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Structure and Variability of Sources from Geodetic VLBI-Data

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Abstract. 8 GHz maps of 39 radiosources have been obtained with ≈ 0.5 mas resolution from geodetic VLBI-data. Structure variability has been investigated on $\approx$ monthly interval during the bursts of radio emission of two sources 0059+581 and 0202+149 in period from June 1994 to February 1996. Bright jet components in the sources show no steady outward motion, but may be some oscillations near stationary positions.

In June 1994, in accordance with agreement between Goddard Space Flight Center (GSFC) of NASA and Haystack Radio Observatory (USA), Russian Academy of Sciences and Ukrainian National Academy of Sciences the radiotelescope RT–22 (Simeiz) has been equipped with a Mark-III system and high sensitive radiometers at 13 and 3.6 cm made at IAA. This allowed to IAA to participate in geodetic VLBI experiments and to receive the geodetic VLBI-data from NASA. Since 1995 the data are used for mapping with the help of Caltech VLBI Programm Package courteously presented to IAA by Dr. T.J. Pearson. The first sample of ≈ 0.5 mas resolution maps has been obtained (cf. Baikowa, Pyatunina, & Finkelstein 1996) for 39 sources. Data on variability of two sources 0202+149 and 0059+581 are presented below.

0059+581—An extremely variable, unidentified radio source. For the period from June 1994 to February 1996 eleven maps have been obtained. These maps reveal a nearly point-like core and curved multi-component jet. Two main components of the jet are located at radial distances about 0.4 mas in P.A.$\approx 180°$ and at 0.7 mas in P.A.$\approx$ -140°. The period under study corresponds to a fading phase of the burst that has flared up before June 1994. Flux density of nearly point-like core of the source fell from 3.56 Jy in June 1994 to 0.66 Jy in February 1996 (Fig. 1a). Light curves for two main components (Fig. 1b) look similar in shape but are shifted in time by ≈ 0.4 year. The distance between the components along the jet is ≈ 0.5 mas, so we can estimate the apparent velocity of a post-burst shock propagation along the jet as ≈ 1.2 mas yr^{-1}. The components reveal no outward motion, but may be some oscillations near the mean positions. Additional observational data are desirable to confirm reality of the oscillations.

0202+149 (NRAO 91)—Quasar at ($z = 0.833$), γ-ray source (Montigny von et al. 1995). Eight high resolution images were obtained for the period from January 1995 to February 1996, when the source exhibited a burst of radio emission. The source consists of a core and two components, at $\approx$ 0.4 mas in P.A.$\approx -50°$ and at ≈ 1.0 mas in P.A.$\approx -80°$. A tapered map for 17 October 1995 shows a long faint jet extended in P.A.$-50°$ up to radial distance 7 mas. At the later stages of the burst a slightly better agreement has been obtained for four-component model with a faint additional component at radial distance ≈ 0.3 mas in P.A.$\approx 130°$. The period under study covers both a rising and a fading parts of the burst (Fig. 1a). We didn't find a reliable outward motion for the component on scales above ≈ 0.2 mas (Fig. 1c) but rather some oscillation near the mean value 0.45 mas. If the oscillation is real it can be understood as a result of some structural changes within unresolved core. At the rising part of the burst the core is probably shifted to South-East and nearly coincided with a faint eastern component.

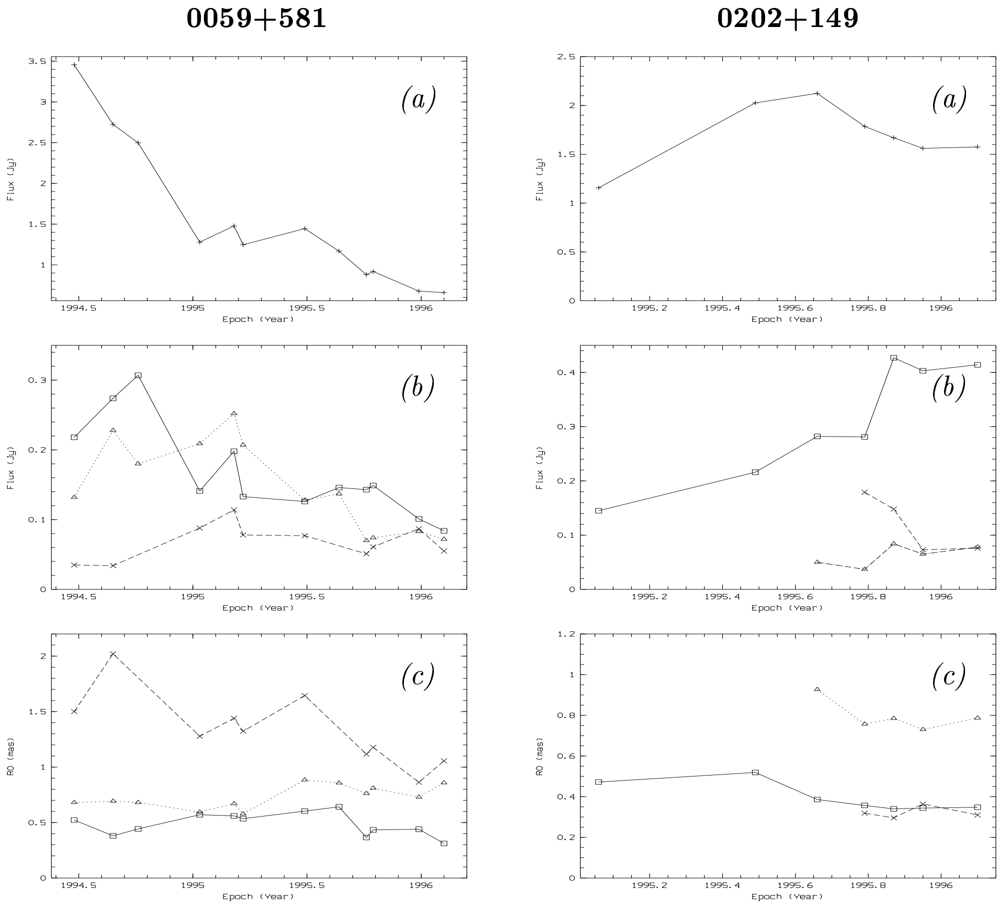

Figure 1. Light curves for the core (*a*) and jet knots (*b*). The jet knots radial distances as functions of time (*c*).

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References

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