

Metal-rich end of galactic chemical evolution: oxygen abundances from [O I] 6300, O I 7771–5 and near-UV OH.

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Abstract. We present a detailed and uniform study of oxygen abundances in a large set of 155 metal-rich dwarfs. *EW* measurements were carried out for the [O I] 6300 Å line and the O I triplet, while spectral synthesis was performed for several OH lines. NLTE corrections were calculated and applied to the LTE abundance results derived from the triplet. Abundances from [O I], the O I triplet and near-UV OH were obtained in 103, 87 and 77 dwarfs, respectively. A good agreement between [O/H] ratios from forbidden and OH lines is found, while the NLTE triplet shows a systematically lower abundance. Nevertheless, the consistency with other indicators improves if we consider LTE triplet results. In any case, discrepancies between OH, [O I] and the O I triplet hardly exceed 0.2 dex. All three indicators show that, on average, [O/Fe] decreases with [Fe/H] in the metallicity range $-0.8 < [\text{Fe}/\text{H}] < 0.5$.

Keywords. Stars: abundances, Galaxy: abundances, Galaxy: solar neighborhood, Galaxy: disk

1. Introduction

Several indicators were used in the determination of oxygen abundances in disc and halo stars: the near-IR O I triplet (e.g. Israelian *et al.* 2001), the [O I] at 6300 and 6363 Å (e.g. Takeda 2003; Shchukina *et al.* 2005), and the near-UV OH lines (e.g. Boesgaard *et al.* 1999). Recently, Israelian *et al.* (2004) have reported the largest conflict between O I and [O I] 6300 in very metal-poor giants, with discrepancies in [O/H] up to 1 dex.

2. Results and conclusions

For data analysis details, see Ecuivillon *et al.* (2005). We found that NLTE triplet abundances are systematically lower than forbidden line results, with discrepancies of the order of 0.2 dex on average, and a large portion of NLTE triplet values show similar discrepancies with respect to OH results (Fig. 1). Nevertheless, OH globally presents a better consistency with NLTE triplet. It is important to note that the NLTE corrections applied to the LTE results correspond to the maximum effect, since collisions with H atoms are not taken into account. This can produce an underestimate of the final triplet abundances, and can be the reason of the systematic underabundance of the NLTE triplet results. Actually, if we compare the results from the LTE triplet with those from [O I] (Fig. 1), the consistency between both indicators seems to improve, with typical

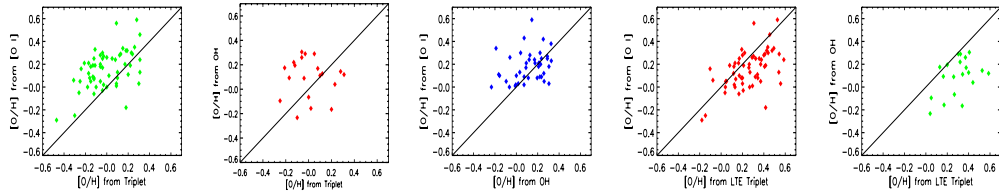


Figure 1. Comparisons of the results from [O I], OH and NLTE and LTE triplet.

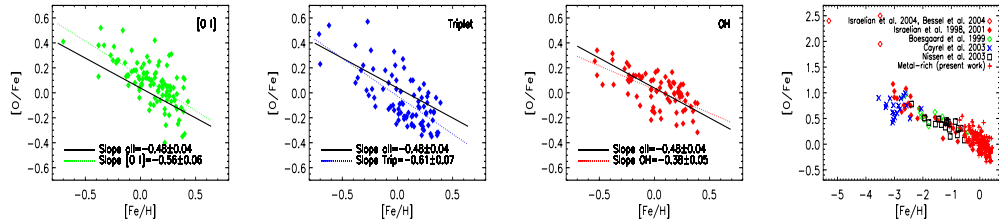


Figure 2. First three panels: [O/Fe] and [O/H] vs. [Fe/H] plots for the three indicators. Linear least-squares fits for each indicator and for the three indicators together are represented. Right panel: [O/Fe] and [O/H] vs. [Fe/H] plot for $-5.5 < [\text{Fe}/\text{H}] < 0.7$.

discrepancies of 0.1 dex. In most cases [O I] and OH agree quite well, with discrepancies of the order of 0.1 dex. Abundances obtained from OH lines are generally lower than those from [O I]. In any cases, we found that discrepancies between the three indicators hardly exceed 0.2 dex. The average trends of [O/Fe] vs. [Fe/H] from different indicators present slight discrepancies, but similar behaviours (Fig. 2). [O/Fe] clearly decreases with [Fe/H] in the metallicity range $-0.8 < [\text{Fe}/\text{H}] < 0.5$, with significantly negative slopes in all the linear fits. The linear fit for the [O/Fe] ratios averaged from the three indicators gives a slope of -0.48 ± 0.04 . Previous studies obtained a similar monotonical decrease (e.g. Takeda & Honda 2005) in the same [Fe/H] range.

3. Extending to the metal-poor regime...

Recent studies (e.g. Israelian *et al.* 2001; Takeda 2003) suggest that O I, OH and near-IR triplet provide more consistent abundances (within 0.25 dex) in dwarfs than in giants. A T_{eff} scale from Melendez & Ramirez (2003) breaks this agreement creating a large conflict (up to 1 dex) between various abundance indicators in stars with $T_{\text{eff}} > 6200$ K and $[\text{Fe}/\text{H}] < -2$ dex. However, it is not clear why such conflict should appear only in hot subdwarfs. It could be that T_{eff} in stars with $T_{\text{eff}} > 6200$ K is overestimated. The work is in progress to provide more reliable T_{eff} s for subdwarfs with $6000 < T_{\text{eff}} < 6500$ K.

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