Z114a ALMA CO Observations of a Giant Molecular Cloud in M33: Evidence for High-Mass Star Formation Triggered by Cloud-Cloud Collisions

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It is a long-standing question how high-mass stars are formed in galaxies. Recently, cloud-cloud collision has received much attention as a mechanism of high-mass stars. We report the first evidence for high-mass star formation triggered by collisions of molecular clouds in M33. Using ALMA, we spatially resolved filamentary structures of giant molecular cloud 37 in M33 using CO($J = 2$–1) line emission at a spatial resolution of $\sim$2 pc. There are two individual clouds with a systematic velocity difference of $\sim$6 km s^{-1}. Three continuum sources representing up to $\sim$10 high-mass stars are embedded within the densest parts of molecular clouds bright in the C^{18}O($J = 2$–1) line emission. The two molecular clouds show a complementary spatial distribution with a spatial displacement of $\sim$3.5 pc, and show a V-shaped structure in the position-velocity diagram. These observational features traced by CO and its isotopes are consistent with those in high-mass star-forming regions created by cloud-cloud collisions in the Galactic and Magellanic Clouds. Further Subaru observations will allow us to study detailed physical properties of high-mass stars formed by the cloud-cloud collision in M33.