THE MANIFOLD OF ELLIPTICAL GALAXIES

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ABSTRACT
The significant number of dimensions of the manifold is two. Notwithstanding the contamination of the second dimension by projection effects, there are arguments for an intrinsic variation.

The manifold of spiral galaxies was studied by Brosche (1973), Bujarrabal et al. (1981) and Mebold and Reif (1981) with the main result of two significant dimensions and a quite stable configuration of the contributing variables. The kinematic quantities from the observed rotational motions were essential for this result. The increasing number of observed inner motions in elliptical galaxies enabled us to undertake an analogous study for this class of galaxies. The data of Tonry and Davis (1981) contain n=101 galaxies for which the type parameter is known to be in the range -6 to -4. Amongst them, for n=29 galaxies rotational motions are known from other sources. We studied both samples; in both cases with and without the only distance-dependent variable, a photometric radius R. Since the incorporation of R did not influence severely the other parameters, and since the results of all parameters are similar for both samples, we present here only the smaller sample for which rotation velocities V are available. Other parameters involved are: the velocity dispersion S, surface brightness L/R^2, ratio of major to minor axis D/d (V and S in km/s, R in kpc, L in solar units).

In the figure we present the gradients of the contributing observables (solid lines) and some secondary variables (broken lines) which can be derived from the observables, namely the mass M, the absolute luminosity L and the ratio M/L. The observed rotational velocities and the apparent axis ratios are both influenced by projection effects. But the variation of logV is larger and the direction of its gradient is more different from that of log(D/d) than one would

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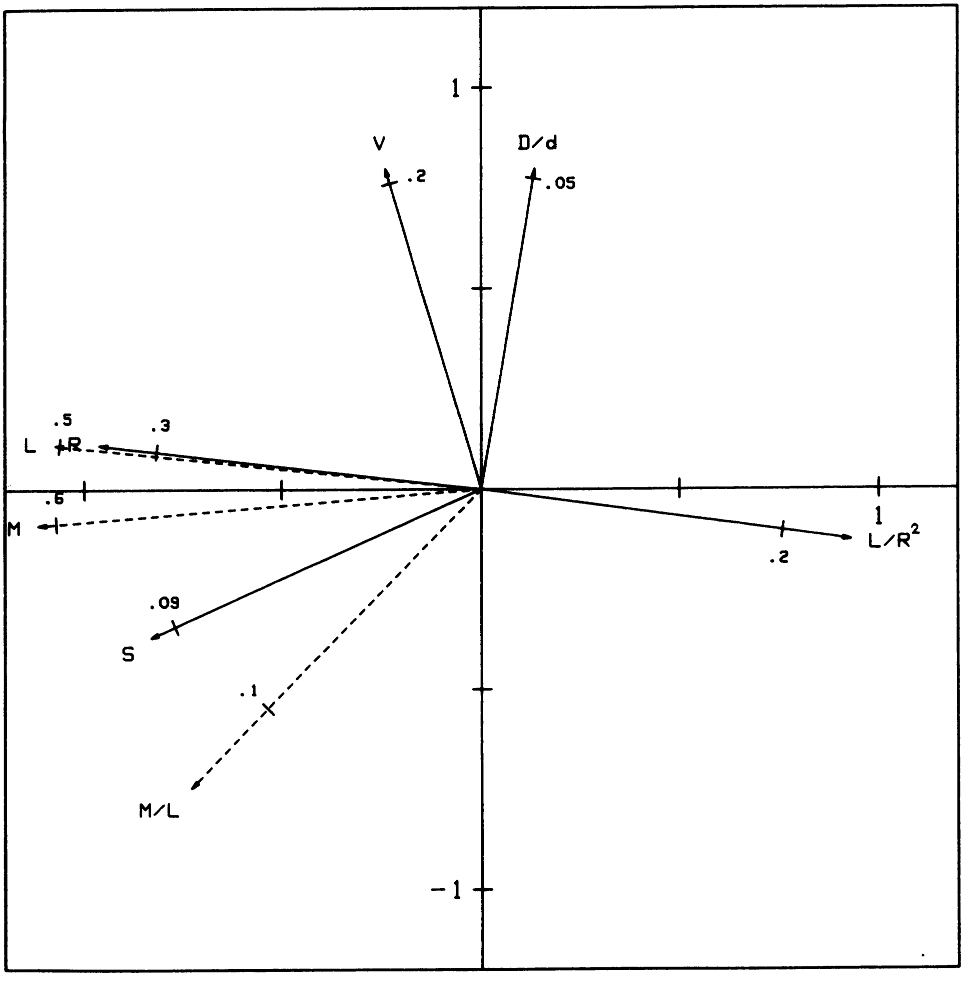
expect if the second dimension were the inclination only. There is a certain qualitative correspondence with the spirals' picture. From the many possible representations of L we may quote $L(B) = 0.27 \cdot \log S - 1.70 \cdot \log(L/R^2) + 25.18$ as a 'Faber-Jackson-relation' generalized for the presence of a second dimension. With S as only parameter, the correlation becomes $L(B) = 3.81 \cdot \log S + 6.43$.



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