

A Fundamental Plane for GAMA galaxies

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Abstract. A full appreciation of the role played by gas metallicity (Z), star-formation rate (SFR), and stellar mass (M_*) is fundamental to understanding how galaxies form and evolve. Using data from the SDSS-DR7 and the GAMA surveys we study the Fundamental Plane for star-forming galaxies. Our analysis allows us to confirm the existence of a Fundamental Plane, for which $\text{stellar mass} = f(Z, \text{SFR})$ in star-forming galaxies.

Keywords. galaxies: abundances — galaxies: fundamental parameters — stars: formation — galaxies: statistics

The existence of fundamental planes (FP) is a natural result of scaling relationships between important astrophysical properties. A FP was found by Lara-López *et al.* (2010) in a three dimensional study of the M_* , gas metallicity, and SFR of SF galaxies using data from the SDSS-DR7. Lara-López *et al.* (2010) showed that the M_*-Z , and M_*-SFR relationships are particular cases of a more general relationship, a FP. This combination reduces the scatter significantly compared to any other pair of correlations. Using GAMA and SDSS star forming galaxies, we performed a principal component analysis (PCA) to identify the underlying dimensionality of the three observables. We find that the first two principal components account for 86% and 12% of the variance, which indicates that 98% of our data can be explained in a 2 dimensional space (for a detailed explanation of this technique see Lara-López *et al.* 2012, in preparation). The FP for GAMA and SDSS galaxies can be seen in Fig. 1. The M_*-Z , M_*-SFR , and $Z-SFR$ relationships are the projections of this 3D distribution. While M_* correlates with both SFR and metallicity (the well known M_*-Z and M_*-SFR relationships), the SFR does not strongly correlate with metallicity, which means that this relation is close to the face-on view of the 3D distribution (see top left panel of Fig. 1).

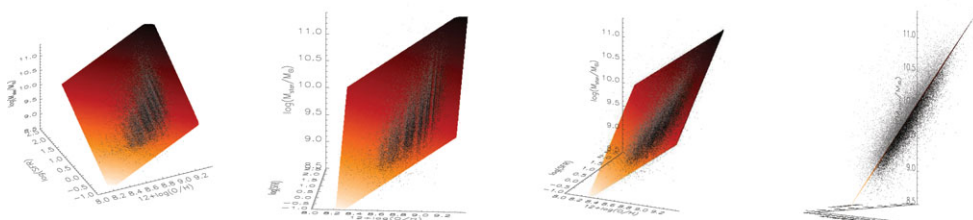


Figure 1. Projections of the 3D distribution formed by M_* , $\log(\text{SFR})$, and $12 + \log(\text{O}/\text{H})$ for GAMA and SDSS galaxies. The cube is rotated clockwise from the upper-left to the bottom-right panel. Grey and black dots show galaxies above and below the FP, respectively.

Reference

Lara-López, M. A., Cepa, J., Bongiovanni, A., *et al.* 2010a, *A&A*, 521, L53