F P4 Looking for a definitive answer for age dependency for the Ap stars

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Ap stars present high abundance of rare earth elements. These overabundances are understood as the result of radiative diffusion. In the model of radiative diffusion, the rare earth elements are pushed to the surface by selective radiation pressure as the wavelength where the radiation field is maximum coincides with the wavelength where the rare earths opacities peak. Radiation pressure is helped by the lack of convection in A star envelopes and by the inhibition of turbulence promoted by the magnetic fields.

A fundamental question in the investigation of Ap stars is when, in the evolution process, does an A star turn into an Ap star? This is an essential problem, because it is connected with the origin of Ap stars, and in the literature there is no agreement if the spectral peculiarity depends on age or not. To solve this problem, we have studied the number ratio of Ap to A stars in 18 open clusters of different ages in a total of 405 stars, including all stars in the spectral range B5V – A9V in each cluster. We classified all stars based on spectra of 2Å resolution and a SN ratio of about 100.

We studied 3 groups of open clusters combined by age, and we found a frequency of occurrence of Ap stars for the first,second and the third group of 4.6%, 5.3% e 10.8% respective. In order to test the significance of the differences in the frequencies, 2×3 a contingency table test for independence was built. The χ^2 value computed is 4.9 and the null hypothesis that the Ap frequencies of the groups and the groups mean age are independent is rejected at a confidence level of 90%.