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THE FUNDAMENTAL PLANE OF EARLY-TYPE GALAXIES

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Abstract. We report recent results from the photometric follow-up study we are conducting in the context of the SAURON project. We use ground-based MDM V -band and Spitzer/IRAC $3.6\ \mu\text{m}$ imaging to characterise our sample of E, S0 and Sa galaxies photometrically. Combined with SAURON integral-field spectroscopic observations, this information allows us to explore and understand the location of these galaxies on the Fundamental Plane relation, providing an important diagnostic tool to study their formation and evolution.

Since its discovery (Djorgovski & Davis 1987; Dressler *et al.* 1987) the Fundamental Plane (hereafter FP) has been one of the most scrutinised relations in the literature. In Figure 1 we plot the FP relation for all the galaxies of the SAURON sample in V and in the Spitzer $3.6\ \mu\text{m}$ band. A number of conclusions can be extracted from close inspection of this plot:

- A large number of Sa galaxies appear to follow the main relation defined by earlier type systems, and are not necessarily displaced below the relation as is usually seen (Falcón-Barroso *et al.* 2002). We believe this is due to the

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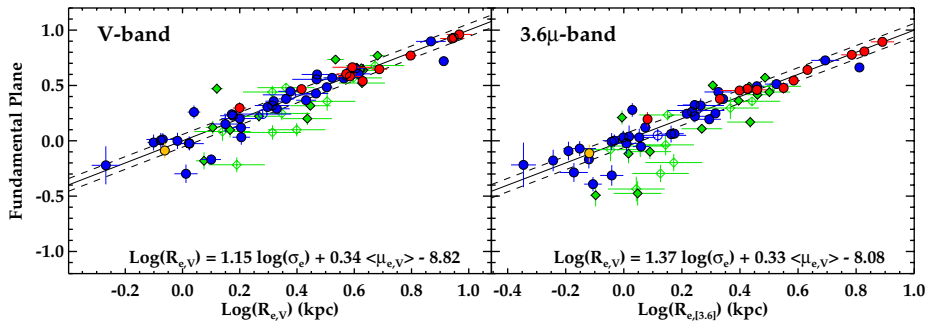


Fig. 1. Fundamental Plane relation for the SAURON sample of galaxies in V - and $3.6 \mu\text{m}$ -bands. Circles denote E/S0 galaxies, diamonds Sa galaxies. Filled symbols indicate galaxies with good distance estimates, whereas open symbols those with only recession velocity determinations. In blue we highlight Fast Rotators, in red Slow Rotators, and in green the Sa galaxies. The special case of NGC 4550 is marked in yellow.

use of σ_e (the stellar velocity dispersion measured within R_e), which is not influenced by the presence of young inner disks, and also accounts to a large extent for the rotation in the galaxies. There are however some galaxies that are located significantly below the relation. These mostly are objects with extremely young populations with signs of on-going, extended star formation (see Jeong *et al.* 2009 and Shapiro *et al.* 2010).

- The Slow rotators (SR) define a tighter relation than the Fast rotators (FR). While this is not totally unexpected (*i.e.* SR are uniformly old systems), it is remarkable how the trend is kept along R_e . The latter, including S0/Sa as well as E galaxies, are thus the main contributors to the scatter.
- The level of kinematic substructure, as determined from our stellar kinematic maps, does not determine a preferred location on the Fundamental Plane. In fact all the SR host large KDCs and still define a very tight relation. This excludes non-homology as one of the main sources for scatter in the relation, as already suggested in Cappellari *et al.* (2006).

A full report on the effect of stellar populations in the Fundamental Plane in early-type galaxies will be presented in forthcoming papers of the SAURON survey.

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