

Centennial Honors College
Thomas E. Helm Undergraduate Research Day 2024

ABSTRACT

Major: Physics

Poster

Faculty Mentor(s): Esteban Araya

Variability Hydroxyl Emission in the Orion Nebula

Gabriel Sojka

The Orion Nebula, which is found in the sword of the Orion constellation, is a high mass star forming region located 1344 light years from Earth. We are investigating this region using spectroscopy, an essential tool in astronomy, which is based on the detection and analysis of spectral lines (certain wavelengths of light either absorbed or emitted by objects in space). The emission or absorption is commonly thought of in the sense of electrons absorbing or emitting photons when jumping between energy levels, but it also occurs when molecules transition between different energy states. This work is based on data from VOLS (the VLA Orion A Large Survey; P.I. G. Busquet), which is an international project using the Very Large Array in New Mexico surveying the Orion Nebula. VOLS is conducting radio continuum (to detect ionized gas) as well as spectral line observations, including hydroxyl (OH) transitions. We report detection of six molecular masers (the equivalent of microwave lasers) corresponding to the 6.035 GHz transition of the hydroxyl molecule, one of which is a confirmation of an earlier detection made by Caswell and Vaile in 1995. We are in the process of analyzing the variability of these masers over approximately 3 months of observations. Our preliminary results include detection of variability at the 20% level in two of the maser components, and the detection of circular polarized emission from two maser components, one of them shows a V-Stokes spectral profile consistent with Zeeman splitting. This research is partially supported by NSF grants AST-1814063 and AST-1814011, and computational resources donated by WIU Distinguished Alumnus Frank Rodeffer.