METHOD OF CALCULATION TO IMPROVE PROPER MOTIONS IN DECLINATION OF HIPPARCOS STARS OBSERVED WITH PHOTOGRAPHIC ZENITH TUBES

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ABSTRACT. The first astronomical satellite mission, HIPPARCOS ESA one (ESA, 1997), was less than 4 years long and finished there are more than ten years before (1991.25 is the epoch of the HIPPARCOS Catalogue). At the other hand, there are a long series of ground – based optical observations of some HIPPARCOS stars, as a different Earth rotation programmes made during interval 1899.7 – 1992.0 (Vondrák et al., 1998), useful to check or to improve some HIPPARCOS data (Vondrák, 2004). Also, the Earth Orientation Catalogue – EOC (Vondrák and Ron, 2003), based on these data, is finished. Here, the data of Photographic Zenith Tubes (PZT) were used to give better proper motions in declination than HIPPARCOS ones, and results are in good agreement with the ARIHIP ones. The ARIHIP proper motions (a combination of the HIPPARCOS and some ground – based data) are more accurate than the HIPPARCOS ones. Because of it, our calculated results were compared with the ARIHIP ones.

1. CALCULATIONS AND RESULTS

The ICRF materializes the ICRS from 1998 via a catalogue of 608 compact radio sources (Ma et al., 1998), and the HIPPARCOS Catalogue is the optical counterpart of the ICRF. The HIPPARCOS was linked to ICRS in orientation and in rotation (Kovalevsky et al., 1997).

The ARIHIP (Wielen et al., 2001) contains 90842 stars and is a selection of the best stars from the catalogues: FK6(I), FK6(III), GC+HIP, TYC2+HIP, and HIPPARCOS. The proper motion data are more accurate than the HIPPARCOS one, and because of it we compared our results with the ARIHIP ones.

As the input data, we used here the Richmond two PZTs data (RCP and RCQ), Vondrák's A00 solution (Vondrák private communication, 2002; Ron and Vondrák, 2001), and first at all removed the polar motion in line with Kostinski formula (Kulikov, 1962) and some systematic variations (local, instrumental, etc.). The residuals were averaged and got about one averaged point per year. The Least Squares Method was used. The steps of method are described in few papers (Damljanović, 2005; Damljanović and Vondrák, 2005; Damljanović and Pejović, 2005).

Calculated results were checked with the ARIHIP ones; for the stars with a long observational history (few decades) the consistency is good. For these stars, it is possible to get valid corrections of proper motions in declination of HIPPARCOS ones. For some other cases, to confirm the HIPPARCOS data. This means, the long history ground – based observations of the Earth

rotation programmes are good enough for the task to improve even the HIPPARCOS satellite data and the corresponding reference frame.

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