# AGE DETERMINATION OF HII REGIONS OF THE LMC AND SMC

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ABSTRACT

    HII region models were constructed which take into account: 1º) A burst for the formation of the ionizing association; 2º) Different Salpeter's initial mass function ($1 \leq x \leq 3$) and upper stellar mass limit ($30 \leq M_u/M_\odot \leq 120$); 3º) Models of stellar evolution with and without mass loss (Maeder, 1980, Hellings et al. 1981).

    From these models the temporal evolution of the H_β emission line equivalent width (W_{H_β}), the ratio of the forbidden lines 4959, 5007 [OIII] to H_β, and of the He^+,H^+ zones volume ratio (R) was obtained. It was found that W_{H_β}, [OIII]/H_β and R decrease as a function of the time and consequently they are good age indicators. Some of the models appropriate for the LMC are shown in figures 1.
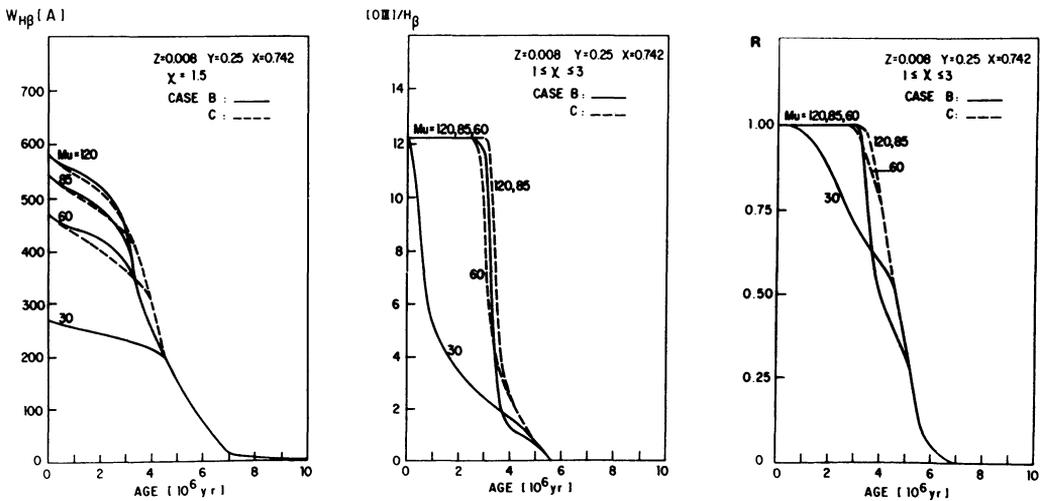
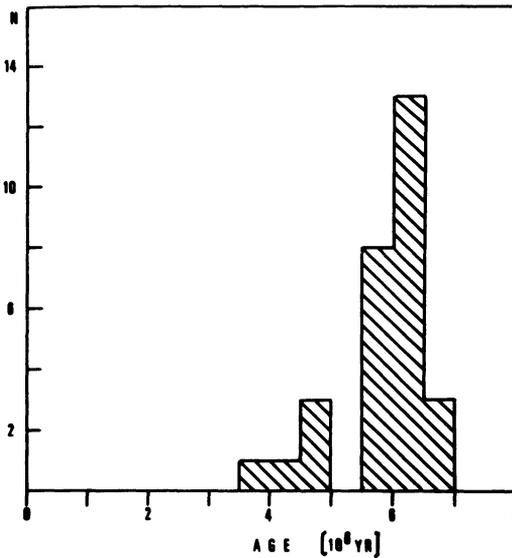Figures 1: Evolution of W_{H_β}, [OIII]/H_β and R as a function of the time.

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Measurements of $W_{H\beta}$ for 29 regions of the LMC (Dottori and Bica, 1981) were analized using the models. Models with $x = 3$ can be disregarded because they are incompatible with $W_{H\beta}$ higher than 90 Å, which are common in the LMC. For $x = 2.5$ the maximum $W_{H\beta}$ is around 200 Å and is not consistent with the values found in 30 Dor. and NGC 2032. Values of $1 \leqq x \leqq 2$ appear to be compatible with data from all regions and the choice of x within the interval does not significantly affect the scale of ages. For $W_{H\beta} \leq 200$ Å (26 of the regions) the M_u also do not influence the age determination. In figure 2 we plot the histogram of ages for $x = 1.5$ and $M_u = 60\ M_\odot$, which indicates a burst of star-formation with highest activity about 6.0 to 6.5×10^6 years ago, and with a duration of 1.5 to 2.0×10^6 years, measured at half maximum.

Figure 2: Histogram of formation of HII regions in the LMC.

Ratios [OIII]/H_β and R were obtained for 11 HII regions of the LMC from data of Dufour (1975). The mean age obtained through these two parameters are very similar (The limits are 2.2 and 4.0×10^6 years assuming $M_u = 30\ M_\odot$ and $60\ M_\odot$ respectively). These ages are smaller than those obtained from $W_{H\beta}$, which may be related to the fact that the two samples have a few objects in common.

For the SMC, data on [OIII]/H_β for 12 regions (Dufour and Harlow, 1977), lead to a mean limit of ages of 1.4 and 3.0×10^6 years for $M_u = 40\ M_\odot$ and $100\ M_\odot$ respectively. We emphasize that the dispersion around these ages is very small, suggesting that all the regions were formed simultaneously.

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