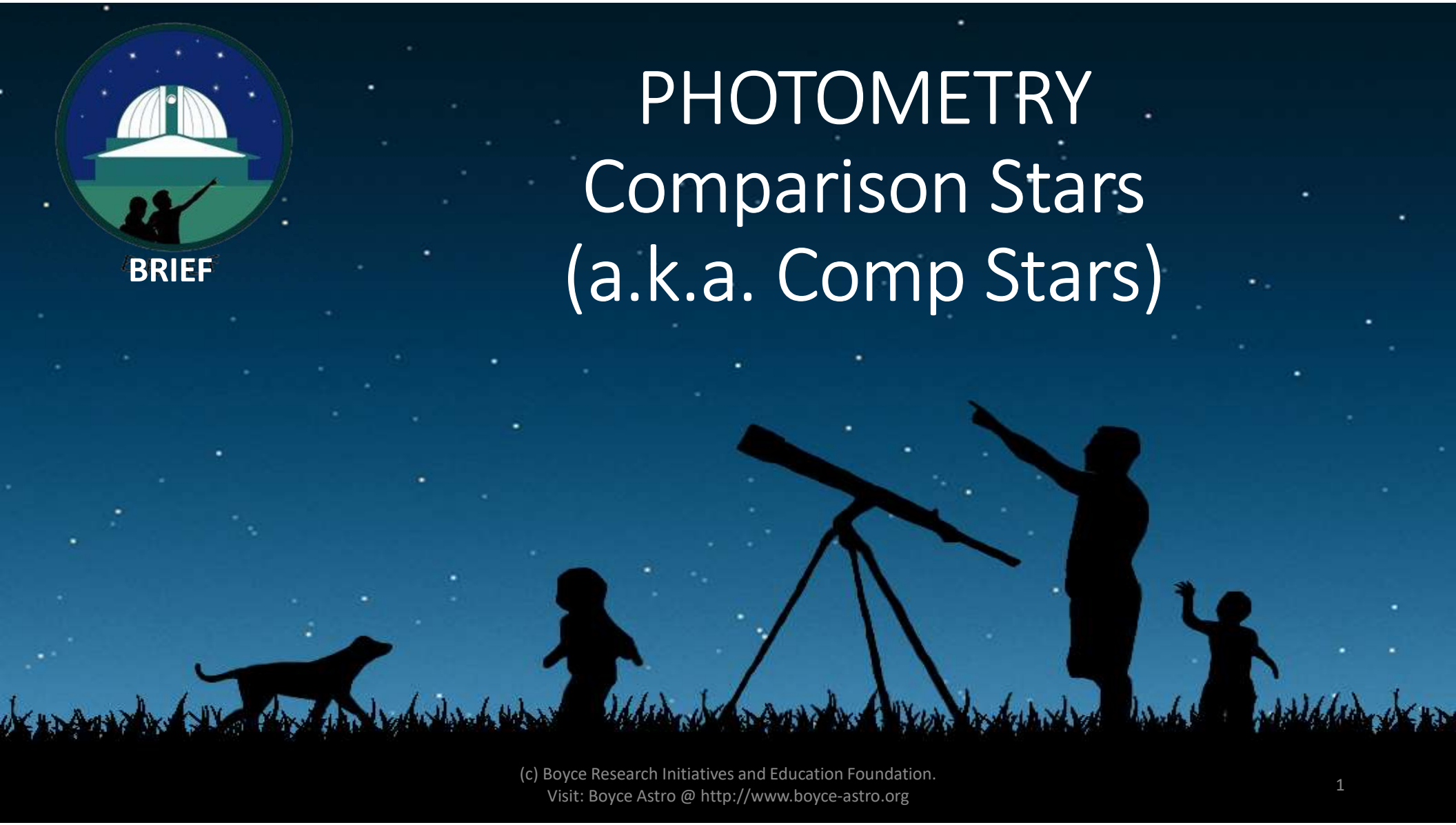
BRIEF

PHOTOMETRY
Comparison Stars
(a.k.a. Comp Stars)



Overview

Comparison stars are at the heart of photometry.

While photometry seeks to measure the flux changes of a target star, the comparison provides the baseline from which to compare. Without comp stars, it would not be possible to know the flux changes of the target.

It is important that comp stars be stable and un-variable. There are tools available to determine whether a desired comp star is variable or not. The AAVSO has excellent resources for this purpose.

Other software packages such as AstroImageJ (AIJ) provide feed back on randomly selected comp stars.

What is a Comparison Star

The sky is filled stars that vary in brightness: Exoplanet Host Stars, Eclipsing Binaries, New Stars, Old Stars, etc.

Their variations in brightness can change in minutes, in hours, in days, or years. How their periods of variability are measured is through comparison of their variations to those that do not have any brightness changes: Comparison Stars.

Comparison stars are one that do not have any change in their light output: Flux.

Comp Stars, when located in the same frame, accommodate for overall brightness fluctuations caused by changes in ambient light, thin clouds, atmosphere, etc.

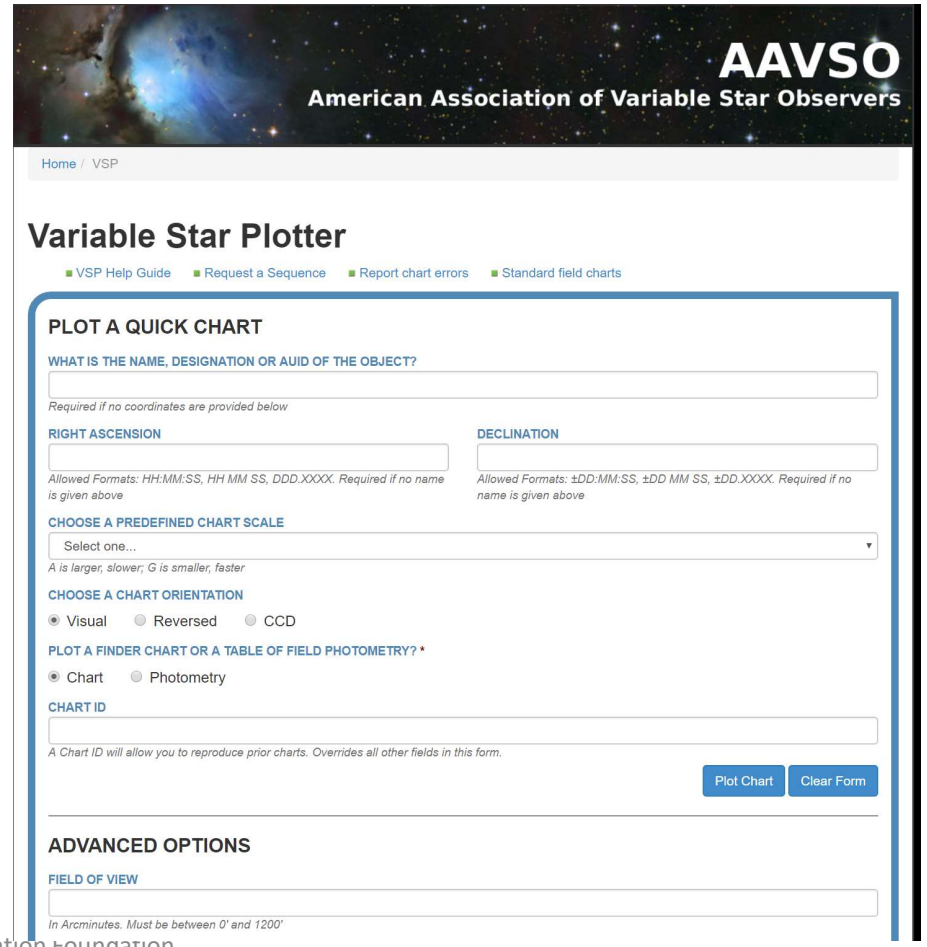
Referencing the image to the right, how do you find a Comparison Star?

Locating Comparison Stars - AAVSO

URL: https://www.aavso.org/apps/vsp/

The AAVSO hosts a series of useful tools for the study of variable stars.

The Variable Star Plotter allows the user to identify a target variable star (i.e. Exoplanet Host Star) and make a plot where the surrounding Comparison Stars (those with no flux variability) will be identified.



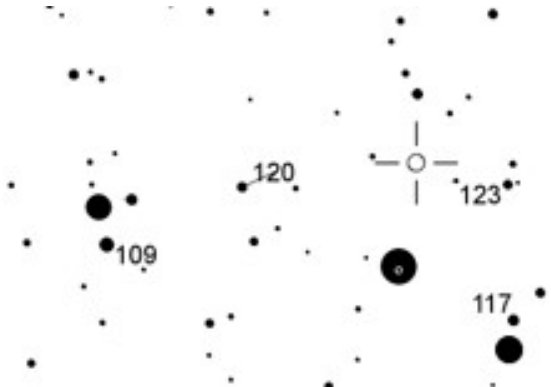
Locating Comparison Stars - AAVSO

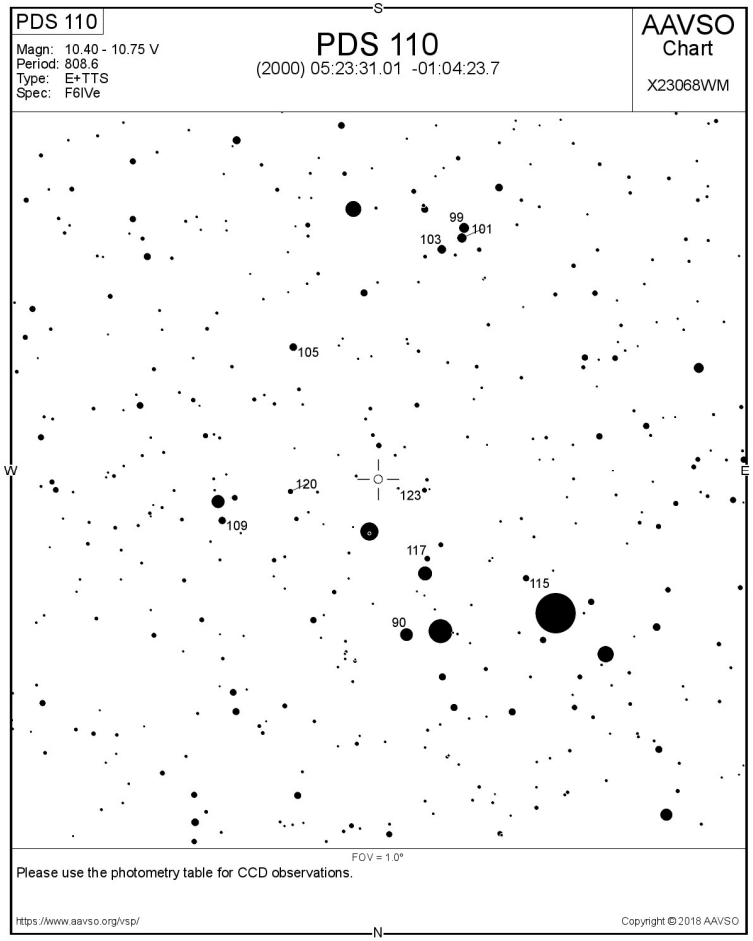
URL: https://www.aavso.org/apps/vsp/

The result is a star chart similar to the one on the right.

The identified target is denoted in a cross and the verified Comparison Stars are identified with numbers next to them.

The numbers denote the known magnitude without a decimal point, in 1/10ths





Locating Comparison Stars - Software

Dr. Michael Fitzgerald has identified a process using Python scripts where all stars in all images will be measured for their variations through out an image series.

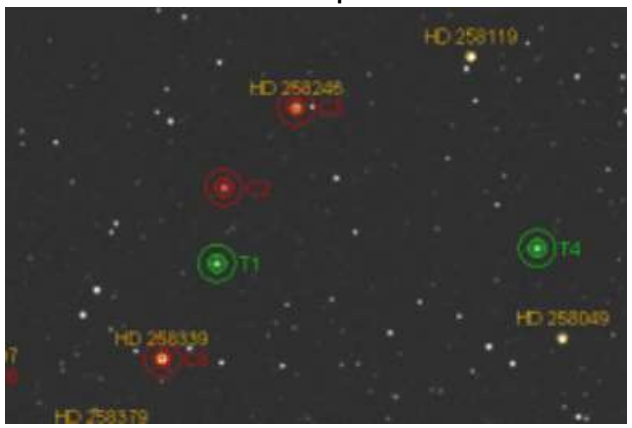
Those that change in brightness are identified as variable and removed from the list of Comparison Stars in the image.

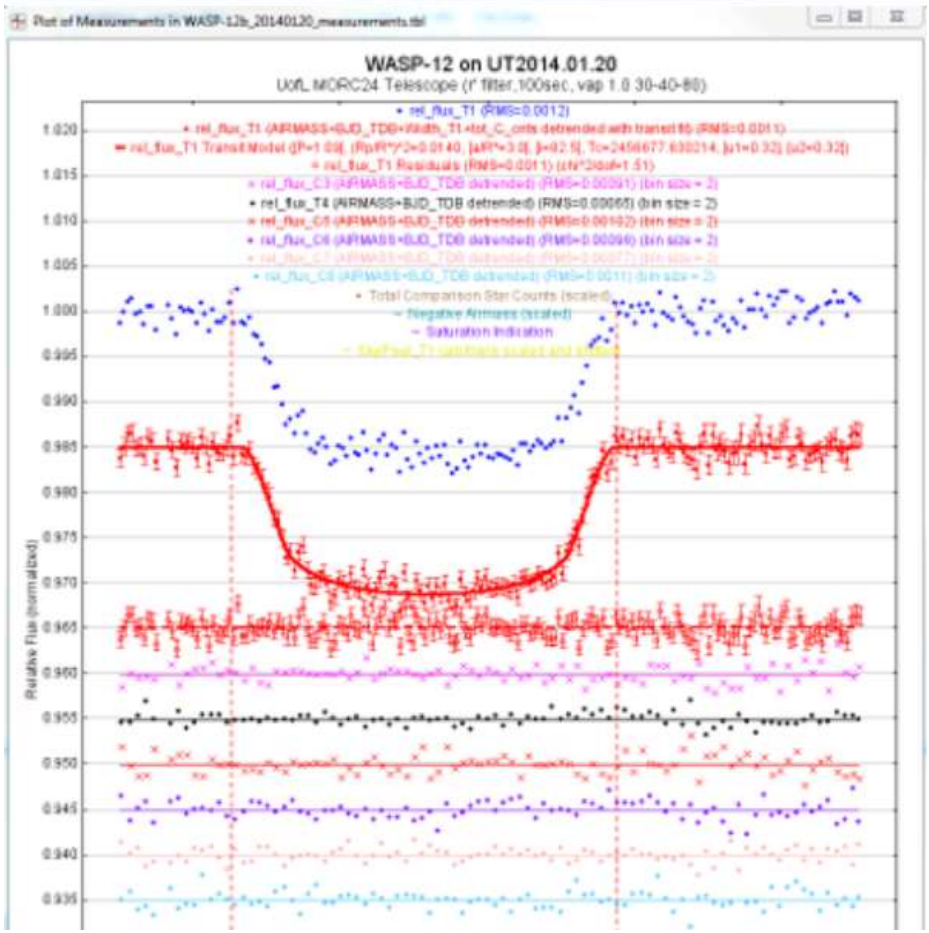
It is not important why they are variable in this process; but, just that they are variable in some fashion.

Locating Comparison Stars - Software

AstroImageJ, used in Exoplanet hunting, provides a means for the user to select potential Comparison Stars as well as the Target star. The software then measures the light variability of the Target against the Comparison Stars and provides a plot (right).

The identified flux changes of the Comparison Stars is plotted. If variability is detected, the Comparison Star should be eliminated and the plot return with a new candidate star.





Summary

In photometry, Comparison Stars and Target Stars are intricately linked.

The comp star provides the baseline from which the target star's changes in flux are measured.

Remember: the comp star must not be variable, or it will impact the light curve output for the target star.

Questions?