

Sensing the astrophysical influence within VLBI astrometric measurements of extragalactic radio-sources

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The radio-sources observed by geodetic-VLBI are Active Galactic Nuclei [AGN]. Most of them show instabilities in their astrometric position time series, more or less strong depending on the source (generally in the order of 0.1-1 milli-arcsecond). Those instabilities may be caused by astrophysical phenomena occurring in the central VLBI region of those objects. Astrometric variations correlated with variability (of the radio-flux) argues in this sense. On this basis, we have begun to characterize the signal included in the available VLBI position time series. First, a general statistical study reveals tendencies on physical parameters (e.g. magnitudes) if the source is astrometrically stable or unstable. Second, a geometrical analysis of those time series reveals that, frequently, a preferred direction stands out from the instabilities. But, for some sources, two directions are distinguished. The first scenario is consistent with regular emergence of knots from the VLBI core, hence causing shifts of the radio emission centroid. The second scenario may give clues to the presence of a second black hole within the AGN that have its own activity offset from that of the first black hole. Finally, taking the Gaia Data Release 2 into account for optical counterparts, we finally compare those directions with the orientation given by the radio-optical position offset. We distinguish between sources, those of which radio-astrometric variations are aligned with the radio-optical offset from those of which this angular deviation is perpendicular. In the future, understanding the underlying physics of AGN will be essential for the realisation of future versions of the International Celestial Reference Frame because of the need to identify sources which materialize the most stable directions of the Universe.