Towards the ICRF3: Comparing USNO 2016A VLBI Global Solution to GAIA and ICRF2

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The Very Long Baseline Interferometry (VLBI) United States Naval Observatory (USNO) 2016A global solution (hereafter, U16A) is part of a work-in-progress effort by the USNO towards the preparation of the third realization of the International Celestial Reference Frame (ICRF3). In this work, we present improved astrometric source positions over the second realization of the ICRF, ICRF2, primarily due to the re-observation of the Very Long Baseline Array Calibrator Survey (VCS) sources (VCS-II, see Gordon et al. (2016)). Our comparison with ICRF2 shows statistically significant offsets of size 0.1 mas between the two solutions. We used the recent Gaia Data Release 1 positions to attempt to understand the nature of these offsets and although we find they are not precise enough to resolve these offsets, they are found to be significantly closer to U16A than ICRF2. In particular, the trend for typically larger errors for Southern sources in VLBI solutions are decreased in U16A. Overall, the VLBI−Gaia offsets are reduced by 21%. The U16A list includes 718 sources not previously included in ICRF2 and 32 of those new sources have statistically significant radio-optical offsets. In half of the cases, these offsets can be explained from PanSTARRS optical images.