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Physics

Use of Contemporary Astronomical Infrared Databases, 2MASS and WISE, for the Determination of Extinction due to Dark Clouds and Characterization of Young Stellar Objects (YSOs).

Recent advances have revolutionized research based on infrared observational astronomy. The most significant advance being that, like the Hubble space telescope, infrared telescopes can now be placed above the atmosphere. Since the Earth's atmosphere absorbs infrared radiation this type of astronomy was virtually impossible prior to the 1990's. The concurrent advances in digital imaging and data storage have caused a situation where instead of no data there is so much data, in the form of images and infrared spectra, that it is now being made public so researchers well beyond the team dedicated to the telescope can participate in the analysis. Otherwise it would be years or decades before the data could be analyzed. Scientifically the infrared spectrum opens up the ability to analyze interstellar gas and dust clouds that visible light is unable to penetrate.

We propose to use publicly available infrared database, 2MASS and WISE, to study dark molecular clouds, an important phase of the interstellar medium. These clouds are quiescent regions of space where star formation (and planet formation) occurs. They are ideal sites to study the properties of dust in the earliest stages of star formation. We will use 2MASS and WISE data to determine extinction along the line of sight to a small subset of dark clouds. Researchers have two different methods of using 2MASS data (near-IR) to determine extinction in a handful of dark clouds. We propose to benchmark these methods and study various biases in the surveys. We will also extend the methods to include the long wavelength data (mid-IR) from WISE database, which has never been done before. These data also allows us to characterize Young Stellar Objects (YSOs) that are embedded in the dark cloud. Our study will result in maps of dust densities and lead to a better understanding the physical and chemical properties of the interstellar medium including the conditions present during the early stages of star formation