[구IM-03] The CO outflow survey toward the Very Low Luminosity Object candidates: a progress report

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We present the preliminary results of CO outflow survey toward the 56 Very Low Luminosity Object (VeLLO) candidates at CO J=2-1 and J=3-2 transitions with two radio telescopes of the Caltech Submillimeter Observatory (CSO) and the Atacama Submillimeter Telescope Experiment (ASTE). The survey is aimed to understand the origin of the formation of low-mass stars or substellar objects. The VeLLO is a very faint ($\lesssim$0.1 $L_\odot$) object deeply embedded in dense molecular clouds and believed to be a proto-brown dwarf which will be a brown dwarf or a faint protostar which has just formed with little mass accretion or which is in quiescent stage of episodic accretion. The candidates were searched for over all nearby (d$\lesssim$450 pc) Gould belt clouds and listed in a new catalogue of the VeLLO candidates by Kim et al. (2014 submitted). To diagnose present status and future fate of the VeLLOs, we conducted a systematic observation for the CO molecular outflows of the 56 VeLLOs to infer how accretion is being made around the VeLLOs. We found 17 VeLLO candidates either having a prominent wing in line profiles or showing bipolar intensity distribution of high velocity components. We will discuss the physical properties of these CO outflows and the identity of the VeLLO candidates.

[구IM-04] Density distributions and Power spectra of outflow-driven turbulence

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Protostellar jets and outflows are signatures of star formation and promising mechanisms for driving supersonic turbulence in molecular clouds. We quantify outflow-driven turbulence through three-dimensional numerical simulations using an isothermal version of the total variation diminishing code. We drive turbulence in real space using a simplified spherical outflow model, analyze the data through density probability distribution functions (PDFs), and investigate density and velocity power spectra. The real-space turbulence-driving method produces a negatively skewed density PDF possessing an enhanced tail on the low-density side. It deviates from the log-normal distributions typically obtained from Fourier-space turbulence driving at low densities, but can provide a good fit at high densities, particularly in terms of mass-weighted rather than volume-weighted density PDF. We find shallow density power-spectra of -1.2. It is attributed to spherical shocks of outflows themselves or shocks formed by the interaction of outflows. The total velocity power-spectrum is found to be -2.0, representative of the shock dominated Burger's turbulence model. Our density weighted velocity power spectrum is measured as -1.6, slightly less that the Kolmogorov scaling values found in previous works.