EVOLUTIONARY PROPERTIES OF POST-AGB AND POST-EAGB STARS

Marco Limongi[1,2], Amedeo Tornambe'[1], and Marco Castellani[1,3]

1) Istituto di Astrofisica Spaziale, CNR, CP67, I-00044 Frascati, Italy
2) Universita' di Roma "La Sapienza", Italy
3) Osservatorio Astronomico di Collurania, 64100 Teramo, Italy

Subject headings: galaxies: elliptical - stars: evolution - stars: interiors

Summary. *We discuss the evolutionary properties of shell burning star models which, due to the erosion of the external hydrogen envelope, leave the Hayashi track and evolve to the blue of the HR diagram. We analyze the properties of star models which evolve off the Asymptotic Giant Branch (AGB), the Early-AGB or the Red Giant Branch (RGB).*

We evolved several star models from the Zero Age Horizontal Branch to the cooling down phase, assuming different starting masses (from 0.48 $M_\odot$ to 0.54 $M_\odot$) and chemical compositions (Y=0.30, $Z=Z_\odot$ and $Z=2Z_\odot$). Mass loss has been allowed to start at different luminosities along the AGB, simulating in such a way a major variety of different evolutionary paths.

Our main findings are:

a) the structural parameters of stars evolving off the Hayashi track are dramatically different if the evolution starts from the thermally pulsing AGB (post-AGB) or if it starts from the Early-AGB. The first main difference is that post-EAGB models are endowed with a residual H envelope which is much larger than required by proportionally smaller He-cores (the physical reason for this occurrence is explained in CLT). In addition post-EAGB models are endowed with an additional energy source due to the actively burning He-shell.

b) We could define with a rather good degree of accuracy the border core mass which separates the post-EAGB evolution from the post-AGB evolution or from the RGB.

c) However, it exist one, and only one, correlation linking the critical H-envelope mass (at which the blueward excursion from the Hayashi track starts) and the luminosity, whatever being the evolutionary phase (RGB, E-AGB, AGB).

d) For low core masses (post-RGB stars) and large core masses (post-AGB stars) there exists one single correlation linking the critical H-envelope with the core mass while, for intermediate core masses (post-EAGB stars) the critical envelope correlates with the core in a quite different way, turning out to be much larger than in the two adjacent cases.

References:

Castellani, M.,Tornambe', A.: 1991, ApJ, **381**, 393
Castellani, M.,Limongi, M.,Tornambe', A.: 1992, ApJ, **389**, 227 (CLT)