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Unveiling the nature of the green pea galaxies: oxygen and nitrogen abundances

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Abstract

We will present recent investigations about the oxygen and nitrogen chemical abundances in extremely compact star-forming galaxies (SFGs) with redshifts between ~ 0.11 and 0.35, popularly referred to as "green pea" (GPs) galaxies (Amorín et al., 2010, ApJ, 715, L128). Direct and strong-line methods sensitive to the N/O ratio applied to their Sloan Digital Sky Survey (SDSS) spectra reveal that these systems are genuine metal-poor galaxies, with mean oxygen abundances $\sim 20\,\%$ solar. At a given metallicity these galaxies display systematically large N/O ratios compared to normal galaxies, which can explain the strong difference between our metallicities measurements and the previous ones. While their N/O ratios follow the relation with stellar mass of local SFGs in the SDSS, we find that the mass-metallicity relation of the GPs is offset more than 0.3 dex to lower metallicities. We argue that recent interaction-induced inflow of gas, possibly coupled with a selective metal-rich gas loss, driven by supernova winds, may explain our findings and the known galaxy properties, namely high specific star formation rates, extreme compactness, and disturbed optical morphologies. The "green pea" galaxy properties seem to be uncommon in the nearby universe, suggesting a short and extreme stage of their evolution. Therefore, these galaxies may allow us to study in great detail many processes, such as starburst activity and chemical enrichment, under physical conditions approaching those in galaxies at higher redshifts.