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A Computational and Observational Study of Interstellar Thioformaldehyde Masers[1] LISA SIMPSON, IAN HOFFMAN, Wittenberg University
— Interstellar spectroscopy of thioformaldehyde (H_2CS) holds substantial promise because of the close relationship between the H_2CS molecule and the well-studied formaldehyde (H_2CO) molecule. We present here a summary of our computational investigation of H_2CS level populations and their relationship to known H_2CO 6-cm masers, as well as the details of an observational campaign of four H_2CS isotopologues. The maser pump model developed by Boland and de Jong (1981) for a known 4.8-GHz H_2CO maser in the Galactic star-forming region NGC 7538 has been extended to the analogous ground state transitions of four thioformaldehyde isotopologues: $H_2^{12}C^{32}S$, $H_2^{13}C^{32}S$, $H_2^{12}C^{34}S$, and $H_2^{12}C^{33}S$. Preliminary results from this model provide strong evidence for non-thermal maser emission from any of these isotopologues. Of considerable interest is the fact that this J=1 transition of H_2CS has never been detected astronomically. Higher-J transitions of H_2CS have been detected in various Galactic sources through thermal absorption but interpretations of these observations are ambiguous. A detection of the J=1 transition of H_2CS would alleviate many of these ambiguities. We describe our forthcoming experiment to search in NGC 7538 for both thermal and non-thermal emission and absorption from the considered H_2CS isotopologues. Both parts of this research effort will provide valuable and novel constraints on H_2CS and H_2CO.

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