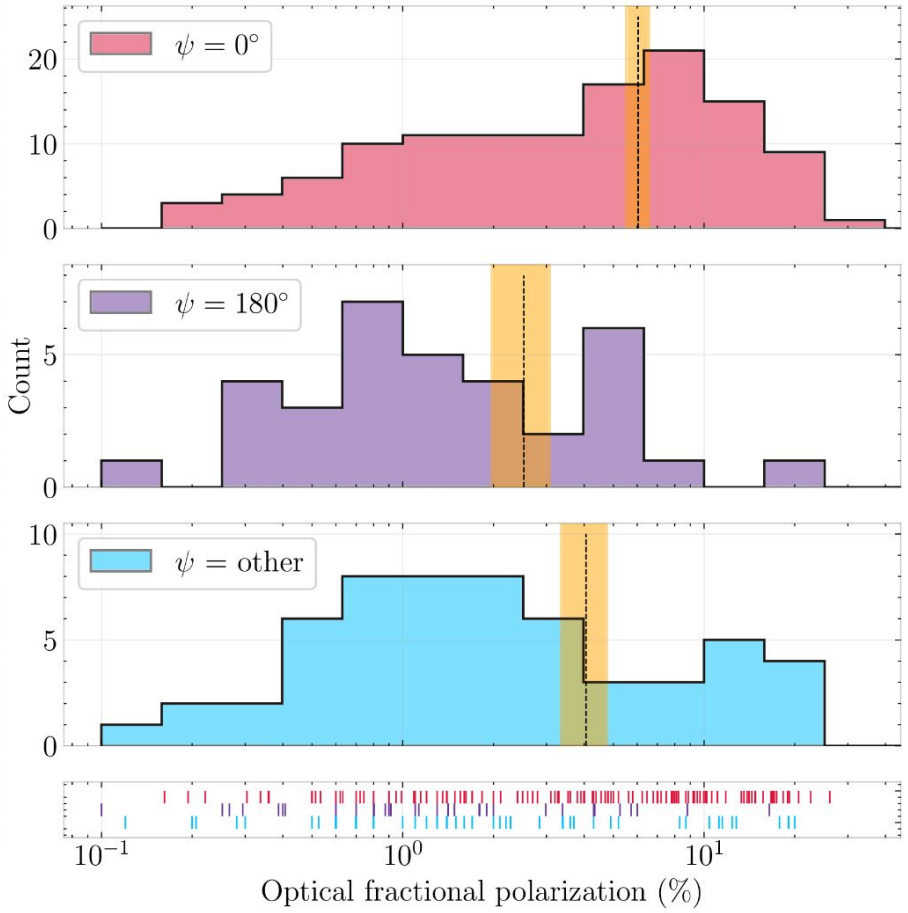
- **287** objects: Kovalev et al (2020)
- **23** objects: Friedman et al. (2020)

We also utilized the millimeter-band polarization data from the Planck Catalog of Polarized and Variable Compact Sources:

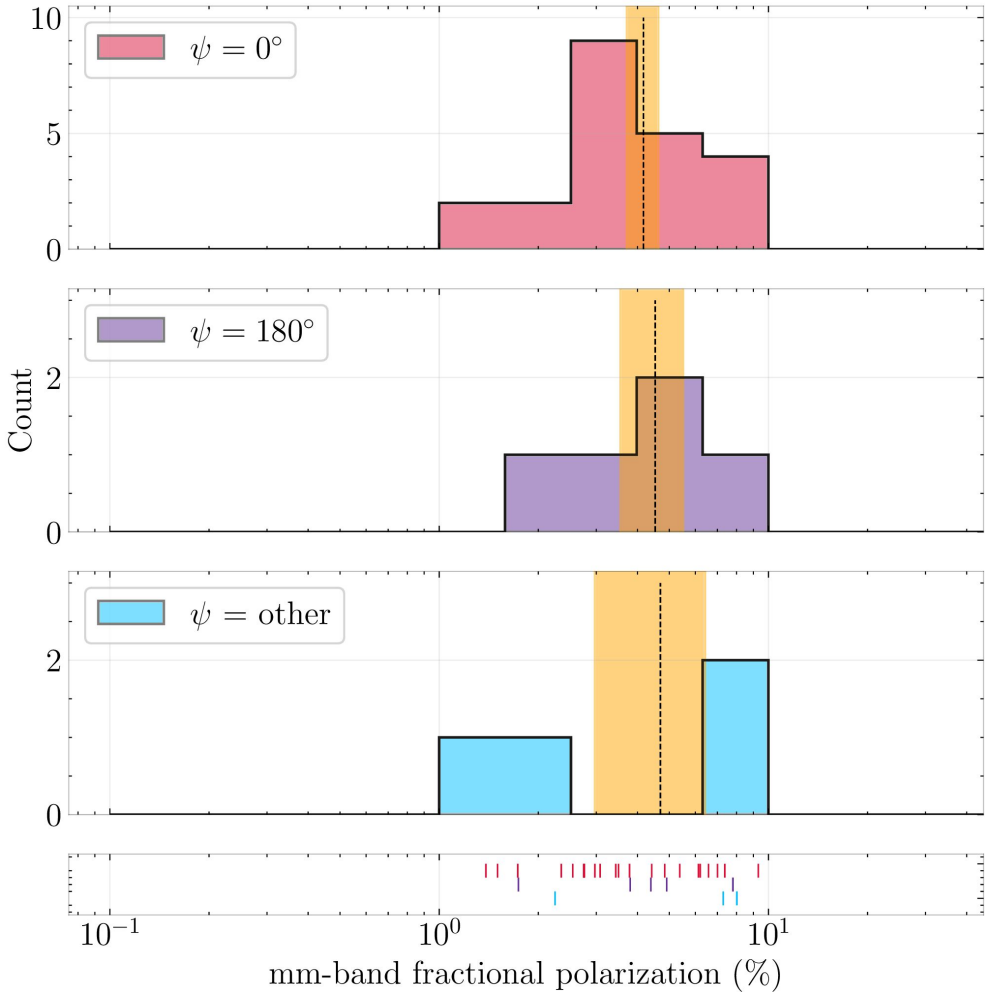
- **95** objects: Rocha et al. (2023)

Optical polarization

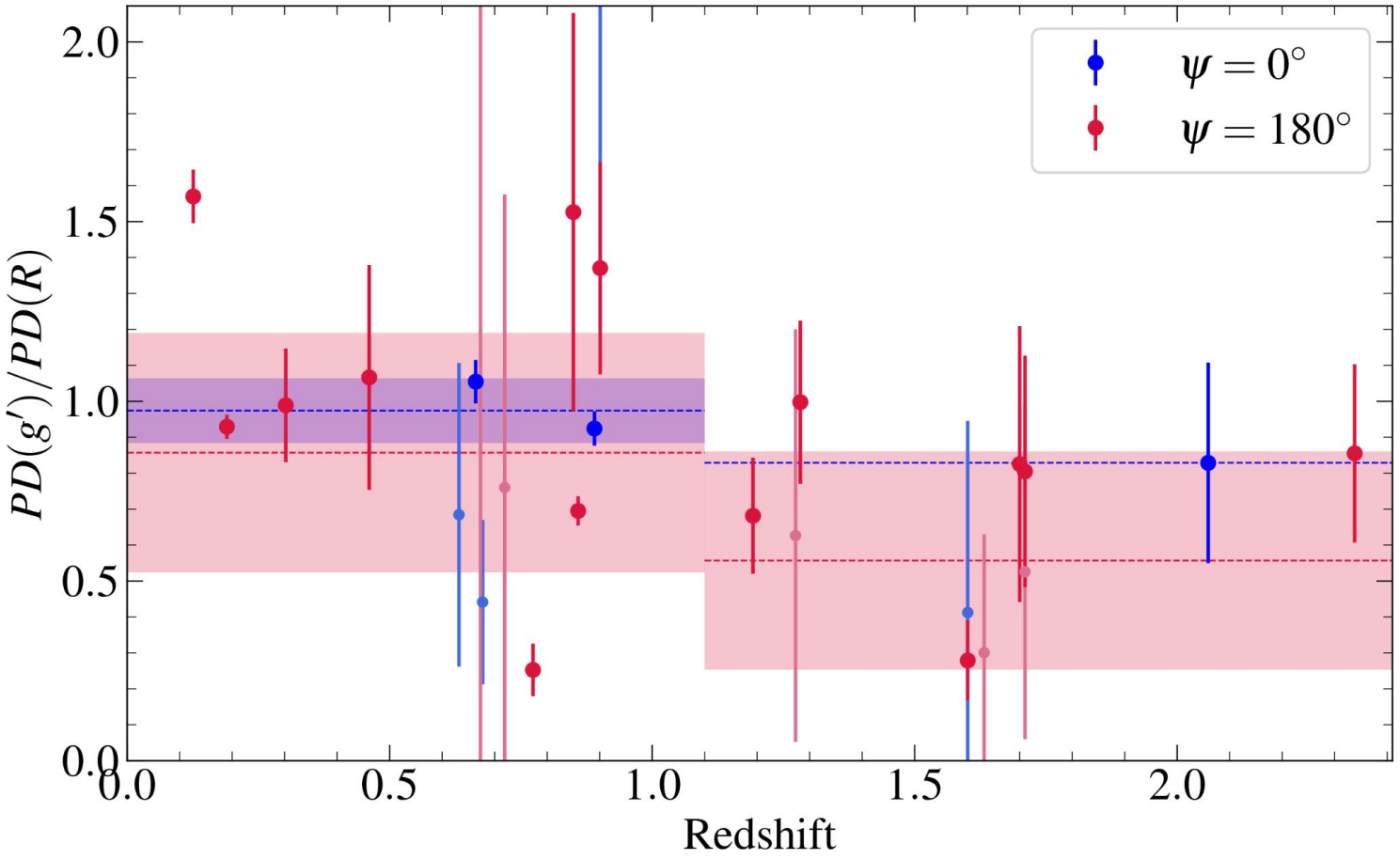




Millimeter-band polarization



Dependence of the optical polarization spectrum on the redshift



Results

1 For downstream VGDs the optical emission is highly polarized due to its synchrotron nature. There is a slight tendency for these sources to align their polarization plane with the jet direction, which could indicate that the toroidal magnetic field component prevails in their jets. In contrast, for upstream VGDs the accretion disk emission dominates the total optical flux, which results in lower polarization due to scattering in a configuration close to axial symmetry.

2 Analysis of millimeter-band polarization contrary to optical emission, it shows similar distributions in the downstream and upstream VGD samples. This is explained by the fact that in both samples we only observe the jet emission in this band, we receive the synchrotron radiation, which possesses the same polarization in both cases.

3 The fractional polarization in the **g'** filter is expected to decrease relative to that in the **R** filter when accretion disk emission enters the former band pass at z~1.1. However, the small sample size and the relatively low signal-to-noise ratio of our two-band measurements did not allow us to detect the expected changes.