THE $D_N - \sigma$ AND FUNDAMENTAL PLANE RELATIONS AS DISTANCE INDICATORS OF EARLY TYPE GALAXIES IN THE VIRGO AND FORNAX CLUSTERS

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Abstract. We investigate the properties of early-type galaxies as distance indicators by applying the $D_n - \sigma$, Fundamental Plane (FP), and $\log(m) - \log r_e$ relations to a complete and fairly homogeneous sample of galaxies members of the Virgo and Fornax clusters. The relative mean distance of the two clusters can be derived with an accuracy up to $\sim 3\%$ provided that the internal kinematics of the galaxies is taken into account and a correct statistical approach is used.

The residuals of the $D_n - \sigma$ and FP relationships do not correlate with many structural and geometrical parameters of the galaxies: the mean effective surface brightness, the total luminosity, the average ellipticity and the Fourier coefficient a_4 of the isophotes, and, the exponent m of the $r^{1/m}$ law which parametrizes the shape of the light profiles. On the other hand, the kinematics of the galaxies affect both relations producing residuals that correlate with the maximum rotation velocity V_{max} and the (V/σ) ratio.

Once confirmed by future more accurate observations, this effect would introduce a sistematic bias in the distance determination of the clusters; a problem difficult to manage if the internal kinematics of the cluster members is unknown.