Cool Stars with Extreme Mid-Infrared Excesses: Potential Tracers of Planetary Collisions

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\textbf{Stars with Extreme MIR Excesses: Tracers of Planetary Collisions}

Theissen & West\textsuperscript{1} found a small sample of older (>1 Gyr), low-mass field stars showing extreme mid-infrared (MIR) excesses.

The amount of MIR flux observed is too large to be attributed to primordial debris disks\textsuperscript{2}. Modeling indicates that dust causing the observed MIR excesses is orbiting within the zones where terrestrial planets are formed.

\textbf{Building a Galactic Model to Estimate Completeness}

Using a Galactic model\textsuperscript{3}, we can simulate low-mass stellar counts and kinematics in selected volumes within the Galaxy. We model the thin and thick disks, along with the halo, and their respective kinematics.

\textbf{A Larger Sample of Stars with MIR Excesses}

We found that low-mass stars exhibiting extreme MIR excesses are less than 0.1\% of the entire population\textsuperscript{1}. A larger input catalog of bona fide low-mass stars is required to identify a significant number of stars with MIR excesses. Photometric surveys contain millions of objects with colors of low-mass stars. However, only proper motions ($\mu$) can distinguish dwarf stars from other red objects. Thus, we built the Motion Verified Red Stars (MoVeRS) Catalog.

\textbf{Investigating Trends for Stars with Extreme MIR Excesses}

With this larger, more uniform sample, and methods to determine completeness, we can investigate trends with stellar mass and age for stars exhibiting extreme MIR excesses.

\textbf{Color (a proxy for mass)}

We find no clear trend with stellar mass, indicating that planetary collisions occur at similar rates in all low-mass stellar systems. Our percentages are also lower than our previous study due to our more selective MIR excess criteria and larger parent population from which they are drawn.

\textbf{Proxies for age}

There is no strong correlation with distance from the Galactic plane, indicating no strong dependence on age.

These systems are important for understanding the long-term evolution of planetary systems and habitability of planets around low-mass stars. These systems will make important targets for the next generation of telescopes.