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Scaling relations of early-type galaxies in the 6dF Galaxy Survey

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Over 10,000 early-type galaxies from the 6dF Galaxy Survey (6dFGS) (Jones, D. H. *et al.* (2009), Jones *et al.* (2004)) have been used to determine the Fundamental Plane at optical and near-infrared wavelengths. We find that a maximum likelihood fit to an explicit three-dimensional Gaussian model for the distribution of galaxies in size, surface brightness and velocity dispersion can precisely account for selection effects, censoring and observational errors, leading to precise and unbiased parameters for the Fundamental Plane and its intrinsic scatter.

The 6dFGS is the largest NIR-selected sample in the local universe, covering a wide range of environments and masses, making it ideal for investigating the influence of dark matter on the Fundamental Plane. Taking advantage of the large and homogeneous nature of the 6dFGS sample we have explored the environmental dependence of the Fundamental Plane. We divided the sample into three sub-samples defined by a measure of richness derived from a group catalogue generated using a percolation-based algorithm. The maximum likelihood fitting algorithm was then used to obtain a robust and accurate Fundamental Plane for each individual richness sub-sample. The resulting fitted offsets and slopes are consistent with no significant difference between the Fundamental Plane of the galaxies in the richest clusters and isolated field galaxies. This has important implications for the peculiar velocities of the galaxies in the 6dFGS sample, as the measured peculiar velocities are dependent on Fundamental Plane distances to these groups and clusters.

References

Jones, D. H. *et al.* 2009, *astro-ph/0903.5451*
Jones, D. H *et al.* 2004, *MNRAS* 791, 355