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THE BORDEAUX VLBI IMAGE DATABASE

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Abstract.
As part of its contribution to the International VLBI Service for Geodesy and Astrometry (IVS) and the maintenance and improvement of the current International Celestial Reference Frame (ICRF), the Laboratoire d'Astrophysique de Bordeaux produces VLBI images of extragalactic radio sources, structure correction maps and structure indices in order to characterize the astrometric suitability of the ICRF sources. All such products are available online through the Bordeaux VLBI Image Database (BVID) which include more than 1000 VLBI images at 8.4 GHz and 2.3 GHz for more than 250 different sources, as well as more than 5000 structure correction maps and structure indices. The amount of data is constantly increasing with the processing of new VLBI experiments and new BVID features are being developed. The Bordeaux VLBI Image Database is accessible through the following web address: http://www.obs.u-bordeaux1.fr/m2a/BVID/.

1 Introduction

The VLBI (Very Long Baseline Interferometry) group at the Laboratoire d'Astrophysique de Bordeaux (LAB) collaborates to the International VLBI Service for Geodesy and Astrometry (IVS) (Charlot et al. 2006). In this framework, one of its contribution consists in producing VLBI images of the extragalactic radio sources that comprise the International Celestial Reference Frame (ICRF).

Such images are essential for maintaining and improving the frame since the ICRF sources typically exhibit extended structures on milliarcsecond scales (Fey & Charlot 1997, 2000), setting limits on the accuracy of astrometric source positions if not accounted for. In practice, source structure modeling requires imaging the sources on a regular basis (up to six times a year) with a VLBI network of 15 to 20 radiotelescopes in order to monitor the structural evolution and positional stability of the reference frame sources.

The Bordeaux VLBI image database (BVID) provides the national and international scientific community with data related to radio source structures and its application to VLBI astrometry. Additionally, it is also useful for astrophysical studies, e.g. for investigating superluminal motions in extragalactic radio sources.

Section 2 describes the products available online trough the BVID web page. Future improvements and extensions of the BVID are presented in Section 3.

2 Current BVID content

The Bordeaux VLBI Image Database comprises more than 1000 VLBI images at 8.4 GHz and 2.3 GHz for more than 250 different reference frame sources (Fig. 1).

In addition to revealing source structures, these images are used to derive structure correction maps. Such maps show the magnitude of intrinsic source structure effects in VLBI bandwidth synthesis delay measurements (the basic quantity in astrometric VLBI) as a function of interferometer resolution. These form the basis for calculating structure indices which characterize the astrometric suitability of the observed sources (Fig. 2) as devised by Fey & Charlot (1997, 2000). *Structure correction maps and structure indices are BVID specificities* compared to other VLBI image databases such as the Radio Reference Frame Image Database (http://rorf.usno.navy.mil/RRFID).

Overall, there are more than 5000 structure correction maps and structure indices available in the BVID, and as many visibility maps. The latter show normalized visibilities as a function of interferometer resolution, similar to the structure correction maps, and are useful e.g. for scheduling purposes (Fig. 1).

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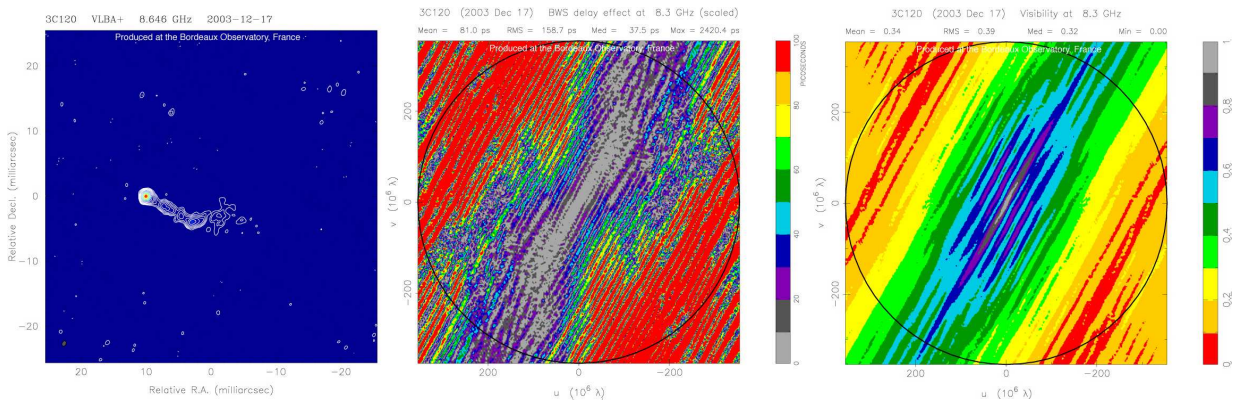

Fig. 1. BVID content for the source 3C120 observed at 8.4 GHz (X-band) in December 2003. From left to right: VLBI image, structure correction map and visibility map. The structure index is 4 since the source is very extended.

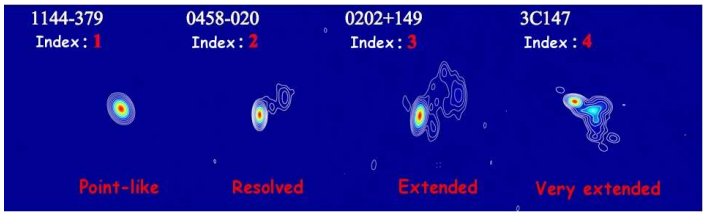

Fig. 2. Illustration of possible values of the structure index according to the complexity of the structure.

The BVID is accessible via a web interface (http://www.obs.u-bordeaux1.fr/m2a/BVID) and is remotely queryable. It may be searched through several criteria: source name, source coordinates or observing date. Thumbnails for the most recent images are also available to facilitate visualization.

3 Future evolution

Maintenance, extension and future development of the BVID will be accomplished through the following:

- Regular addition of data as new VLBI experiments are processed. About 600 VLBI images are expected to be added each year along with structure correction maps, structure indices and visibility maps.
- Addition of structure correction maps and structure indices derived from VLBI observations at higher frequencies (24 et 43 GHz).
- Further development of the database capabilities, the related tools and the web interface.
- Integration of the BVID into the Virtual Observatory in order to facilitate data access.

4 Acknowledgements

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