

# EVN monitoring observation of M 87 jet

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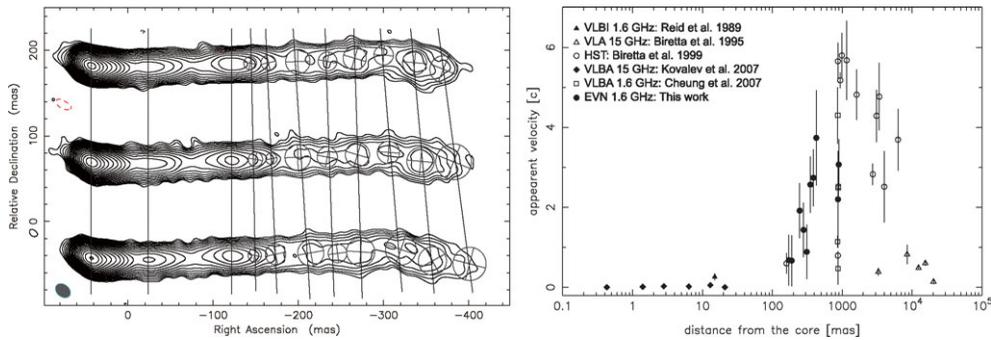
**Abstract.** We report results of our European VLBI Network observations towards M 87 jet at 1.6 GHz in order to study the velocity field. We revealed continuous jet up to 500 mas from the core and HST-1 component. We have not detected any proper motion for the components within first 160 mas from the core and significant superluminal motions from 2.5 to 3.5 c for the HST-1 components. Those are in good agreement with previous observations. We derived proper motions for the components about 160 to 500 mas from the core. Interestingly, the measured proper motions are faster than that of the inner components and slower than that of HST-1 components. It may suggest the possible acceleration region for superluminal features of M 87 jet.

**Keywords.** instrumentation: high angular resolution, techniques: interferometric, galaxies: active, galaxies: jets

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## 1. Introduction

M 87 is one of the closest AGN jets ( $D = 16$  Mpc) in the northern sky. At this distance, one mas corresponds to 0.08 pc, and the proper motion of 1 mas yr<sup>-1</sup> corresponds to 0.25 c. There are many measurements of the proper motions using VLBI facilities, HST and VLA (Reid *et al.* (1989), Biretta *et al.* (1995), Biretta *et al.* (1999), Ly *et al.* (2004), Cheung *et al.* (2007), Kovalev *et al.* (2007)). With these measurements, we have known 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 up to 6 c. There is a missing link in our knowledge about a velocity field between inner part and outer part of the jet. In order to investigate the acceleration mechanism by revealing a velocity field, we have conducted three epoch monitoring observations towards intermediate scale of M 87 jet with European VLBI Network (EVN).



**Figure 1.** Images of M 87 jet with three epoch EVN observations (left). Velocity field of M 87 jet based on apparent proper motions. Apparent acceleration is clearly seen at the scale between 160 to 500 mas.

## 2. Observation

EVN observations were conducted on 12 March 2007, 2 March 2008 and 7 March 2009. All observations were made over 13 hrs at 1.6 GHz, 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 & Discussion

We show the three epoch images of M 87 jet and the velocity field based on the measurements of the apparent proper motions in figure 1. We detected continuous jet up to 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 have not detected any proper motion for the components within first 160 mas from the core, while significant superluminal motions from 2.5 to 3.5 c for the HST-1 components. Those results are in good agreement with previous measurements (Reid *et al.* (1989), Cheung *et al.* (2007)). On the other hand, we succeeded to probe the proper motion at intermediate scale for the first time, and could reveal the proper motion of 1.0 to 3.8 c for the components at these scale. We succeeded to connect unconnected apparent velocities at the innermost and outermost region, and it probably suggests that M 87 jet is possible accelerated at this scale.

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