The dependence of oxygen and nitrogen abundances on stellar mass from the CALIFA survey

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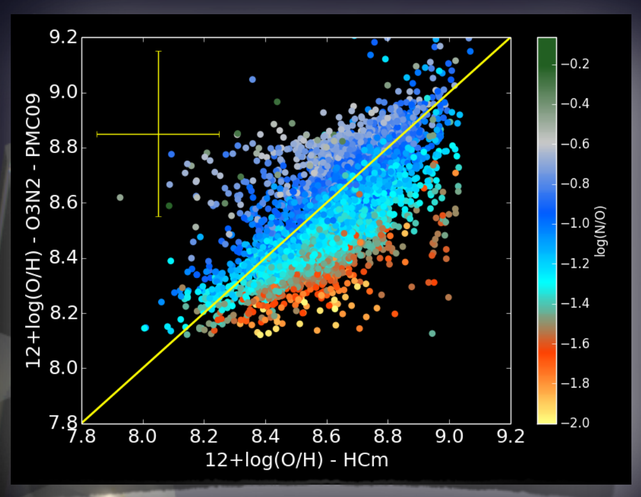
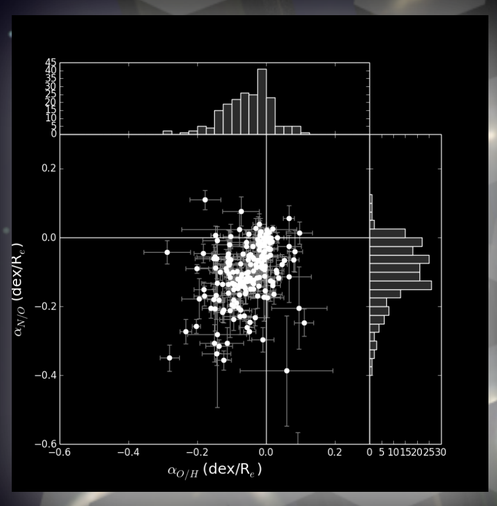
INTRODUCTION

We use the optical spectra of emission-line regions of 350 galaxies taken in CALIFA (Calar Alto Legacy Integral Field Area survey, Sánchez et al. 2012) to study the spatial distribution of O/H and N/O chemical abundances. The observations were taken with the Integral Field Unit PMAS in the 3.5 m. CAHA telescope covering the 3750 – 7100 AA spectral range with gratings V500 and V1200. The data were reduced using the pipeline v. 1.5, the underlying stellar population and the emission lines were fitted using FIT3D and the emission-line regions were extracted using HIIExplorer.

O/H AND N/O CHEMICAL ABUNDANCES

We selected star-forming HII regions and derived O/H and N/O chemical abundances using the code HII-CHI-mistry (Pérez-Montero 2014). This is based on a chi-square weighted mean of observed reddening corrected relative optical emission lines [OI[I], [NII] and [SII] compared to a grid of photoionization models consistent with the direct method. When N/O is previously calculated, we can use [NII] emission lines to predict O/H with more confidence (Pérez-Montero & Contini 2009) obtaining non-negligible differences with respect to to the assumption of a traditional O/H vs. N/O relation.



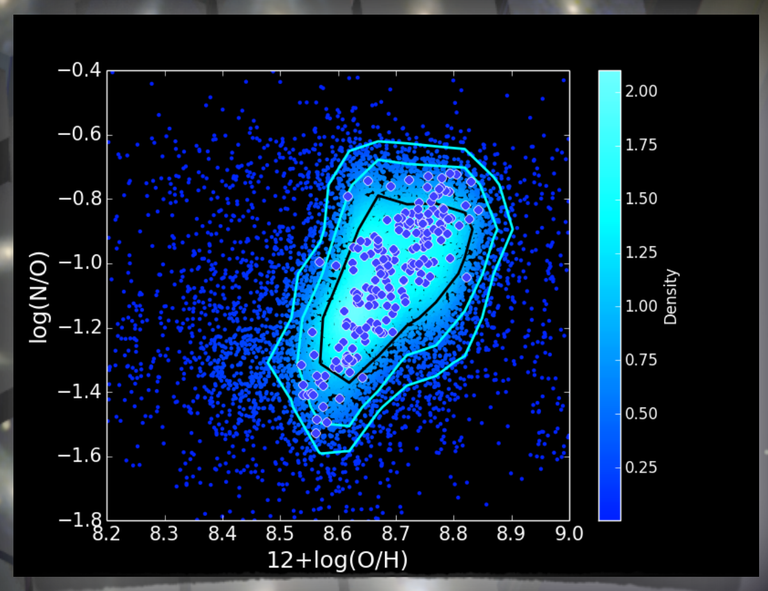


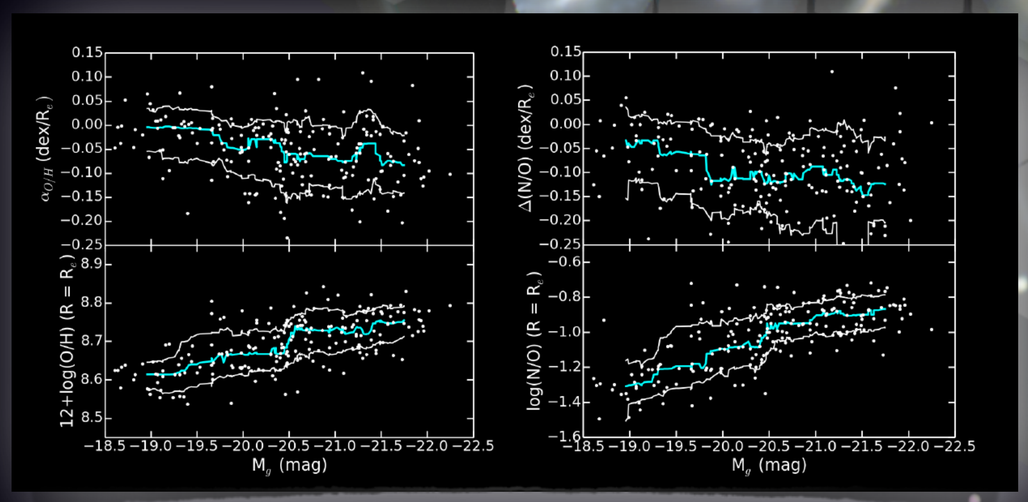
GRADIENTS OF METALLICITY

We performed robust error-weighted linear fittings to all non-interacting galaxies with at least 10 selected HII regions (201 objects) in the whole radial range. Mean slopes for O/H (alpha = -0.053 dex/Re) and N/O (-0.102 dex/Re) are negative, but no clear correlation is found between them. The fraction of objects with flat or inverted gradient (10% for O/H and 5% for N/O) is kept when inclined galaxies are ruled out or the radial range is restricted.

O/H AND N/O CHARACTERISTIC VALUES

The O/H and N/O values of the fittings at the effective radius can be taken as a characteristic abundance value for the whole galaxy. The dispersion in the O/H vs. N/O relation (magenta points) for these values presents a much lower dispersion than for individual HII regions (blue points) regardless of the slopes, inclinations or fitted radial range.





RELATION WITH INTEGRATED PROPERTIES

The relation between the characteristic O/H and N/O values has a very tight correlation with the stellar mass of the galaxies, but no trend is seen with the obtained slopes (as in Sánchez et al. 2014). The mass-metallicity relation dominates all the relations with other integrated properties (star formation rate, integrated color, morphology)

CONCLUSIONS

Although galaxies present a wide variety of spatial chemical distributions both for O/H and N/O, a characteristic value at the effective radius can be obtained that tightly correlates with stellar mass. No other dependences are found with other integrated properties such as SFR, morphology or presence of a bar.