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Memorie della

A discussion of self-pollution mechanisms

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Abstract. Intermediate-mass AGBs and low-mass stars having just passed the helium-flash are both potential contributors to chemical variations in GC stars. Both mechanisms face the difficulty of the short time available between the sweeping of the generated gas at each crossing of the galactic plane by the GCs

I think that both, intermediate-mass AGB (IM-AGB) stars and low-mass ($2 \gtrsim \mathcal{M}/\mathcal{M}_\odot \gtrsim 0.8$) upper RGB stars, which were slightly more massive than the present-day MSTO stars, could contribute to the star-to-star abundance variations in globular clusters (GCs). In the both types of stars, H was burning in a shell (at the base of the convective envelope in the IM-AGB stars – hot-bottom burning (HBB), and atop the He-core in the RGB stars), and the nuclearly processed material could be transported from the shell to the stellar surface (by convection in the IM-AGB stars and by (rotationally induced?) extra-mixing plus convection in the upper RGB stars). An advantage of the IM-AGB stars in regard to the primordial scenario is their having short life times ($\sim 10^8$ yr) compared to galactic orbital periods of GCs. This guarantees that a reservoir of gas ejected by IM-AGB stars can be pumped up in a GC before it will cross the galactic disk and the disk ram pressure will sweep the gas out (Thoul et al. 2002).

Low-mass stars live from $\sim 10^9$ yr to $\sim 14 \cdot 10^9$ yr. However, they do not lose their mass until they reach the RGB tip, and then their mass-loss phase lasts for only $\sim 10^6 - 10^7$ yr. If the mass lost by the upper RGB stars had been smoothed over quite a large volume before the MS stars of lower masses ($\mathcal{M} < 0.8\,\mathcal{M}_\odot$) began accreting it, then the contribution of the upper RGB stars to the abundance variations in GCs would be apparently unimportant because of very low density of the accreted gas. But the primordial scenario with the IM-AGB stars as the only contaminators of low-mass MS stars in GCs actually faces the same problem (Thoul et al. 2002). Observational tracing of the O-Na global anticorrelation from the MS through the RGB tip assumes that at least some of the low-mass MS stars in GCs have accreted more than 100% of their initial masses (e.g., a $0.3\,\mathcal{M}_\odot$ MS star must have accreted $\sim 0.5\,\mathcal{M}_\odot$ of material formerly processed in H-burning). It is hard to believe that a star could accumulate such the huge amount of material by simply passing (even if many times) through a contaminated gas cloud of uniform (and, therefore, not too high) density. It is much more probable that the star entered a dense cloud of gas ejected by a more massive star a short time before. But in this case, considering either the IM-AGB stars or the upper RGB stars as contaminators is equally possible. A discussion of *pros* and *cons* for these 2 types of potential contaminators is given by Denissenkov elsewhere in this volume.

References

Thoul, A. et al. 2002, A&A, 383, 491