Variable Stars

An Introduction to Variable Stars

What are Variable Stars?

Put simply variable stars are stars that change in brightness. This can be by as much as 20 magnitudes or as little as a thousandth of a magnitude. The period of variation can differ as well, sometimes taking just seconds and other times having a variation period of years.

Today, we know and have catalogued over 150,000 variable stars, with thousands more suspected. The reasons for their variation changes, meaning there are many types of variable stars that do not all fit within the same category.

Types of Variable Stars:

There are two categories into which all variable stars fit, intrinsic and extrinsic. An intrinsic stars variability is caused by physical changes, including pulsation and eruption. While an extrinsic variable star is due to factors including eclipse by a star, exoplanet transit or effects of stellar rotation.

Types of variable stars are: -

1. **Rotating Variables** (luminosity varies because either they have a non-uniform surface brightness, perhaps due to sunspots, and/or ellipsoidal shapes)
2. **Eclipsing Variables** (a pair of stars rotating around a centre point, where observes see changes in luminosity as one star eclipses the other)
3. **Pulsating Variables** (periodic expansion and contraction of the stars surface layer)
4. **Eruptive Variables** (vary in brightness because of the violent progresses such as flares that occur on the surface of the star)
5. **Pre-main Sequence Variables** (before it reaches its main sequence the star is contracting and its internal temperature rising)
6. **Miscellaneous Variables** (not easily categorised)

Cepheid variables are an important type of pulsating variable star. Being very regular in terms of their pulsation periods, whether in terms of days or months. They can be used to determine distances to galaxies and helped establish the Hubble constant.

The online observatory collaboration consists of the following partners:
Baldone Observatory, Brorfelde Observatory, Cardiff University, Harestua Solar Observatory, Helsinki Observatory

Why Study Variable Stars?

Observing variable stars teaches us about an important part of the universe, stars. Stars are the primary engine of cosmic evolution, particular in the creation of elements heavier than hydrogen and helium. The variability of these stars is what provides clues about stellar properties such as mass, radius, luminosity, temperature, internal and external structure, composition and evolution. Some of this information would not be possible, or very difficult, to obtain any other way.

Another important reason to study stars is to search for other possible life. The system of planets around stars are where we might find life, or an exoplanet that could support life. To understand variable stars, they must be systematically observed over decades in order to determine their long-term behaviour.