F P17 The helium abundances in HgMn and normal stars

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The parameter-free model of diffusion in the atmospheres of HgMn stars predicts that helium should sink below the He II ionization zone in order that diffusion of other elements may take place. Therefore if the diffusion model has explanatory power, it is predicted that all HgMn stars should have deficits of helium in their photospheres. In this study, the Smith & Dworetsky sample of HgMn stars and normal comparison stars is examined, and the helium abundances determined by spectrum synthesis using échelle spectra taken at Lick Observatory.

Abundances were determined for 25 HgMn stars and 12 normal and superficially-normal stars of similar $T_{\rm eff}$, using an LTE analysis. It is well known that the effects of non-LTE can safely be ignored in the relevant temperature range. The analysis was performed for two He I lines, λ4026.2 and λ4471.5. The normal stars give $\log N({\rm He})/N({\rm H}) = 11.00 \pm 0.05$, in excellent agreement with the standard value 10.99. All HgMn stars have underabundances, ranging from factors of 0.3 dex at low $T_{\rm eff}$ to 1.5 dex at the highest $T_{\rm eff}$. There is also a weak correlation between the helium deficit and Smith's stellar peculiarity index α.