X71a Disentangling emission lines and continuum in the ALCHEMI 3D datacube using a low-rank and sparse matrix decomposition

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Significant progress in radio interferometry has made it possible to acquire high-dimensional, large-volume data. In fact, ALCHEMI, an ALMA large program observed the nearby starburst galaxy NGC 253 and revealed numerous molecular and recombination lines, as well as continuum emission, with high spatial resolution. While higher sensitivity enables the detection of faint molecular lines, it simultaneously reduces the number of line-free channels, making it difficult to accurately determine the continuum level. To address this issue, it is desirable to incorporate data-scientific methods in addition to conventional approaches. In this study, we apply a matrix decomposition technique to separate an ALCHEMI datacube into a continuum map and a line cube. In this decomposition, the continuum component is modeled as Low-rank, while the line emission is modeled as Sparse. As a result, we successfully separate the continuum map and a line cube from the original datacube. While the result is promising, further refinement is ongoing to minimize the attribution of some emission lines to the low-rank component and to enable the separation of absorption features.