P129a Discovery of a Photoionized Outflow toward the Massive Protostar G45.47+0.05

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Massive protostars generate strong radiation feedback, which may help set the mass they achieve by the end of the accretion process. Studying such feedback is therefore crucial for understanding the formation of massive stars. We report the discovery of a photoionized bipolar outflow towards the massive protostar G45.47+0.05 using high-resolution observations at 1.3 mm with ALMA and at 7 mm with VLA. By modeling the free-free continuum, the ionized outflow is found to be a photoevaporation flow with an electron temperature of $10,000$ K and an electron number density of $\sim 1.5 \times 10^7$ cm^{-3} at the center, launched from a disk of radius of 110 au. H30α hydrogen recombination line emission shows strong maser amplification, with G45 being one of very few sources to show such millimeter recombination line masers. The mass of the driving source is estimated to be $30 - 50$ $M_\odot$ based on the derived ionizing photon rate, or $30 - 40$ $M_\odot$ based on the H30α kinematics. The kinematics of the photoevaporated material is dominated by rotation close to the disk plane, while accelerated to outflowing motion above the disk plane. The mass loss rate of the photoevaporation outflow is estimated to be $\sim (2 - 3.5) \times 10^{-5}$ $M_\odot$ yr^{-1}. We also found hints of a possible jet embedded inside the wide-angle ionized outflow with non-thermal emissions. The possible co-existence of a jet and a massive photoevaporation outflow suggests that, in spite of the strong photoionization feedback, accretion is still on-going.