CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

S1807

Project Title

Kinematics of H-alpha Emitting Stars in Andromeda

Abstract

Objectives/Goals

Studying emission line stars helps improve our understanding of stellar evolution, types of stars, and their environments (Prichard et al. 2016). In this study, we investigated the correlation of H-alpha emission line star velocities to their ages in order to increase our understanding of stellar populations by validating existing stellar evolutionary models for rare star populations and gaining physical insight into the nature of H-alpha stars.

Methods/Materials

We used a combination of spectroscopic and photometric diagnostic methods to remove a population of foreground Milky Way (MW) star contaminants from our data set. The H-alpha stars were selected from a sample of 5295 spectra from the Spectroscopic and Photometric Landscape of Andromeda's Stellar Halo (SPLASH) survey and accompanying photometric data from the Panchromatic Hubble Andromeda Treasury (PHAT) survey. Velocities of two classes of H-alpha stars, main sequence (MS) stars and asymptotic giant branch (AGB) stars, were analyzed through a novel Age-Velocity Difference Correlation (AVDC) method, which utilizes line-of-sight velocity differences (LOSVDs) in order to estimate the age of a rare stellar population.

Results

Histograms, weighted means, and weighted standard deviations of the LOSVDs were used to conclude that MS stars are more kinematically coherent than AGB stars, and that H-alpha stars are kinematically comparable to non-H-alpha stars of similar evolutionary phases.

Conclusions/Discussion

Our results showed that H-alpha stars are close in age to their non-H-alpha counterparts. Our AVDC method sets a precedent for the use of similar methods in predicting the ages of rare stellar subgroups.

Summary Statement

Using an age-velocity difference correlation method we created to analyze the kinematics of H-alpha emission line stars, we discovered that H-alpha stars are kinematically comparable and thus close in age to their non-H-alpha counterparts.

Help Received

We worked under the mentorship of Professor Puragra Guhathakurta through the Science Internship Program at UC Santa Cruz.