15 Conclusions and Future Work (DG)

Through an international effort, we have produced a celestial reference frame of 3414 compact radio sources using nearly 30 years of VLBI observations. This new catalog has become the second realization of the International Celestial Reference Frame (ICRF2). Compared to the first ICRF, the second ICRF has more than 5 times as many sources, is roughly 5–6 times more accurate, and is nearly twice as stable.

In preparation for ICRF2, we generated and studied catalog solutions from 7 different VLBI analysis centers made with 4 different analysis software packages. A combined catalog was also constructed. Intercomparisons amongst the individual catalogs and with the combined catalog indicate agreement at the $\sim$50 μas level. Internal and external tests and comparisons were made to determine a formal error scaling factor of $\sim$1.5 and a conservative estimate of the noise floor of $\sim$40 μas.

The final ICRF2 catalog is based on a single solution, made after some final tweaking of the sessions and the solution configuration. This final solution was aligned with the first ICRF by using 138 stable sources common with ICRF1-Ext2. Some 295 sources were selected to be the ICRF2 "defining" sources, based on their positional stability and a lack of any known extensive source structure. Their stability and the fact that they are very evenly distributed over the northern and southern hemispheres eliminates the two largest weaknesses of the first ICRF. The 295 ICRF2 defining sources will be used to define the ICRF2 frame for all future maintenance or extensions of the ICRF2.

The ICRF2 catalog is extremely diverse, with over half the sources being observed in only one session. As such, it is split into two parts. The 'multi-session' sources (1448 sources) are those sources in two or more sessions; and the 'survey' sources (1966 sources) are those in only one session, mostly VLBA Calibrator Survey sources.

It is not certain whether any future extensions will be made to ICRF2, but the VLBI geodetic/astrometric programs will continue. Reference frame work will continue in several areas. The southern hemisphere CRF sessions should continue, and perhaps new antennas can be used and/or new collaborations in the southern hemisphere can be developed. Attempts should be made to re-observe many of the noisiest sources to improve their positions, particularly after an expected doubling of the recorded bit rates for some sessions are accomplished. Attempts to observe the optically brightest quasars, even though they may be weak in the radio region, should be begun, for future alignment with Gaia optical positions.

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