This Technical Note gives a presentation of analyses of VLBI extragalactic reference frames performed in the framework of the International Earth Rotation service (IERS), in the course of the maintenance of its conventional celestial frame. These studies are a part of the global analysis of celestial frames, terrestrial frames and Earth orientation made at the Central Bureau of IERS. They are based on results obtained by the Jet Propulsion Laboratory (JPL), the NASA Goddard Space Flight Center (GSFC), the NOAA National Geodetic Survey (NGS), and the US Naval Observatory (USNO), as a part of programs of observation and analysis of Earth rotation, crustal dynamics, deep space navigation, astrometry.

In Section 1 the definition of the IERS celestial reference system and its relationship with the 1991 IAU Resolution A4 on Reference Systems are described. The 1991 realization of the IERS celestial reference system, RSC(IERS) 91 C 01, is studied in terms of internal consistency and precision. Finally the physical properties and the observational history of the 396 extragalactic objects it contains are analysed in some detail.

Section 2 is devoted to the comparison of celestial frames obtained from independent observation programs by GSFC, JPL, NGS and USNO. Two sets of four catalogues ("1990" and "1991") are compared under complementary viewpoints. The catalogues available in 1990 are analysed considering only the 39 objects common to the four data sets; the dependence on geometrical and physical parameters of the discrepancies of coordinates for the same object in the various frames is studied. It is shown that outside the regions of the sky where the network geometry induces slight deformations, the uncertainty on the coordinates is ±0.0002". The regional deformations are further studied with the 1991 versions of the frames derived by the same four institutes.

Section 2 is concluded by the description of the combination algorithm by which the IERS Celestial Reference Frame is maintained, and a comparison with a frame recently compiled by JPL from a combination at the level of the observations.

Section 3 gives an estimation of the expected accuracy of the link of the Hipparcos frame to an extragalactic frame and its time evolution based on VLBI observations of radio stars.