Stellar Ages: Comparing the Physics from 1D Stellar Structure Codes

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Abstract

The space photometry revolution has ushered in a new era in our search for extra-solar planets and for our understanding of stellar physics. Previously inaccessible parameter spaces (e.g., core mass) provide new constraints on stellar models thanks largely to the determination of the oscillation frequencies of stars in the Kepler and CoRot field. Still, determining the age of a star in isolation remains an inexact science. Uncertainties of up to 30%-40% exist with model dependent techniques. With the wealth of data now available, our group will utilise gyrochronology, binaries and clusters, isochrone fitting as well as individual matching of asteroseismological variables to determine the ages of 1000's of stars with unprecedented accuracy. Some of these techniques are model dependent, and as such, we will employ independent codes (at least three) from expert groups around the world as a consistency check. Not only will we better determine ages of the observed stars but this project provides an opportunity to improve stellar modelling theory. What physics to include, and the different means by which to parameterise these processes in 1D codes may lead to degeneracy in the parameter space that we intend to match. Here we focus on 1D models and describe and compare some of the physics that varies from code to code.

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