Characterizing periodic maser lightcurves

Project level: Masters
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Background: It has been just over 20 years ago since the discovery of the first periodic methanol masers associated with high mass star formation regions (hmsfr)'s. Since that discovery the list of known periodic masers have drastically increased to over 30, and counting. Various hypotheses have been made to try and explain the underlying mechanisms responsible for the periodicity, however, no observations have been able to confirm any of these hypotheses. The periodicities comes in many shapes, i.e. flares profiles. Since we expect that each flare profile describes some physical mechanism, it poses the question whether the flare profiles could describe different phases in the formation proses of massive stars. With this in mind, maybe there are light curves observed at other wavelengths outside of the radio that could tell us something about the evolutionary stages these different regions might be in?

Project statemnet: For this project, the student will anlayse the data for as many periodic methanol maser sources that they can get their hands on and do a complete flare profile, time series, and period analyses, and characterising these sources into catagories based on the results obtained from the analysis. The student will then try and classify the different light curves and see if they can find possible candidate light curves from other branches of astronomy in order to connect the flare profiles to possible physical mechanisms that can cause this periodic behavior.

Recommended skills and interests: The student will learn about maser theory and how it is related to high mass star formation, and the current theory of high mass star formation. The student will make use of Python to analyse the data where possible, he/she will analyse data to find the periods of these masers and to obtain the information like, flare shape, flare stability, flare duty cycle, and by using these and other observations, draw conclusions on possible driving mechanisms for these period masers.