

THE PROGRESS OF THE REFERENCE FRAME

L.V. MORRISON

Royal Greenwich Observatory, Cambridge, UK

F.W. Argelander proposed to a meeting of the Astronomischen Gessellschaft in 1867 that an accurate catalogue of all stars down to 9th magnitude should be compiled. The sky was divided into zones of declination and observations were undertaken with transit circles at a number of observatories in an international collaboration. The importance of fitting these zonal observations to one global reference frame was realized, and for this purpose A. Auwers produced a *Fundamental-Catalog* (FC) for the Northern and Southern hemispheres in 1879 and 1883, respectively. The accuracy of the positions was about half of an arcsecond. This was the first international celestial reference frame.

This reference frame was improved over the next hundred years by continued international cooperation which was later coordinated through the IAU. These efforts culminated in the FK5 which was issued in 1988. The progress in accuracy from the FC to the FK5 is shown in Figure 1. Meanwhile, radio astronomy through the technique of Very Long Baseline Interferometry (VLBI) began to produce positions of extragalactic sources with an accuracy of a milliarcsecond (mas), which is almost two orders of magnitude better than that of the optical positions of the stars in the FK5.

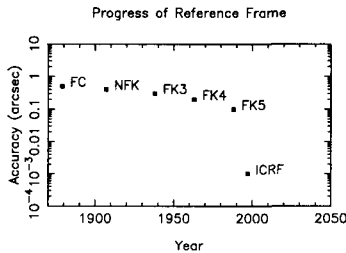


Figure 1. Improvement in accuracy of the reference frame from the first *Fundamental-Catalog* (FC) of Auwers in 1879 to the ICRF in 1997.

The inherent problem of a reference frame based on optical positions of nearby stars is that a complete model of the dynamics of these stars, as well as the motion of the Earth's equator (precession), are required in order to establish a non-rotating frame. Systematic errors in the observations compound the problem, and the elimination of these was one of the objectives of the Hipparcos space mission adopted by ESA in 1980.

By a remarkable coincidence of events, we are now in possession of radio and optical catalogues which both have accuracies of 1 mas or better. The radio catalogue of 608 positions which has been constructed in the past year and published as IERS Technical Note 23 will at this IAU General Assembly be proposed as the primary international celestial reference frame (ICRF). The Hipparcos Catalogue which was issued in June 1997 and is linked to the ICRF with an accuracy of 0.6 mas at epoch 1991.25 will be proposed as the realization of the ICRF at optical wavelengths.

At this Joint Discussion, we will hear how these catalogues were constructed and linked, how their accuracy is to be maintained, and how the reference frame is to be transferred to other categories of objects.