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THE DISTRIBUTION OF METAL POOR GALAXIES IN THE N/O PLATEAU

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Nitrogen is produced in both intermediate mass and massive stars, where the contribution from the former group suffers a significant time delay due to the evolutionary time. Identifying the stellar mass range most responsible for N production is essential for understanding the cosmic evolution of N.

We rederived N and O abundances of 67 metal-poor [12+log(O/H)<8.1] galaxies using optical dereddened line strengths from the literature. Most objects are BCG taken from Kobulnicky & Skillman (1996) and Izotov & Thuan (1999). Using *CLOUDY 96.01*, we performed a photoionization analysis to infer the [N II] and [O II] nebular temperatures directly from the [O III] temperature. For most objects, the relevant auroral lines for the first two ions are unavailable. The clouds were illuminated with the lowest metallicity *CoStar* models (Z = solar/5). These account for NLTE effects, line blanketing and stellar winds. The ionization parameter range was log(U) from -3. to -1, while the stars and clouds were set to have similar metallicities corresponding to 12 + log(O/H) $\approx$ 7.99 (or the maximum metallicity of our sample objects) and log(N/O) = -1.46 (a typical value for the plateau objects). Our photoionization models indicated that N/O = ICF$\times$(N$^+$/O$^+$), where $ICF = 0.95 \pm 0.05$ on average. Results are plotted in Figure 1.

The N/O plateau extends between -1.58 $\leq$ log(N/O) $\leq$ -1.15 (delimited by dashed lines) and appears to form a Gaussian distribution in log(N/O). We find log<N/O> = -1.37 (+.017/-.018), with σ = +.088/-.110. Our mean exceeds by roughly 0.1 dex earlier estimates by Garnett (1990) and Izotov & Thuan (1999), log<N/O> = -1.36 and -1.37 below and above 12+log(O/H) = 7.8, respectively, and thus the mean is independent of 12+log(O/H). A chi-square analysis of N/O values shows that a sizeable portion of the observed scatter is real and cannot be accounted for by errors.

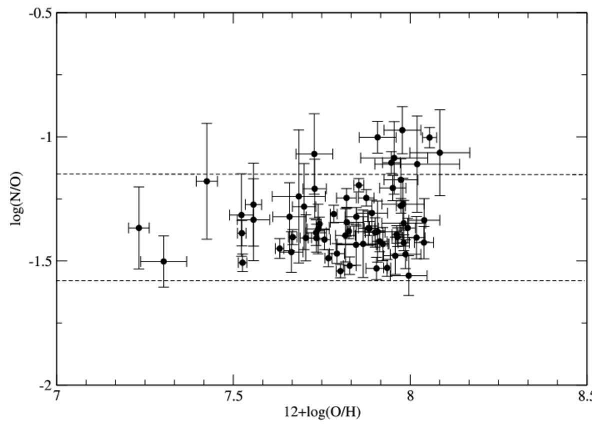

Fig. 1. log(N/O) versus 12+log(O/H) for our sample BCG. The dashed lines show the limits of the N/O plateau.

We carried out Monte Carlo simulations using a chemical evolution code in which input values for system age and SFE were chosen randomly. The results indicate that objects on the N/O plateau differ only in age and SFE and have been evolving for less than 7 Gyr with SFEs between 0.01 and 0.30 Gyr^{-1}.

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