

An All-Sky Catalogue of 21,942 Compact Radio Sources

The method of very long baseline interferometry (VLBI) allows us to determine positions of compact radio sources with an extreme level of accuracy.

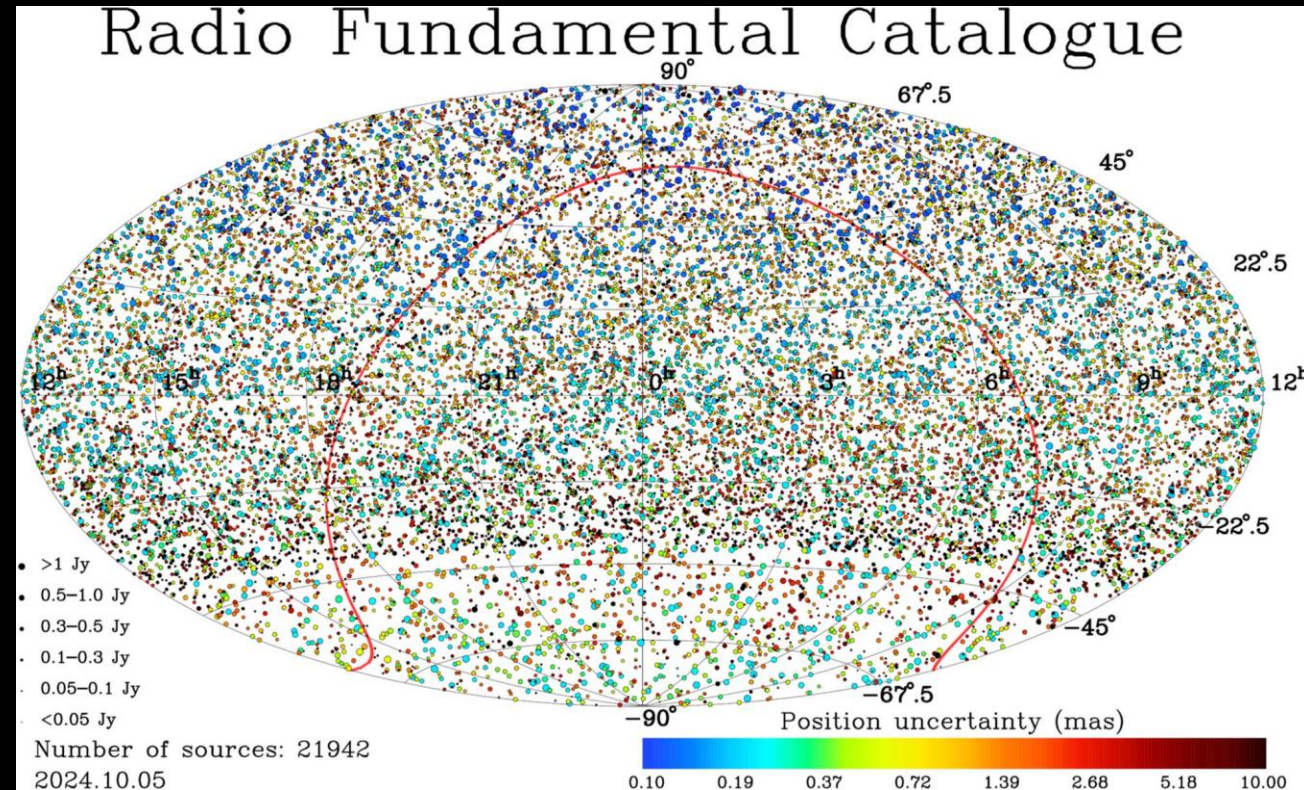
The very first VLBI catalog contained coordinates of 35 active galactic nuclei. Since then, VLBI observations became routine for geodesy, astronomy, astrophysics, and space navigation.

In the 1980s, researchers realized a need for a much more expansive list of sources with precisely known positions and their images at different frequencies.

Space geodesy -- one application example -- requires a millimeter-level of accuracy in ground station position determination, which in turn requires a list of 100–300 bright extragalactic sources uniformly distributed over the sky with positions known at subnanoradian accuracy. Other applications like navigation of interplanetary spacecrafts require a much denser grid of sources.

Combining catalogs poses a significant challenge to account for differences in data reduction, in systematic errors and in assigning correct weights of individual catalogs. The procedure is not transparent, brings an element of subjectivity, and is not equivalent to the best fit of data.

This project overcame those difficulties by combining all observations in one least squares solution, leaving no data point behind.



The distribution of RFC sources over the celestial sphere in the equatorial coordinate system. The circle size corresponds to flux density at 8 GHz (or at lower frequencies if a source was not detected at 8 GHz). The circle color corresponds to the semimajor axis of the positional error ellipse. The red line shows the Galactic plane.

