The spectacular giant radio flares of Cygnus X-3

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Abstract

After more than 5 years of quiescence, the microquasar Cygnus X-3 underwent two giant radio flares on September 2016 and April 2017, reaching 13 and 17 Jy at 8.5 GHz, respectively. These very bright and spectacular radio events are clearly associated with the ultra-soft X-ray state and gamma-ray emission. Multi-frequency single-dish observations were carried out during the whole duration of the flares with SRT and Medicina. Long exposures allowed us to infer variation of the radio emission on short timescales. We highlighted a steepening of the spectrum from –0.4 to –0.6 within 5 hours at the peak of the 2016 flare. It is the first time that such a steepening is observed on the hour scale, which gives support to plasmon evolution from optically thick to optically thin as they move outward from the core and expand. VLBI observations were triggered during the 2016 mini-flare and the decay phases of both giant flares. The mini and short-lived flare was produced close to the core, with the indication of a slight increase of the source size. An observation performed 4 days after the peak of the 2016 giant flare allows us to infer constraints on the size and velocity of the jet. The jet emission was most likely extended over 30 mas with a jet knot velocity $>$ 0.3c assuming a blob formation at the peak emission as suggested by the change in the spectral index we observed. The data analysis of the 2017 giant flare is on-going.

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