

X59c **A matrix decomposition approach for separating emission lines, continuum, and noise in the ALMA extragalactic line survey ALCHEMI**

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With remarkable advancements in observational technology, it has become possible to acquire high-dimensional and large-volume data. For instance, in the ALCHEMI survey using the ALMA telescope, numerous molecular emission lines and continuum components were observed at high spatial resolution across multiple frequency bands, targeting one of the nearest starburst galaxies, NGC 253.

However, the observed data may contain few line-free channels to confidently determine the continuum level. It is still challenging to accurately separate and analyze each component. To resolve this issue, it is promising to incorporate data-scientific approaches apart from traditional methods.

In this study, we apply a matrix decomposition technique to separate the three components (continuum, lines, and noise) in the ALCHEMI data. We extract a spatial slice matrix (x, ν) for a fixed value of y from the 3D data cube and then model continuum components as a low-rank matrix, the line components as a sparse matrix. As a result, we successfully separate the components to that slice matrix. However, a limitation is identified in that some line emission features are mixed into the low-rank component. In this presentation, we report the separation results, their evaluation, and the remaining issues through the analysis.