The SDSS quasars as a testbench for the Gaia fundamental reference frame grid-points

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THE BEGINNING

Gaia is an ESA mission, planned to be launched in November 2013, it will perform astrometric measurements with an accuracy down to 20 µas, that require a well defined grid of points which constitute the fundamental Gaia reference frame. Due to their point-like appearance and the cosmological distance QSOs are the best objects to define such reference frame. Along the five years – the predicted duration of the mission – Gaia will detect ∼60000 QSOs, and the extreme accuracy in its positions will produce a reference frame that will change the future paradigm of the International Celestial Reference Frame–ICRF [1].

QSOs are active galactic nuclei so powerful that their luminosity may surpass that of the entire host galaxy by 2 or 3 magnitudes. So QSOs are not real point-like sources they just appear to be.


For the 5458 QSOS

In figure 7 one can see that the larger fraction of extended sources appears for absolute i magnitudes Mi~<25 to Mi~<26. All parameters revealing similar behavior. In figure 8 is noticed that the largest fraction of extended sources are detected for redshift z~1 to z~2, is interesting to see that the SHARP and SROUND parameters reveal an increase in the fraction of extended objects for redshifts of z~2.5, though the last bin has no statistical meaning and for that is not considered in the analysis.

COMPARISONS WITH OTHER CLASSIFICATION METHODS

We already started some comparisons with the classification available in SDSS DR7 QSOs catalog [4], which is based in the difference between the PSF magnitude (more suited to point-like sources) and the model magnitude (more suited to extended sources because makes use of light profiles typical of galaxies). Our first test revealed that our method fails the classification in the extreme extended and bright sources, but on the other hand appears to be more sensitive to the presence of the host galaxy in higher redshift regime.

OBTAINING ABSOLUTE MAGNITUDES

Due to the redshift effects is not trivial obtain absolute magnitudes. It is necessary to apply k-corrections which depend on the redshift, on filter used to perform the observations, and on aR of the source.

In the present we are developing an algorithm to calculate absolute magnitudes in the 5 SDSS (u, g, r, i, z) we are going to use the Gaia catalog [5], which contains synthetic magnitudes obtained using the modified template technique [6]. The absolute magnitudes will be obtained for z~0.5, and the calibration will be made using the available in Schneider et al. [4].

STUDYING THE HOST GALAXY POPULATION

In general it is poorly known the relationships between the AGN and the host galaxy properties. From the observational point of view such relationships must be worked out because, due to the size of the spectrometers fibers and the smallness of the QSO emitting region, it is generally assumed that the QSO properties are representative of the host galaxy properties. From the observational point of view such relationships must be worked out because, due to the size of the spectrometers fibers and the smallness of the QSO emitting region, there is always a large fraction of light from the host when the core is studied.

The QSO age and ageing are fundamental questions for the interpretation of cosmological chronology and the formation and evolution of galaxies. Their timeline can be traced by emission lines of heavy elements such as C II and Si IV which is mainly produced in Type II supernovae, which requires long-lived progenitors. Thus, Fe emission can be used to constrain the epoch of the first star formation in QSOs host galaxies [7]. That evolution can be disclosed also from the host galaxy stellar population, brightness and colors. On the other hand the study of nearby sources revealed relationships between host galaxies morphology and fundamental properties of the AGNs [8], such as luminosity and perhaps black hole mass and/or accretion rates. By consequence those relationships permit to use the hosts morphology to obtain some insights of the evolutionary state of the AGN and the galaxy itself.

In our investigation we seek how u, g, r, i, z magnitudes and morphological indices differences can inform about those characteristics that may reveal the story of host/AGN co-evolution.

FINAL COMMENTS

The presence of a host galaxy component in the QSO light interfere to the PSF morphology allows to trace the presence of the host galaxy, which can be used to minimize the precision issue in the Gaia context.

The study of these parameters will be explored by us in more detail, in order to seek some QSOs host properties. In the process we are developing new methods to determine absolute magnitudes, and we want also to compare different morphological classification methods.

REFERENCES

2) Andrei et al., 2009, Gaia CU3 Plenary Meeting, Turin, Italy
3) Richards et al., 2006, AJ, 131, 2766