PROCEEDINGS OF SCIENCE

EVN observations of M 87

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We report results of our EVN observations towards M 87. In order to study the velocity field of M 87, we conducted multi epoch EVN observation towards the jet of M 87 at 1.6 GHz. As the results, we revealed continuous jet upto 500 mas from the core and HST-1 component. Especially, the components about 160 to 500 mas from the core are detected at the first time. Using these observations, we possibly detected proper motions and discussed the velocity field of the jet.

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1. Introduction

It is well-known that some of AGN jets show ultra-relativistic proper motion and well-collimated structure. For the collimation mechanism, some evidences for the magnetically driven collimation process have been reported based on VLBI observations ([1], [2], [3], [7]). However, the numbers of the clues to discuss the acceleration mechanism are limited. In order to investigate the acceleration mechanism by revealing a velocity field, we have conducted EVN observations towards M 87. M 87 is the closest AGN (D = 14.7 Mpc) in the northern sky. At this distance, one mas corresponds to 0.08 pc, and the proper motion of 1 mas yr^{-1} corresponds to 0.25 c. There are many measurements of the proper motions using VLBI facilities, HST and VLA ([4], [5], [9], [8], [6], [10]). With these measurements, we have become to know that the jet within the first 160 mas have had subluminal motion, while the jet components with the distance of more than 1 arcsec have shown superluminal motions upto 6 c. There is a missing link in our knowledge about a velocity field between inner part and outer part of the jet.

2. Observations and Data Reductions

The first EVN observation was made with the 8 stations (JB, WB, EB, ON, MC, TR, CM and NT) on 2007 March 12 at 1.6 GHz. The second EVN observation was made with the 8 stations (JB, WB, EB, ON, MC, TR, CM and NT) on 2008 March 3 at 1.6 GHz. Both observations were made over 13 hrs, with four IFs of 8-MHz bandwidth. An a priori amplitude calibration and Fringe fitting was performed using the AIPS. CLEAN and SELF-CALIBRATION was performed using DIFMAP.

3. Results and Discussion

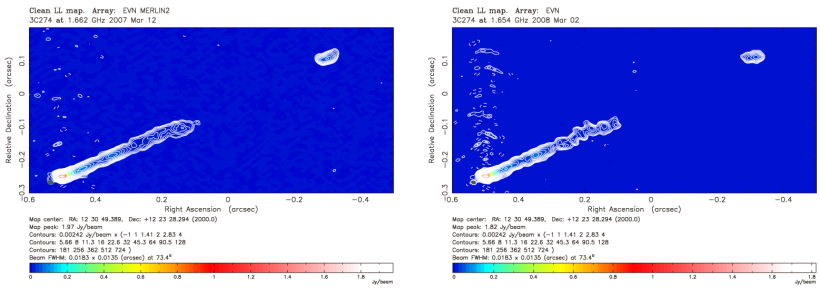

Figure 1: Images of our first and second observations. We detected the extended jet feature and promising knot components up to 450 mas from the core, and possible proper motions.

We show the images of two epochs in figure 1. We detected continuous jet upto 500 mas from the core and HST-1 component. Especially, the components about 160 to 500 mas from the core have not sufficiently been detected and investigated so far. We can say that there is a significant time variation with these two epoch image.

It is just based on two epoch observations, but we discuss the proper motions of the components. Firstly, we have not detected any proper motion for the components within first 160 mas

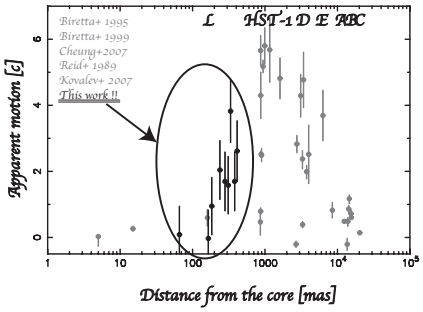

Figure 2: Velocity field of M 87.

from the core. Secondly, we have detected significant superluminal motions from 2.5 to 3.5 c for the HST-1 components. These are in good agreement with previous observations ([11], [6]). Thirdly, we invoke the possible proper motions for the components about 160 to 500 mas from the core. We note that the jet shows very knotty structure at the regime so that identification of the components are ad hoc with our two epoch observations. However, we derived proper motions of 1.0 to 3.8 c for the components. These proper motions are faster than that of the inner components and slower than that of HST-1 components. This is the preliminary results and further observations is necessary, however it may suggest that we might access to the possible acceleration region of M 87 jet (see figure 2).

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