

# SECULAR MOTIONS OF EXTRAGALACTIC RADIO-SOURCES AND THE STABILITY OF THE RADIO REFERENCE FRAME

T.M. EUBANKS, D.N. MATSAKIS, F.J. JOSTIES,  
B.A. ARCHINAL, K.A. KINGHAM, J.O. MARTIN,  
D.D. McCARTHY, S.A. KLIONER, T.A. HERRING

**Abstract.** The best current approximation to an inertial reference frame is provided by Very Long Baseline Interferometry (VLBI) observations of extragalactic radio sources with red shifts ( $z$ ) up to 3.8. The stability of the resulting reference frame directly depends on the amount of any secular changes in the observed source positions.

Two types of potentially observable secular motions should be present in extragalactic source positions. Gravitational accelerations of the solar system will cause secular motions through aberration, amounting to, e.g., about 4 microarcsec ( $\mu\text{as}$ )  $\text{year}^{-1}$  due to the mass of the galaxy. Extragalactic mass concentrations will cause gravitational deflections in the apparent positions of more distant radio sources, and these will change with time as the mass concentrations evolve. This effect could easily cause secular motions of order 1  $\mu\text{as}$   $\text{year}^{-1}$  in some, or even most, radio sources with  $z \geq 1$ .

The present astrometric VLBI data set contains about one million observations over a 15 year period, with current source proper motion formal errors being as small as 2.5  $\mu\text{as}$   $\text{year}^{-1}$ . Proper motion estimates from these data reveal many sources with statistically significant proper motion estimates of order 30  $\mu\text{as}$   $\text{year}^{-1}$ , about an order of magnitude larger than expected. Work continues to determine if the observed motions are due to systematic errors or reflect true secular changes in source positions. The results from a continued proper motion analysis of the complete astrometric VLBI data set will be presented.