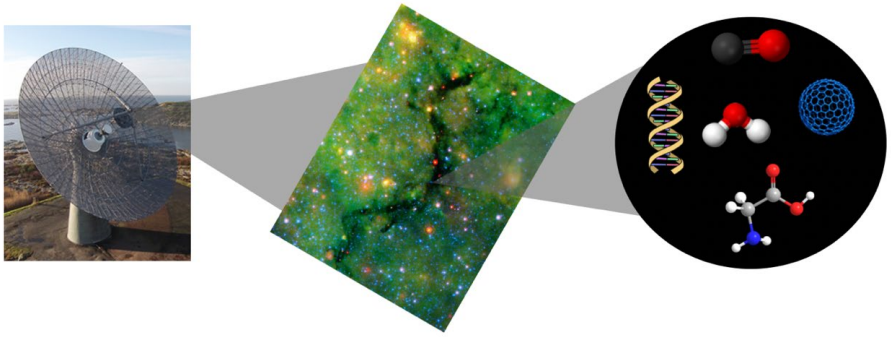
Massive Star Fireworks



Background

Massive stars, which are those with more than 8 times the mass of our sun, play a crucial role in the Universe, from the evolution of galaxies to the generation of elements that constitute life. Indeed, along with providing the building blocks of life, massive stars mix and stir the Interstellar Medium through stellar winds, jets and outflows, and more impressively, supernova explosions. This contributes to create the physical and chemical conditions for new stars to be born and hence galaxies to evolve. Despite this importance, it is not yet clear how massive stars form. Since massive stars are usually located very far away and in crowded environments, studying their formation usually requires very powerful telescopes. An excellent way to unveil the secrets of massive star birth is to observe their parent molecular clouds, known as Infrared Dark Clouds (IRDCs). Studying the physical conditions, such as temperature, density, magnetic field properties and velocity flows, and chemical content of IRDCs gives important information with which to test theories of massive star formation. **Massive stars are the reason for the iron in your blood, the calcium in your bones, and the oxygen you breathe, and they are definitely the reason you are reading this! Join us in this project!**

Work Description

Students will work on a sample of up to 20 IRDCs to investigate their physical and chemical properties of the gas by using various emission lines of molecular species (e.g., CO, SiO) observed by radio telescopes from around the world. While most data are already taken and available in data archives, **there will also be the possibility for students to take part in real observing sessions through the SHRECK program. A visit to Onsala Space Observatory is envisioned as part of the project as well.** In addition to studying the molecular gas of the IRDCs, we will also study their star formation content by identifying sites of star formation using infrared data and investigating their spatial and mass distribution along with their evolutionary stage using the newly developed Python package *sedcreator* to generate and fit Spectral Energy Distributions (SEDs). Moreover, we will also retrieve and analyse data from the *GAIA* mission which has revolutionise astronomy in the last few years.

In this project, you will learn how to analyse real astronomical data. You will also acquire programming skills, which are highly transferable to any other academic discipline and industry. The main programming language will be Python to analyse, plot and present the results. No prior knowledge of Python is needed.

Group Size

5-6 students per group, maximum 4 groups.

Group Target

Engineering Physics, Engineering Mathematics and Chemical Engineering students at Chalmers University of Technology, Physics students at Göteborg University. The project will be carried out in English.

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Note: this report can be written in Swedish, and if anyone from TKTFY or TKTEM is in the group the report must be written in Swedish. OBS: Rapporten kan skrivas p¬ svenska och om n¬gon fr¬n TKTFY eller TKTEM [a] r med i gruppen s¬ skall rapporten skrivas p¬ svenska