A NOVEL APPROACH FOR AUTOMATED ANALYSIS OF HIGH-RESOLUTION MOLECULAR LINE SURVEYS

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Massive star-forming regions are hotbeds of interstellar chemistry where unique physical conditions allow for the formation of a wide variety of molecular species. Accurately characterizing the morphology of these molecules allows us to glean information from the energetic physical processes taking place during massive star formation as well as achieve a better understanding of how such relatively large molecules are formed in the interstellar medium. In order to more efficiently process the vast amounts of data that modern interferometers such as ALMA are producing, we have developed a least-squares fitting routine capable of fitting the combined spectra of a given list of molecules across a broadband line survey for thousands of pixels in a data cube. Results of the application of this routine to high mass star-forming regions will be presented in the form of spatial maps for the derived parameters incuding excitation temperature, kinematics, and column densities. Most previous approaches to analyzing the spatial morphology rely on spectra extracted from a handful of pixels and extrapolating across the field of view with a moment map, using the intensity of a single transition as a proxy for the abundance of a molecule. In contrast, the maps generated by our fitting routine utilize the full suite of available lines and will showcase the physical parameters of the region in an unbiased manner. Maps showcasing the physical column density ratios will be presented as well; these unique products of our approach will give insight into how the protostellar environment influences the relative abundance of interstellar molecules.