Atomic and Molecular Gas in Early Stage Interacting Systems

Daisuke Iono[12], Min S. Yun[1] and Paul T. P. Ho[2]

[1] University of Massachusetts, Amherst, MA 01003
[2] Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA 02138

E-mail contact: diono@cfa.harvard.edu

We present HI and CO (1–0) observations of 10 equal-mass interacting systems obtained using the Very Large Array (VLA) and the Owens Valley Radio Observatory (OVRO). These sources are selected from previously published optical and CO (1–0) interacting galaxy surveys based on their size ($M_B \leq -19$), projected nuclear separation and the single dish CO (1–0) content ($S_{CO} \geq 20$ Jy Km/s), and the sample primarily consists of systems that have recently undergone the initial pericentric passage (i.e. early stage interacting systems). These results are analyzed in conjunction with a control sample of 20 nearby isolated systems in the BIMA SONG sample. It is found that the molecular gas in interacting systems is much more extended than in isolated systems, and that the fraction of molecular gas (M_{H_2}/M_{gas}) is higher in the perturbed disks. From these results and an analysis of a simulated disk-disk collision, it is inferred that the gas dissipation in the models occurs too quickly, and the validity of the assumptions and approximations made in the simulations are reviewed. A new merger sequence is proposed using 5 independent observational parameters, and this is found to be independent of the projected nuclear separation of the disks. Finally, discussion of the scientific goals achievable at ALMA is given in a context of observing gas and dust of nearby and high-z interacting systems.