D KNS Atomic diffusion in stellar surfaces and interiors

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Stars where atomic diffusion has been suggested to play a significant role include: the Sun and up to the upper main sequence, Pop II turnoff stars and cluster age determination, horizontal branch stars (including sdOs and sdBs), white dwarfs and neutron stars. In all those cases, radiative accelerations play a significant role. A stars are however arguably those that show most prominently the effects of atomic diffusion. In so far as the effects of mass loss, turbulence and meridional circulation may be neglected in evolutionary models of A stars, the effect of atomic diffusion in them have now been calculated from first principles and are presented using complete evolutionary models of 1.7 and 2.2 $M_{\odot}$ stars. Abundance anomalies are not only superficial but extend over a significant fraction of the stellar radius. Iron convection zones appear at a temperature of about 200000 K. Abundance anomalies similar to those observed in Am stars are produced. However the comparison to observations requires linking atmospheres to interior evolution. Models that have been proposed to take into account atomic diffusion in atmospheric regions in order to explain observations are critically reviewed. They depend on a number of parameters because the atmospheric regions are imperfectly modeled, the magnetic field is not taken into account, and important hydrodynamic processes require arbitrary parameters for their description.