

Morphology of Galaxies and host galaxies of Quasars as seen by Gaia in DR3

Laurent Galluccio - Côte d'Azur Observatory

→ Scientific Objective

- First all-sky survey of Host Galaxies of Quasars from space (few tens with morphology from Hubble telescope and ~25 000 detected from ground)
- Structure of quasars in visible wavelength
- Important for the Gaia CRF
- Important for the link of Gaia celestial reference frame (optic) to International Celestial Reference Frame (radio)

→ Input List

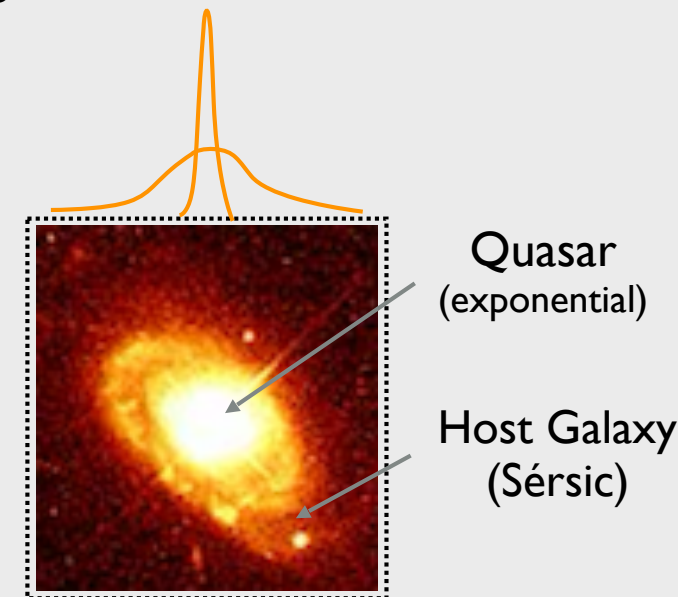
- compilation of multiple QSO/AGN catalogs : 1.4 M sources ([MILLIQUAS](#) (Flesh 2017), [ALLWISE](#) (Secrest 2015), [ALLWISE](#) (Assef 2018) [CU7](#) (Priv. Comm. L. Eyer), [LQAC3](#) (Souchay 2015), [ICRF2](#) (Ma 2009), [SDSS](#) [DR12](#) (Pâris 2015))
- Filtering on Nb of transits, angular coverage : 1.1 M sources remain

→ Informations

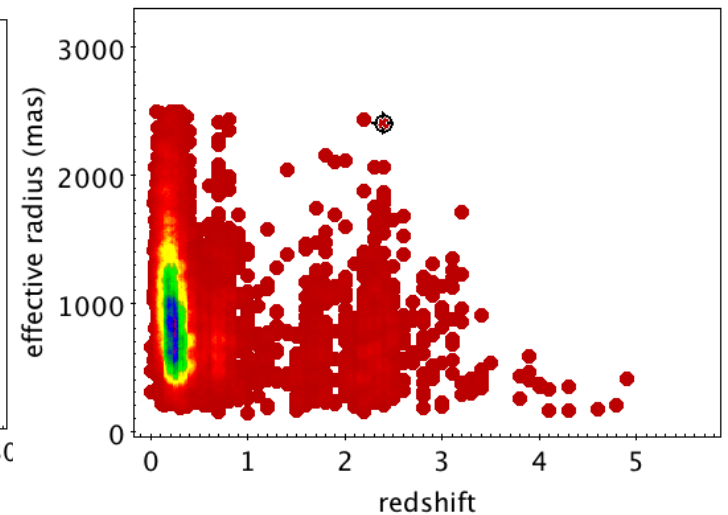
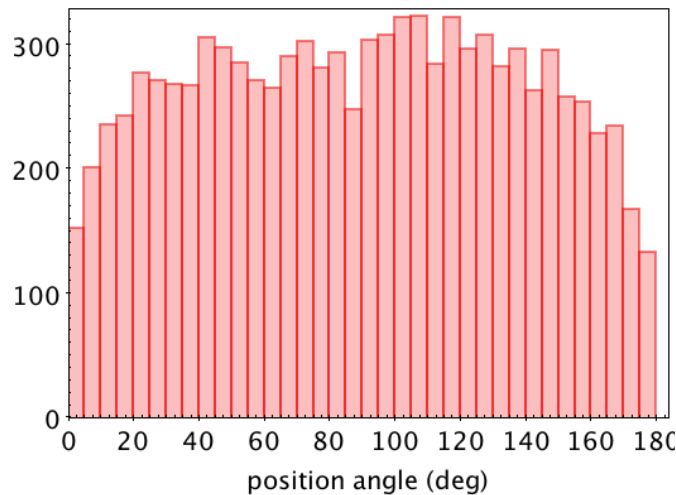
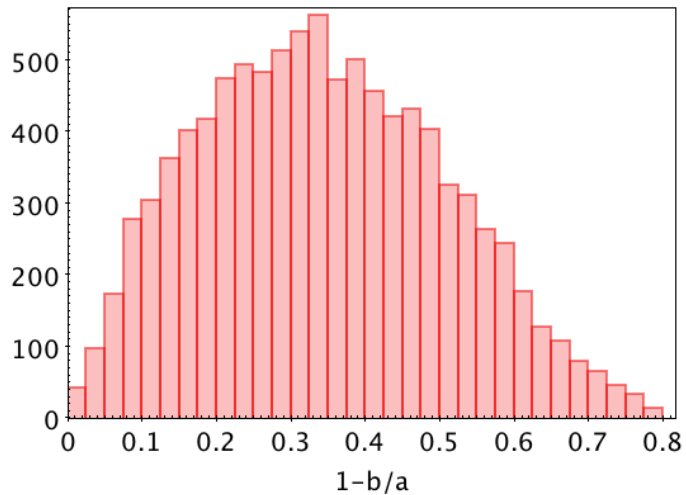
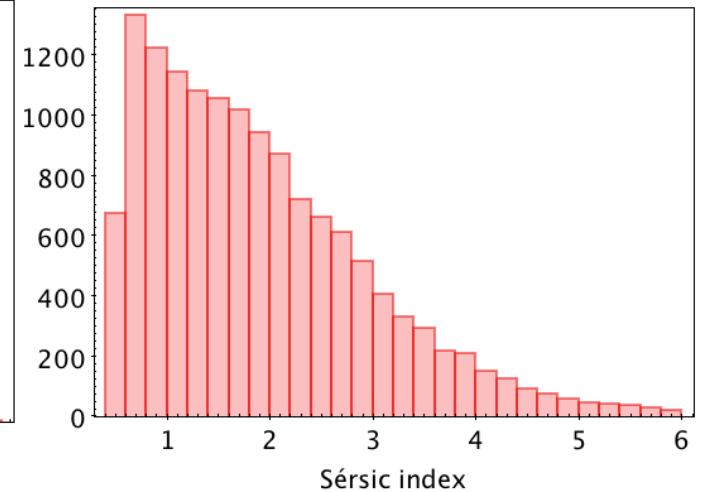
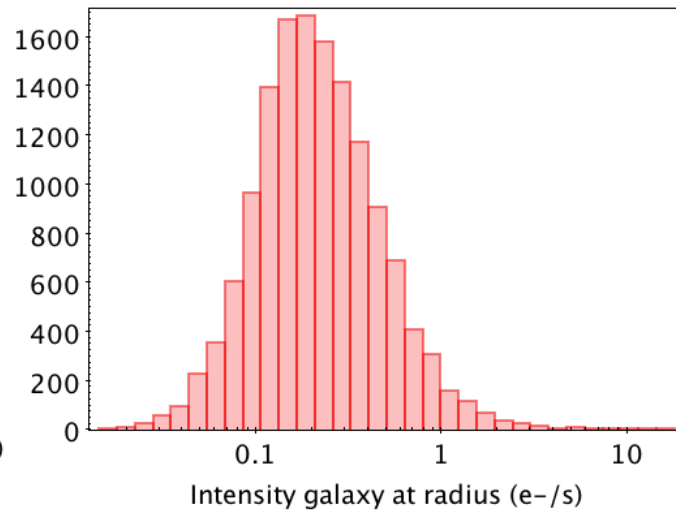
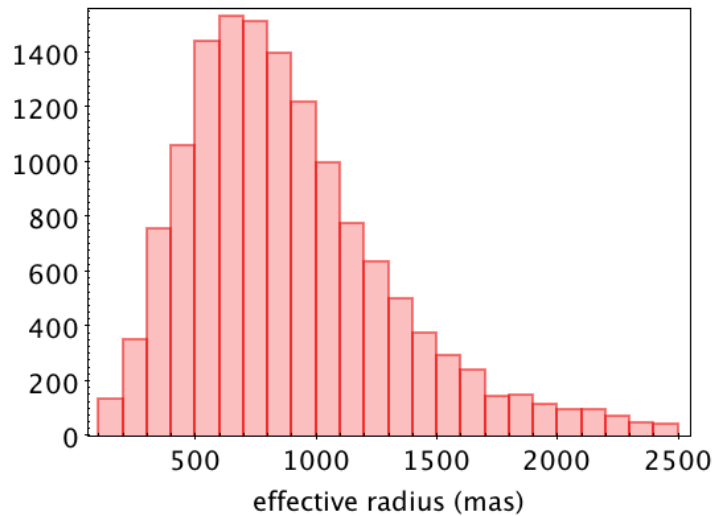
- Indication of the **presence or absence of a Host Galaxy**
- Host galaxy light profile for a sub-sample
- Quality flag

→ Results for DR3

- 1.1 M sources processed, ~28 million transits analysed
- Host galaxy detected (64 498 from which 15 867 published light profile + covariance matrix)
- No host detected (861 451)

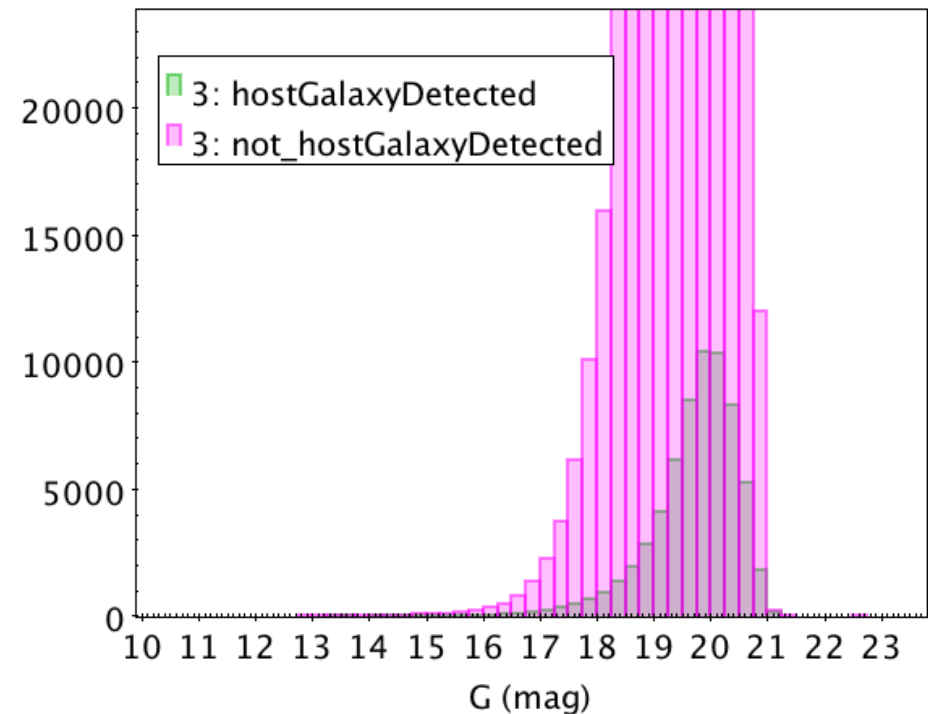
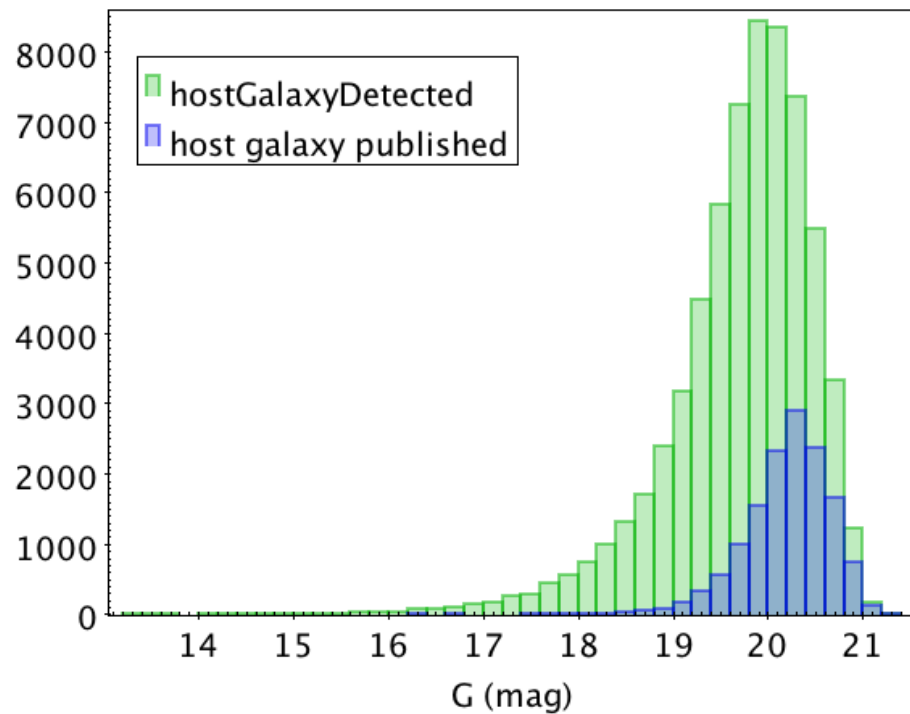


Host galaxy of Quasar - properties

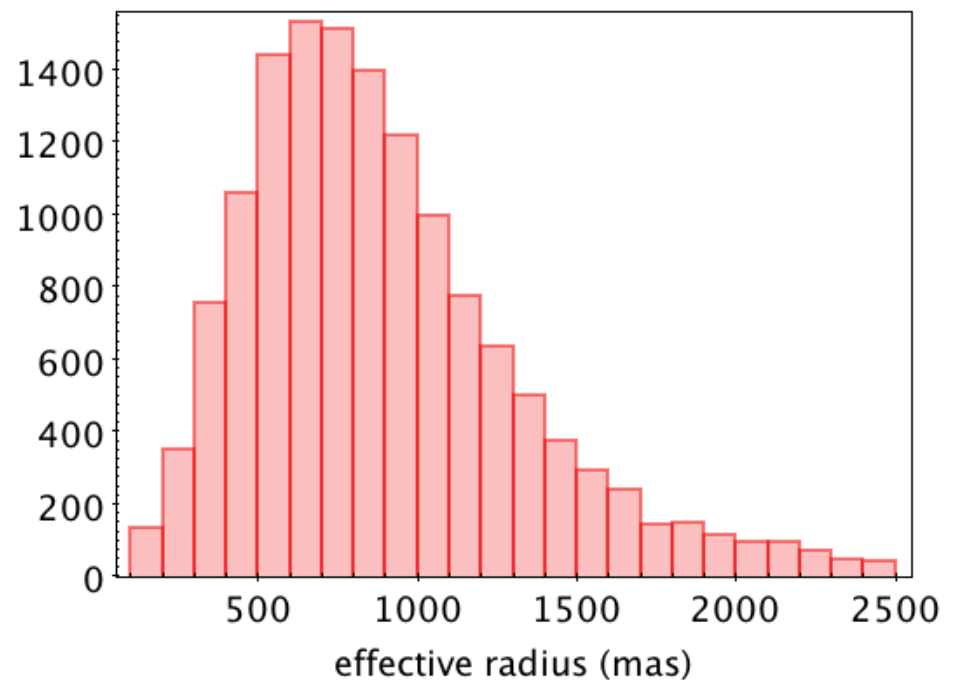


- ➡ 15 807 Published profiles
- ➡ most redshift < 0.5

Host galaxy of Quasars - properties



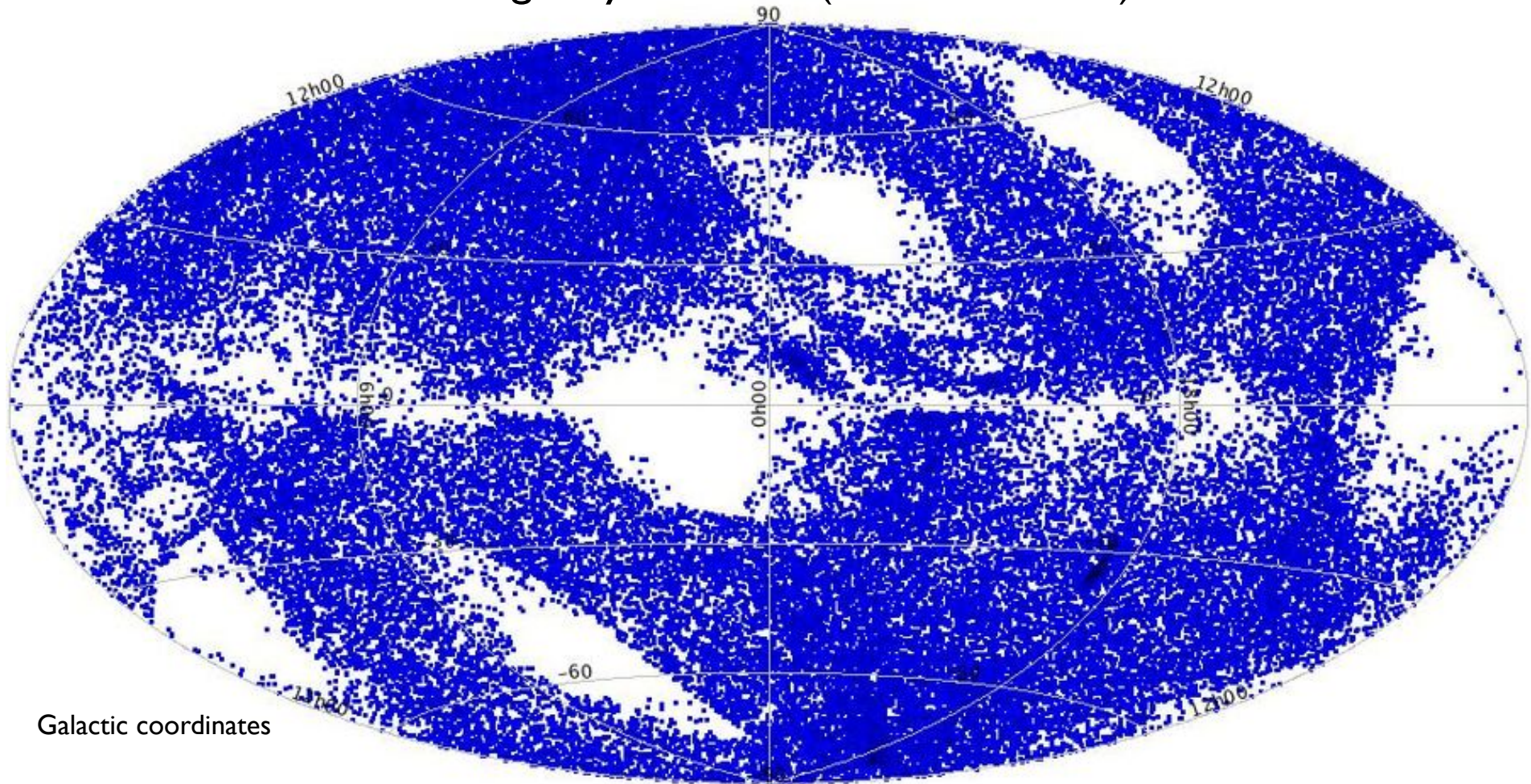
- ➡ Published profiles : faint sources (limitation on size by Gaia windows)
- ➡ "Host Galaxy detected" flag for closest sources
 $135 \text{ mas} < \text{radius} < 2500 \text{ mas}$
possible stellar contamination for $\text{rad} < \sim 200 \text{ mas}$



Quasar : Spatial repartition

■ 1: HostDetected

Host galaxy detected (64 498 sources)



Galactic coordinates

➡ Inhomogeneous, scanning law, filtering on nb of transits

➔ Scientific Objective

- First space-based survey of galaxies at that resolution (~ 180 mas)
- Study of the local Univers content
- Luminosity profiles of tiny galaxies never observed from ground

➔ Input List

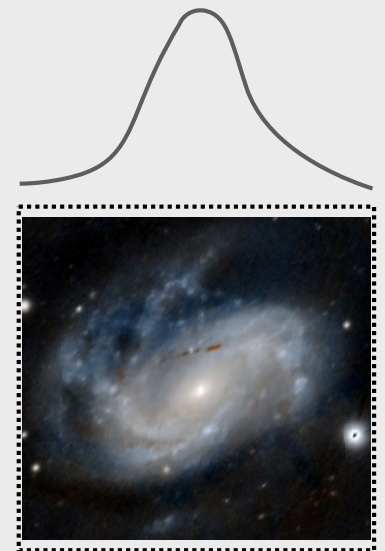
- Galaxies identified in DR2-ALLWISE : unsupervised classification method 1.9 M objects (Krone-Martins+,2021, high astrometric excess noise $> 4 + G-WI > 2 + G > 14$ HDBSCAN + SVM on astrometry+photometry + classification "star" or "galaxy").
- Filtering on Nb of transits, angular coverage : 1 M sources remain

➔ Processing and Post processing

- EOR 2021 June 14 (21 days)
- 3 profiles fitted (Sérsic, de Vaucouleurs, exponential)
- Flag about consistency and quality of result

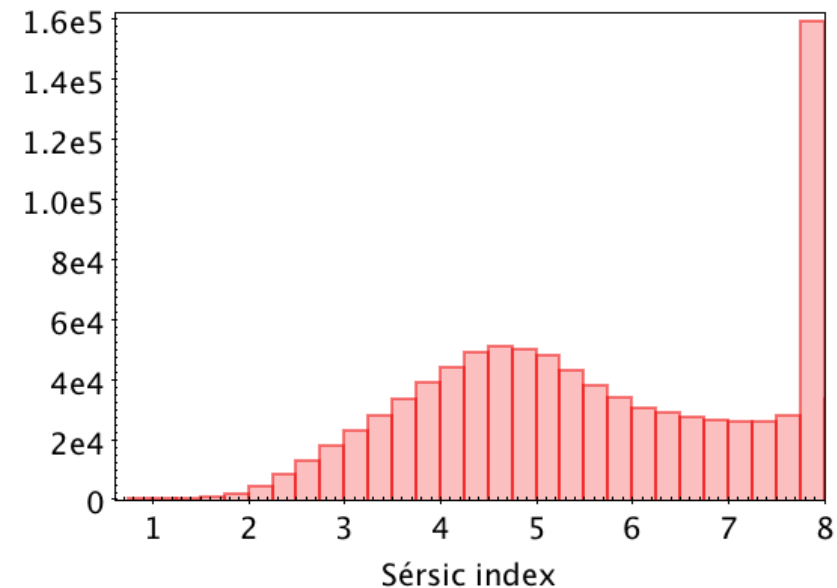
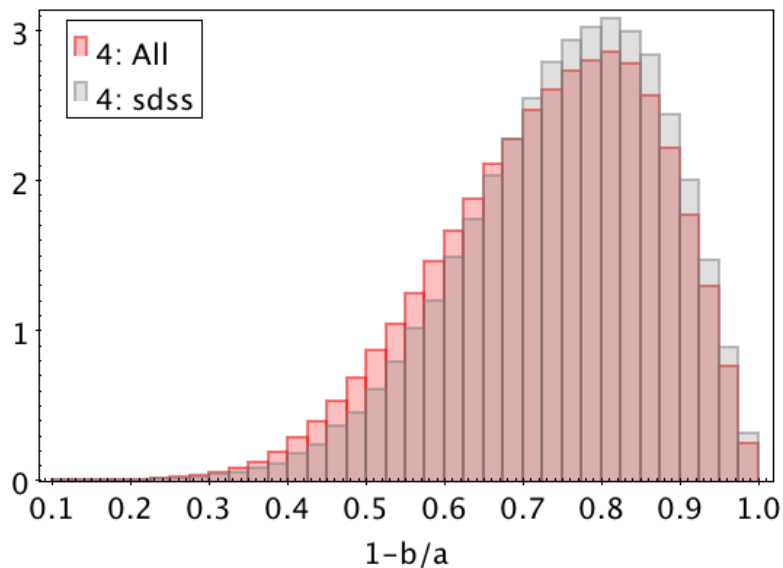
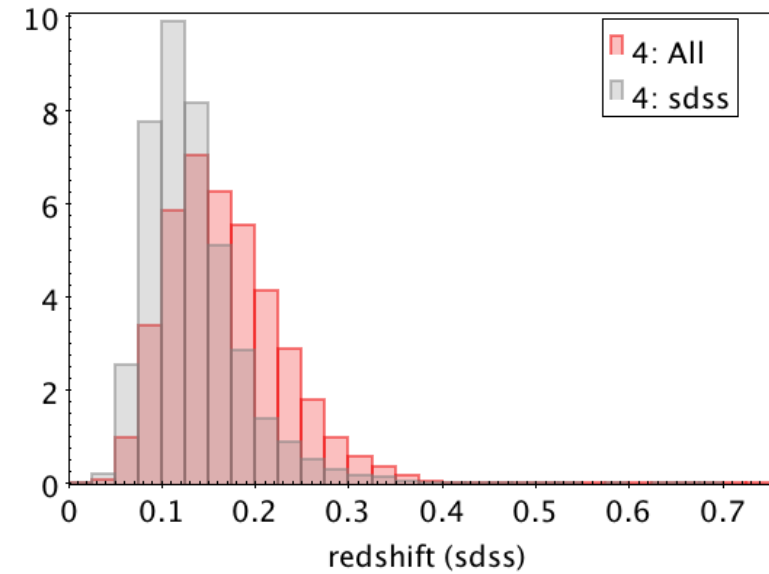
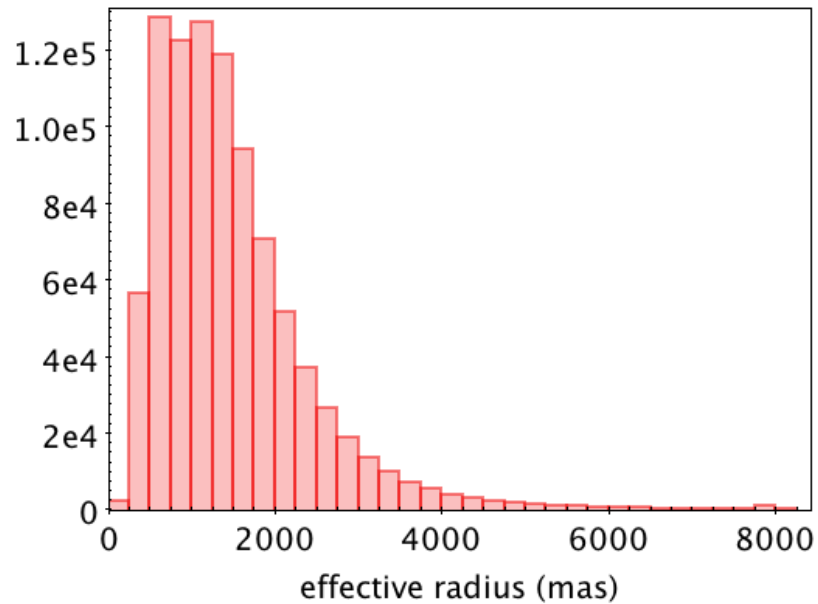
➔ Results for DR3

- 918 620 published sources
- parameters of 3 morphologic light profiles + covariance matrix
- Flag of quality



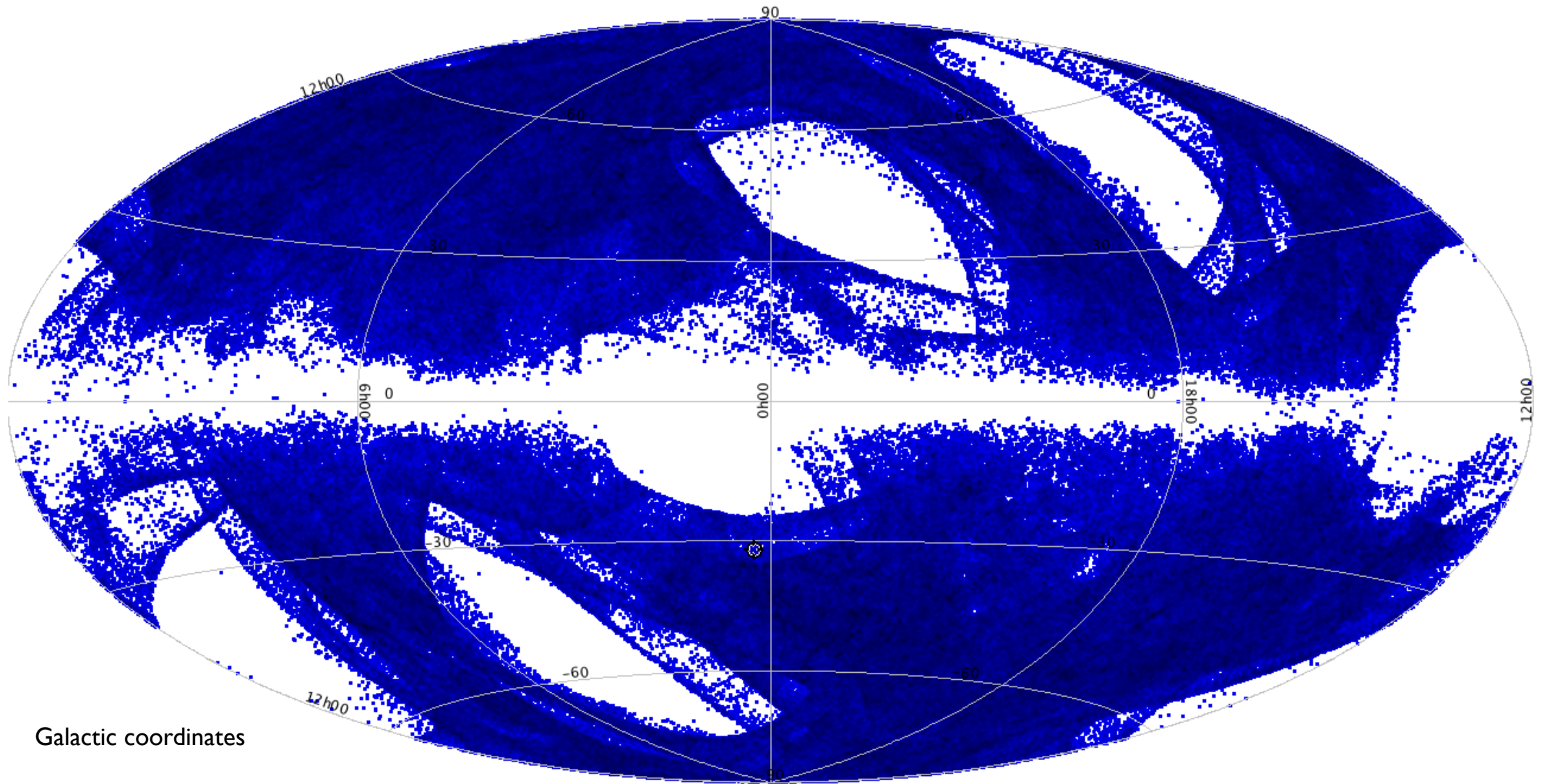
X 3 profiles
(Sérsic, de Vaucouleurs, exp)

Galaxy - Properties



- radius ~ 1500 mas [200 - 8000 mas] with avg_zph ~ 0.17 [0.01, 0.72]
- SDSS comparison sample closer than this catalog
- Light systematics in ellipticity (sdss : ground based, Gaia space based) different resolutions
- Sérsic index ~ 4-5 : majority of bulges detected by Gaia, very few discs

Galaxy : Spatial repartition



➡ Inhomogeneous, scanning law, filtering on nb of transits

- Quasar's hosts&galaxies light profiles hosted in two tables compiling results from other DPAC pipelines dedicated to extra-galactic sources
- Several millions of quasar and galaxy candidates expected
- Information provided in these tables :
 - Supervised classification as quasar or galaxy based on BP/RP spectroscopy, and integrated photometric light-curves respectively, and their associated probability
 - Redshifts for a subset of those sources (around one million sources)
 - Morphological parameters for galaxies (around one million sources) and host galaxies of AGN (several thousand sources)
 - Selected properties for AGN based on integrated photometric lightcurves
 - The Gaia-CRF3 sources published in EDR3 will also be merged together with those candidates

Thank you !