

The Influence of Shear Motion on Giant Molecular Associations in Spiral Galaxies

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The evolution of Giant Molecular Clouds (GMCs) and Giant Molecular Associations (GMAs) is one of the keys to understand massive star formation in a galaxy and hence evolution of the galaxy. It has been considered that GMCs and GMAs are formed in spiral arms. Recently, however, GMCs are found not only in the spiral arms but also in the inter-arms. It is suggested that the GMCs in the inter-arms might be formed from GMAs by the shear motion. However, the relation between molecular clouds and the kinetic shear motion in the clouds is still speculation, because the kinetic shear has not been directly measured in a galaxy. We have investigated the dynamics of the molecular gas and the evolution of GMAs in two spiral galaxies, M51 and M101. The velocity vectors in the disks were derived at each spiral phase from the distribution of the line-of-sight velocity of the CO gas. The shear motion in the galactic disk was determined from the velocity vectors. It was revealed that the distributions of the shear strength and of GMAs are anti-correlation each other. In addition, there is a cutoff in number counts of GMAs in strong shear regions. These results strongly suggest that the evolution of GMAs is heavily affected by the shear.