OTELO SURVEY: OPTIMAL EMISSION-LINE FLUX AND METALLICITY ESTIMATION WITH OSIRIS/GTC


The present work has been developed within the context of the OTELO project, an emission line survey using the Tunable Filters (TF) of OSIRIS-GTC.

As part of the OTELO preparatory activities, we performed simulations finding that, for the red TF, a FWHM of 12 Å and a sampling of 5 Å is an optimal combination that allow deblending Hα from the [N II]λ6583 line with a flux error lower than 20%. This combination will allow estimating SFRs and metallicities using the Hα flux and the N2 method, respectively.

One of the aims of the OTELO survey is to estimate metallicities of ELGs. A detailed description of the different metallicity methods and calibrations are given in Kewley & Ellison (2008) and Lara-López et al. (2009a,b, 2010a). The N2 ≡ [N II]λ6583/Hα method has been used and calibrated by several authors (Denicoló et al. 2002; Kewley & Ellison 2008), and has demonstrated to work accurately estimating metallicities from 3–100 times the solar value (Denicoló et al. 2002). One of the most important advantages of this method is that an extinction correction is not required because it only uses the Hα and [N II]λ6583 lines, both close in wavelength. It requires only a narrow spectral range, making it suitable for surveys of limited spectral coverage like OTELO. Finally, the N2 method has demonstrated to work accurately at high redshift, making it suitable for detecting evolution (Lara-López et al. 2010b).

We generated spectra of typical star forming galaxies with different EWs (5, 10, 20, 30, 40, 50 Å; λα6583 line with a flux error lower than 20%). We convolved those spectra with the tunable filter response of the OSIRIS instrument of FWHM of 12 and 9 Å, subtracting the continuum, and estimating the relative errors of the recovered Hα and [N II]λ6583 fluxes. We conclude that using an Airy function with FWHM >15 Å, the errors of the recovered fluxes are larger than ~25%. Therefore, the convolutions were performed using a FWHM of 9 and 12 Å.

As a result of our simulations we concluded that with the OSIRIS’s TF it is possible to estimate metallicities using the N2 method in galaxies spanning a wide range of EWs and morphological types, to discriminate star forming from AGN galaxies, and to estimate the SFR using the Hα flux. The selected combination of TF FWHM and sampling that will allow deblending Hα and [N II]λ6583 lines, and estimating their fluxes with an error lower than 20%, is a TF FWHM of 12 Å and a sampling of 5 Å. For more details see Lara-López et al. (2010c).

REFERENCES