Double Peak Galaxies - A far-IR/millimeter Perspective

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Abstract

The best tracers we have of the cold and dense interstellar medium in galaxies are the rotational lines of CO. In some galaxies, these lines exhibit broad double-peaked (DP) emission profiles, while in others the lines are narrow and single-peaked (SP). In large part, the lines reflect the gas kinematics in the galaxies, but in the absence of resolved observations it is not clear how we are to interpret DP vs SP line profiles: rotating disks, major mergers, or turbulent disks? There is tentative evidence that high-z dusty starburst galaxies tend to have broader and double-peaked CO line profiles, while dusty QSOs have narrow and single-peaked line profiles. Recent galaxy simulations of the bright far-IR fine-structure line of CII at 158um ([CII]) suggest that the line can be used to trace the gas and dynamical masses of distant galaxies. The fact that simulations have demonstrated the utility of the [CII] line is significant, as the line has become the work-horse line with which we study the gas-kinematics in distant galaxies. On-going ALMA [CII] surveys of z $>$ 4 galaxies and QSO have revealed new exciting insight into the large-scale motion of the gas in these galaxies - insights which may provide clues to how the galaxies assembled in the first place.

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