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Title

APEX CO (9-8) MAPPING OF AN EXTREMELY HIGH VELOCITY AND JET-LIKE OUTFLOW IN A HIGH-MASS STAR-FORMING REGION

Source

ASTROPHYSICAL JOURNAL LETTERS, vol.743, no.1, DEC 10 2011, 1-4.

Abstract

Atacama Pathfinder Experiment (APEX) mapping observations in CO (9-8) and (4-3) toward a high-mass star-forming region, NGC 6334 I, are presented. The CO (9-8) map has a 6." 4 resolution, revealing a similar to 0.5 pc, jet-like, and bipolar outflow. This is the first map of a molecular outflow in a THz line. The CO (9-8) and (4-3) lines arising from the outflow lobes both show extremely high velocity line wings, and their ratios indicate a gas temperature greater than 100 K and a density higher than 10^4 cm^{-3} . The spatial-velocity structure of the CO (9-8) data is typical of a bow-shock-driven flow, which is consistent with the association between the bipolar outflow and the infrared bow-shaped tips. In short, the observations unveil a highly excited and collimated component in a bipolar outflow that is powered by a high-mass protostar, and provide insights into the driving mechanism of the outflow. Meanwhile, the observations demonstrate that high-quality mapping observations can be performed with the new THz receiver on APEX.