The 2nd edition of the Roma-BZCAT

E. MASSARO¹, P. GIOMMI², C. LETO², P. MARCHEGIANI¹,
A. MASELLI³, M. PERRI², S. PIRANOMONTE⁴, S. SCLAVI¹
¹Dipartimento di Fisica, Università di Roma ”La Sapienza”, Roma, Italy
²ASI Science Data Center, ASI, Frascati, Italy
³IFC, INAF, Palermo, Italy
⁴Osservatorio Astronomico di Roma, INAF, Monteporzio Catone, Italy

ABSTRACT. The 2nd edition of the Roma-BZCAT is available on line at the ASDC website (http://www.asdc.asi.it/bzcat) and in the NED database. In this short paper we describe the major updates from the first edition.

1. Introduction

The Roma-BZCAT is a list of carefully checked Blazars originally conceived as a tool for the identification of counterparts of high energy sources. The Fermi-LAT collaboration is in fact currently using it for this purpose in various γ-ray source catalogues, like 1FGL (Abdo et al. 2010a) and 1LAC (Fermi LAT AGN Catalog, Abdo et al. 2010b).

The complete first edition of the Roma-BZCAT, only available on-line included 2728 sources (Massaro et al. 2009). The first two volumes of a printed version covering the RA intervals 0h-6h (Volume I) and 6h-12h (Volume II) have also been published (Massaro et al. 2005, Massaro et al. 2008). In addition to the catalogue tables, these two volumes present a large collection of data and the Spectral Energy Distributions (SED) of more than one hundred sources.

2. The 2nd Edition

The second edition of the Roma-BZCAT has been issued on line on May 11, 2010 (see http://www.asdc.asi.it/bzcat). Compared to the first edition it includes over 250 additional sources, many of which discovered in very recent surveys.

Plotkin et al. (2010) presented a sample of 723 optically selected BL Lac candidates based on the Sloan Digital Sky Survey Data Release 7 (York et al. 2000). However, only 106 of these objects have been added so far to the Roma-BZCAT catalogue as we decided to adopt rather severe selection criteria. In our first approach, we considered only sources with a radio flux larger than 5 mJy at 1.4 GHz and preferentially with an optical spectrum indicating a strong nuclear activity. Fainter sources, in fact, could be safely distinguished from other types of AGNs, like weak radio galaxies.

Other new blazars and blazar candidates come from lists of possible associations with γ-ray sources discovered in the LAT survey (Abdo et al. 2010b). New optical observations, most of which still unpublished, have been used to distinguish between BL Lac objects and FSRQs. We accepted this classification, but we list the BL Lacs without an available spectrum in the candidate section.
Other radio discovered blazar candidates, characterized by flat spectra, without a firmly established optical counterpart, were not considered as confirmed blazars and therefore are not included in this version of the catalogue.

Fig. 1 (top) shows the sky distribution in equatorial coordinates of all sources reported in the 2nd edition of the *Roma-BZCAT*: as expected, the North-South asymmetry is more pronounced than in the 1st edition, because newly discovered blazars are mostly in the Northern sky. The same asymmetry is apparent in the sky distribution in galactic coordinates, shown in Fig.1 (bottom), due to the absence of deep surveys in the Southern sky.

The $R$ magnitudes are taken from USNO databases and in a number of cases are affected by the presence either of large host galaxies or of very close sources. In this case, magnitudes reported with the notes $g$ for a strong host galaxy contamination, $p$ and $t$ for pair and triple systems, do not correspond to the blazar nuclear component. Moreover, radio fluxes at 1.4 GHz are mainly derived from NVSS (Condon et al. 1998) and at 0.843 GHz from SUMMS (Mauch et al. 2003; indicated in the catalogue by the note $s$) and can be affected by possible contributions originating from emission components different from the nuclear ones. Finally, we recall that the completeness in flux level of various surveys at different frequencies used for discovering blazars and other AGNs is highly non-uniform.

For these reasons it is very important to verify the selection strategy for extracting samples to be used in statistical investigations to avoid the occurrence of strong biases.

3. Types of Blazars and source naming

We use the same denomination of blazars adopted in the 1st edition. Each Blazar is identified by a three-letter code, where the first two are BZ for Blazar and the third one specifies the type, followed by the truncated equatorial coordinates (J2000).

The codes are:

- **BZB**: BL Lac objects, used for AGNs with a featureless optical spectrum, or having only absorption lines of galaxian origin and weak and narrow emission lines;

- **BZQ**: Flat Spectrum Radio Quasars, with an optical spectrum showing broad emission lines and dominant Blazar characteristics;

- **BZU**: Blazars of Uncertain type, adopted for a small number of sources having peculiar characteristics but also showing Blazar activity: for instance, occasional presence/absence of broad spectral lines or features, transition objects between a radio galaxy and a BL Lac, galaxies hosting a low luminosity Blazar Nucleus, etc.

The 2nd edition contains 1165 BZB sources, 261 of which are reported as candidates because we could not find their optical spectra in the literature, 1660 BZQ sources and 261 BZU objects.
4. Scientific tools

The on-line version of the Roma-BZCAT provides access to useful tools developed at ASDC that can be easily accessed by clicking on the Data Explorer button. For instance it is possible to build sky maps of catalogued sources in the region surrounding the selected blazar or retrieve optical and radio images at different size scale. A large series of catalogues in many electromagnetic bands is available and all major databases can be accessed in a transparent way, including bibliographical services.

An important tool is the ASDC SED builder, that shows the Spectral Energy Distribution of the source from a collection of available data. SEDs can be enriched adding users data using the Load data button. It also possible to calculate some emission models by means of a Synchrotron-Self Compton code.

Finally, the user can evaluate the spectral parameters useful to derive figures of merit of the sources for their high-energy detection according to different criteria.

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Fig. 1. Hammer-Aitoff projection in equatorial (top) and Galactıc (bottom) coordinates showing the distribution of Blazars included in the 2nd edition of the *Roma-BZCAT*. Red dots are BL Lacs and candidates, blue dots are FSRQs and green dots are Blazars of uncertain classification.
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