

# Analysis and Visualization of ALMA Data Cubes

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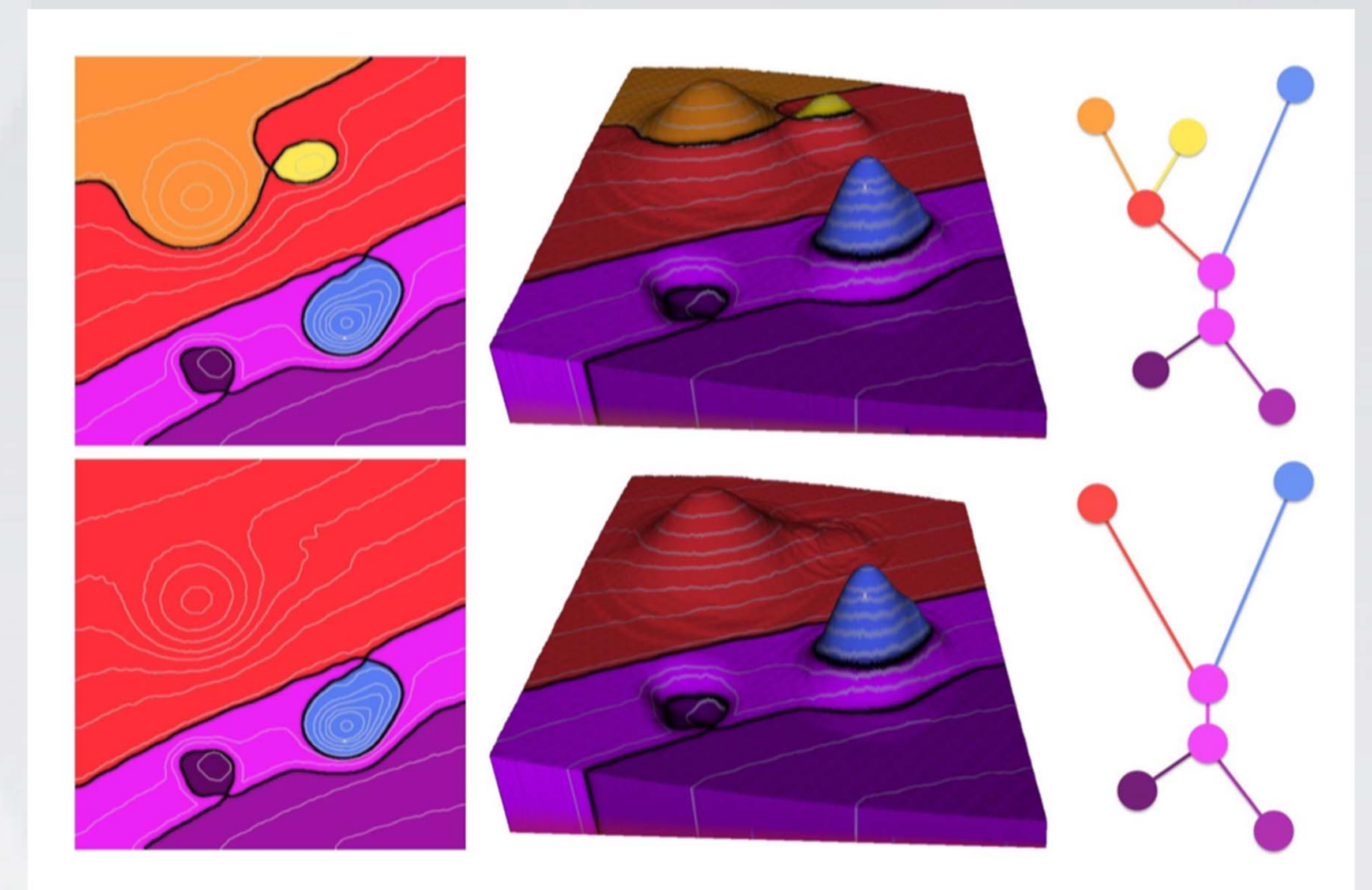
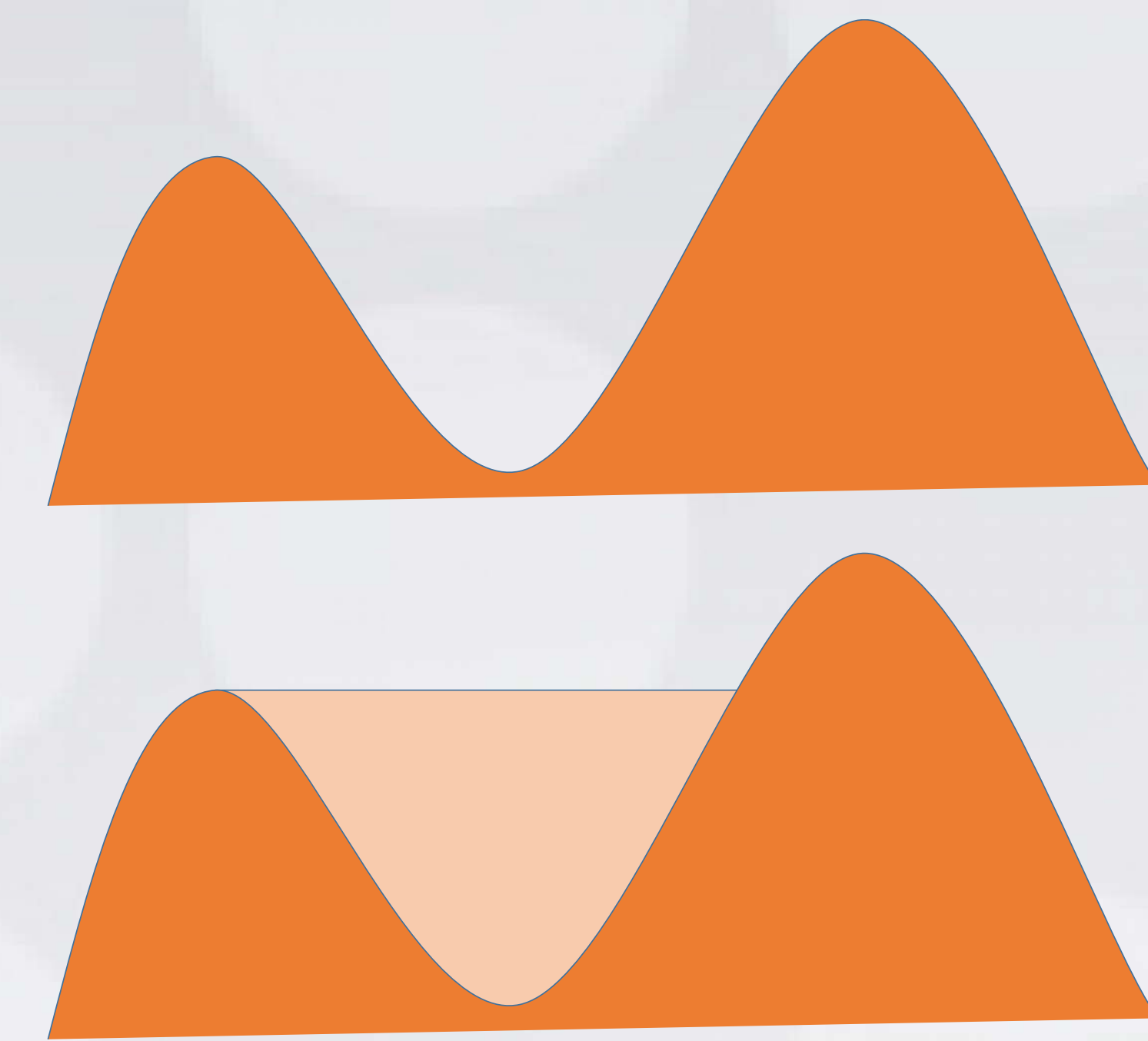
## Overview

The availability of large data cubes produced by radio telescopes like the VLA and ALMA is leading to new data analysis challenges as current visualization tools are ill-prepared for the size and complexity of this data. Our project addresses this problem by using the notion of a contour tree from topological data analysis. The contour tree provides a mathematically robust technique with fine grain controls for reducing complexity and removing noise from data. Furthermore, to support scientific discovery, new visualizations are being designed to investigate these data and communicate their structures in a salient way: a process that relies on the direct input of astronomers.

## ALMA Data Challenge

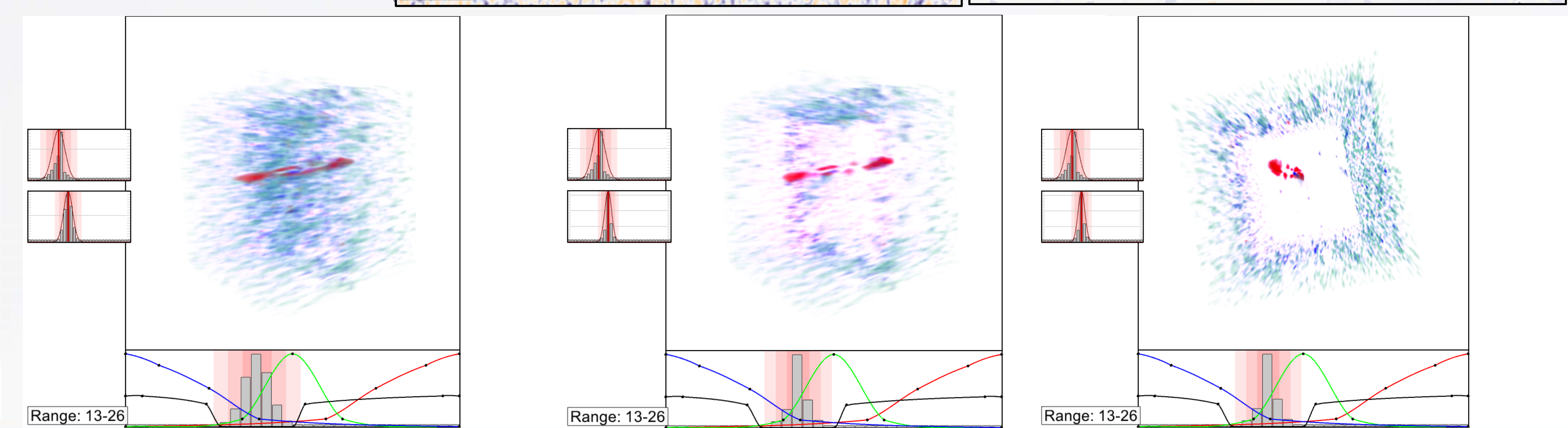
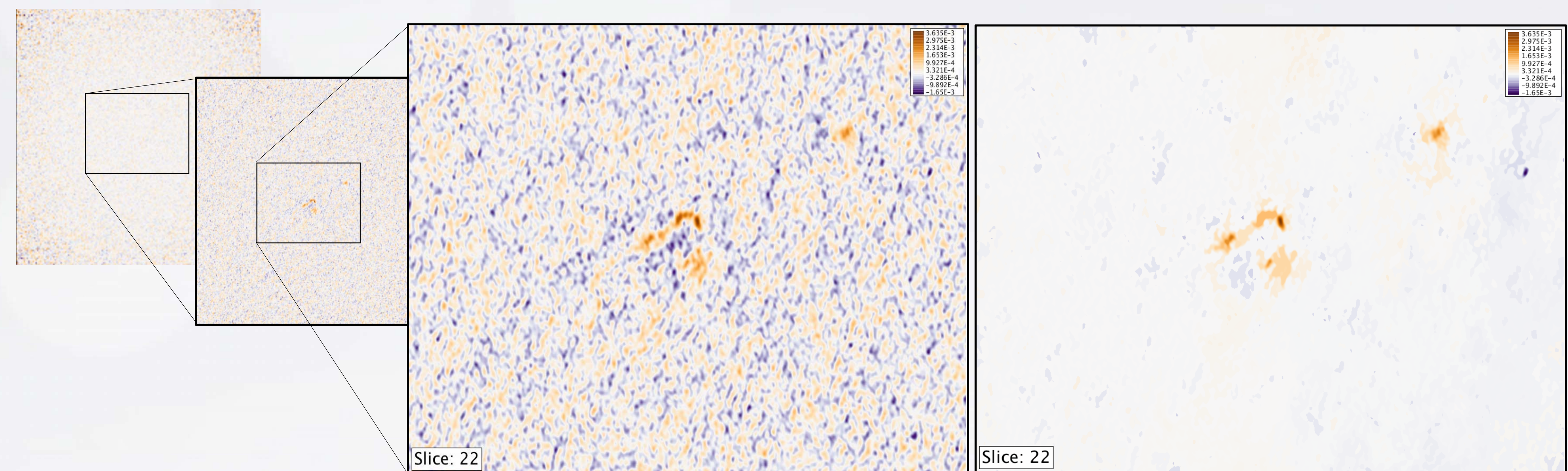
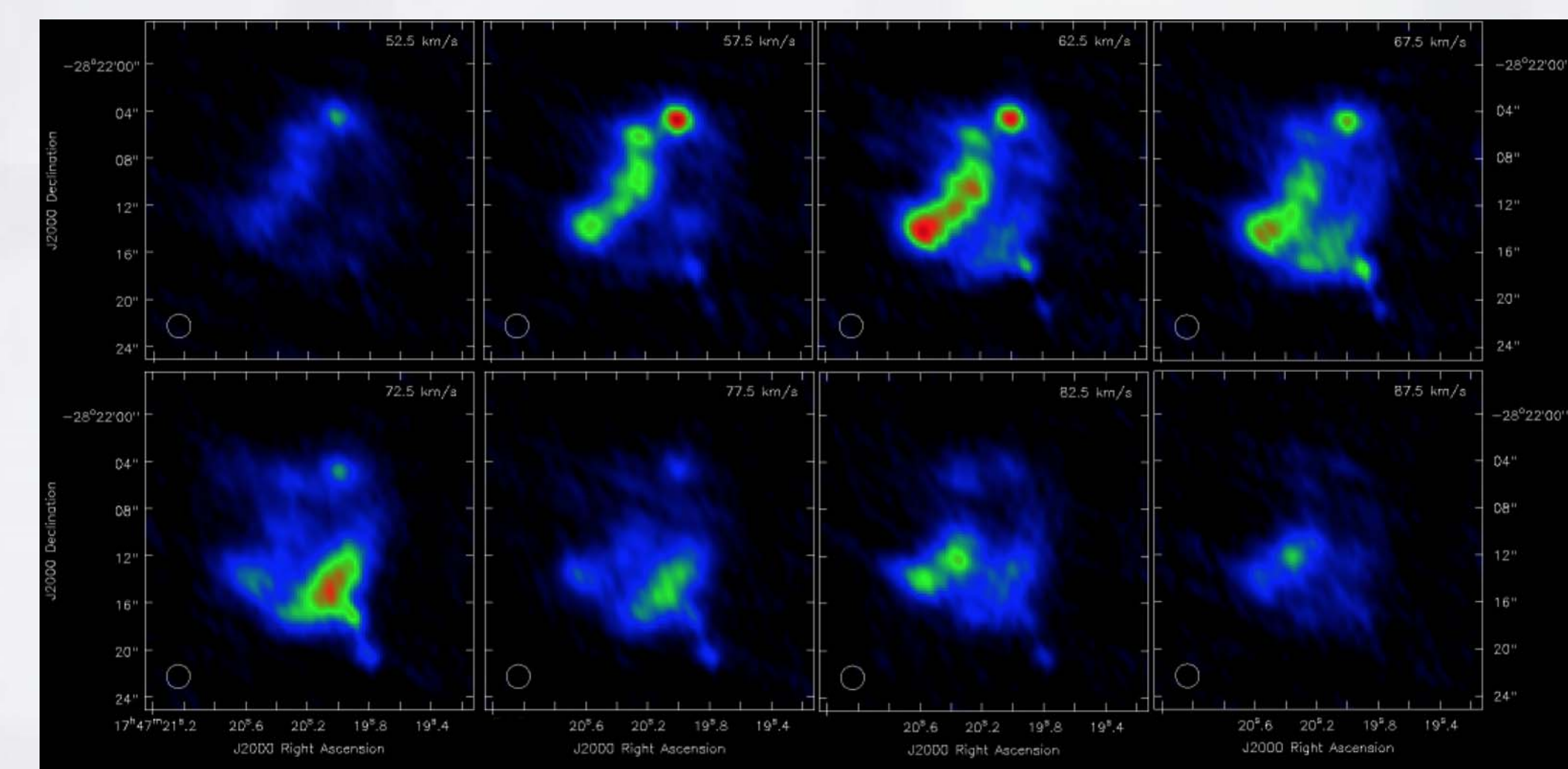
“There simply are no tools capable of simultaneously visualizing, comparing and analyzing the dozens to hundreds of data cubes for all of the detected spectral lines in a given source.” (Jeff Kern, NARO)

## Feature Denoising and Source Finding



## Study Black Hole: Mirach's Ghost Galaxy

Study stellar and gas kinematics (movement of stars or gas without needing to understand how they acquired their motion), where contours represent light distribution of the galaxy, or the luminosity in the gas emission lines.



Credit: ALMA

Credit: Anil Kern

