

MAINTENANCE OF THE ICRS: STABILITY OF THE AXES BY DIFFERENT SETS OF SELECTED RADIO SOURCES

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EXTENDED ABSTRACT. The International Astronomical Union (IAU) recommended (1994) the adoption of a celestial reference system realized on the basis of precise coordinates of extragalactic radio sources observed with the technique of Very Long Baseline Interferometry (VLBI). The celestial reference system of the International Earth Rotation Service (IERS) (Arias et al., 1995) has been adopted as the International Celestial Reference System (ICRS); the ICRS is materialized in the radio frequencies by the coordinates of the radio sources in the International Celestial Reference Frame (ICRF); the Hipparcos catalogue is the ICRS realization in the optical frequencies (Kovalevsky et al., 1997).

The first realization of the ICRF (Ma et al., 1998) is the result of the effort of the Working Group on Reference Frames (WGRF) of the IAU. Extension of the ICRF, published under the name ICRF-Ext.1 (IERS, 1999) and ICRF-Ext.2 (Fey et al., 2004) made the frame more dense by including about one hundred new radio sources. Three sets of criteria were adopted by the WGRF to classify the sources in the ICRF: quality of data and observational history; consistency of coordinates derived from subsets of data; repercussions of source structure. The so-called “defining sources” were used in the first realization of the ICRF to align the axes of the resulting catalogue to the ICRS, they are used as fiducial points in the process of maintenance of the frame and in the catalogue comparisons.

A different approach for the selection of stable radio sources has been proposed by Feissel-Vernier (2003); she focused her analysis on VLBI data acquired since 1989.5, and proved that it is possible to make a judicious classification of radio sources based on statistical studies of their coordinate time series, among other tests. Comparing the sets issued from the two classifications, it has been found that the criteria often diverge, and consequently the sources in each set are different.

We performed an analysis of two independent VLBI celestial reference frames by using the sources selected by the WGRF to realize the ICRS on one side, and those from the Feissel-Vernier selection on the other. The model used for catalogue comparison at the IERS has been used in the analysis. The results show that in either case, the orientation of the axes of the ICRS is better realized by using the set of stable sources selected at Feissel-Vernier (2003).

This shows that in the selection of the more stable sources for the realization of the celestial reference system, statistical tests on the time-varying behaviour of source coordinates should be included. VLBI observations from 1979 – 1995 were used in the construction of the ICRF and in the classification of its radio sources. The selection of sources by Feissel-Vernier is applied to observations during the period 1989.5 – 2002.4, indicating that limiting the time span of observations to the last ten years favours the quality of the frame. It is desirable to densify the set of stable sources south of -50° declination.

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