**Chemistry Study on Hot Corino Serpen South CARMA-7**

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Abstract

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Keywords: hot corino, astrochemistry, ALMA

**1. Introduction**

This thesis studies the chemistry property of a recently discovered hot corino-like protostar, CARMA-7 in the Serpen South region. CARMA-7 is one of the 15 [C] hot corinoes discovered so far and has a high degree of chemical richness and traces of possible bipolar molecular outflow. This thesis will list molecular line identification results from 6 spectral windows from ALMA observations in 2016 (?) and will attempt to discuss possible structure of the source.

**2. Observation**

The ALMA observation on CARMA-7 is divided into 6 spectral windows, each with a rest frequency (GHz) but same VLSR of 8.0 km/s.

<spectral widow information table>

**3. Methods**

To accurately identify all emission lines from all 6 spectral windows, a variety of continuum substraction and molecular line identification tools were used. These tools include STATCONT, ADMIT (ALMA Data Mining Toolkit, integrated with CASA) and XCLASS. Raw .fits data cubes were first cropped (to eliminate impacts of the cube’s original circular shape on calculation of background rms and improve focus on center area) and continummed substrated (with noise level set to 1) with STATCONT to produce line cubes that were ready as input file for ADMIT’s ContinuumSub and LineIdentification tasks. The following is a sample ADMIT script used to process data cube:

<line\_identification\_ADMIT.py>

**4. Discussion: molecules identified**

Chemical richness + possible bipolar molecular outflow.

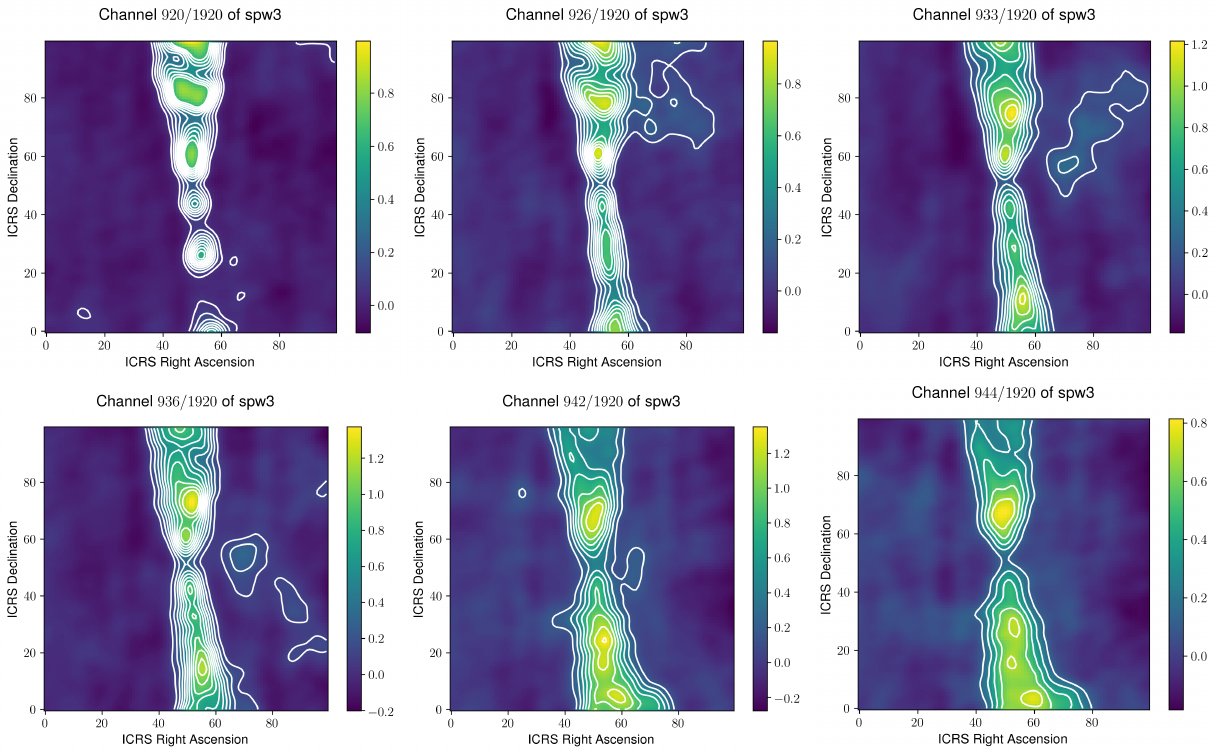
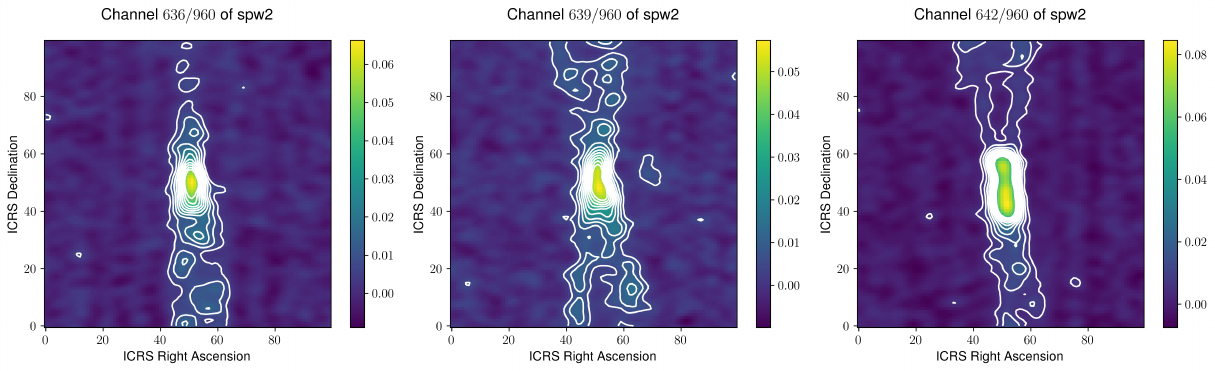
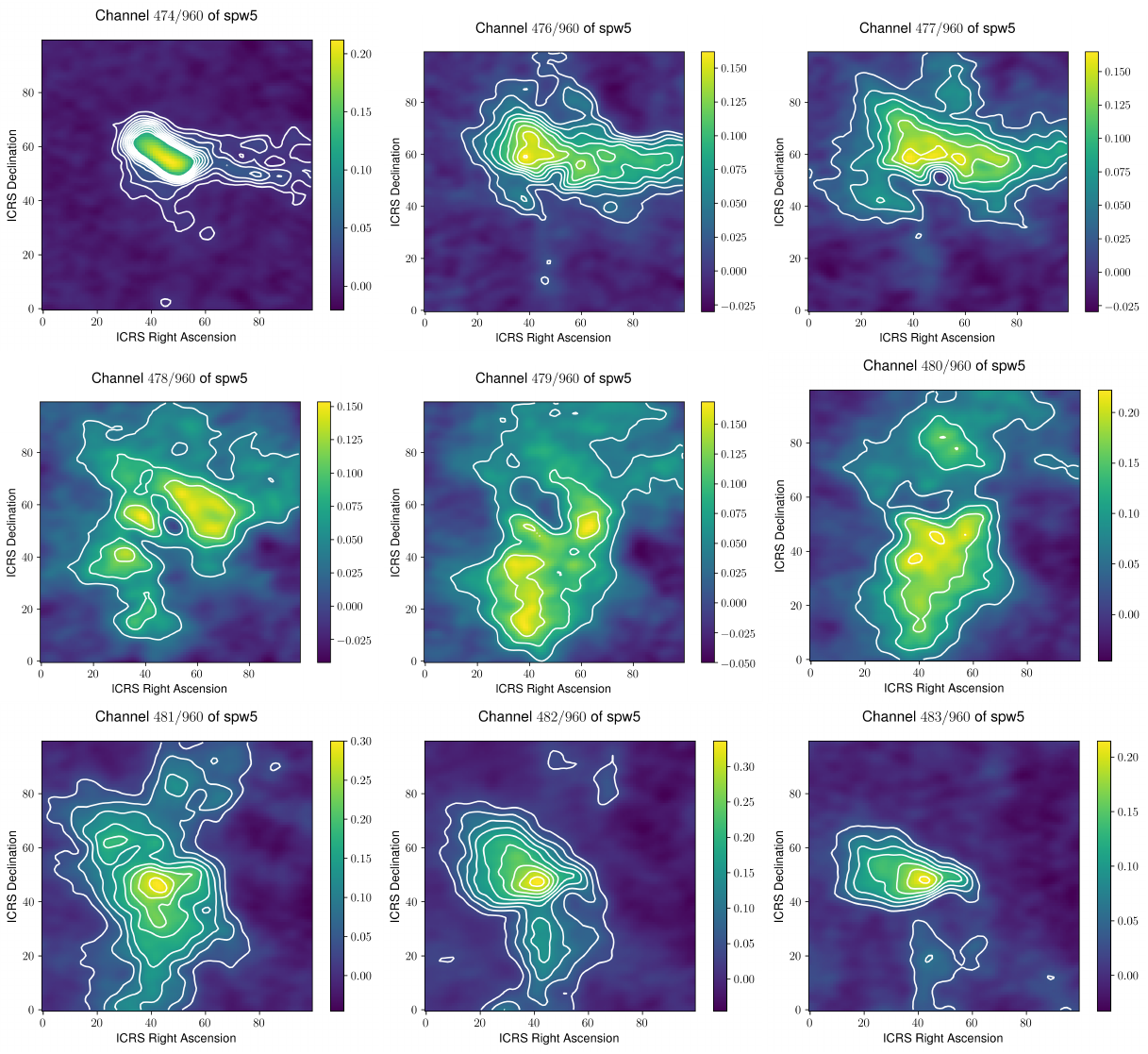
**5. Discussion: motion of the source**

Figure 2 Contoured plot (10 levels from 2 to 20 times of background noise rms) of selected channels of spectral window 2 that shows some signs of a possible bipolar outflow feature.

Figure 1 Contoured plot (10 levels from 2 to 20 times of background noise rms) of selected channels of spectral window 3 that displays prominent signs of a bipolar outflow feature.

In certain spectral windows such as spectral window 3 and spectral window 2, a bipolar outflow is clearly visible and in progress with each channel. In other spectral windows, the source appears to be in some type of less well-defined motion that revolves around its (visual) center. Such pattern is visible in contoured plots of spectral window



References

1. Surname A, Surname B and Surname C 2015 *Journal Name* **37** 074203
2. Surname A and Surname B 2009 *Journal Name* **23** 544