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THE HUBBLE DIAGRAM FOR RED MAGNITUDES OF BRIGHT CLUSTER GALAXIES

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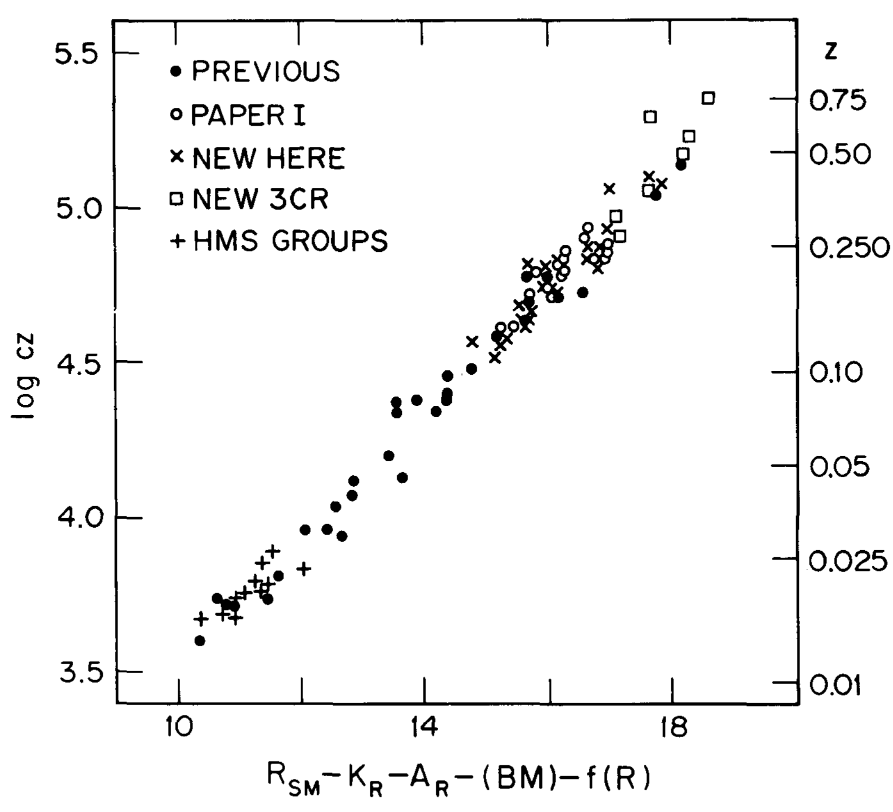
Nous présentons le diagramme de Hubble des amas brillants de galaxies.

The figure shows the current status of our program to extend the Hubble diagram for faint galaxy clusters to larger redshifts. A detailed paper has been submitted to the Astrophysical Journal. Most of the points beyond redshift 0.2 are new within the last year. Redshifts are measured with a prism spectrograph, with an SIT television detector, designed for this program. The photometry is a combination of conventional photoelectric photometry and direct 2-dimensional photometry with the same SIT system used with the spectrograph. The clusters include (a) at the bright end, previously measured clusters and groups, and (b) at the faint end, a combination of faint Abell clusters, 3CR clusters, and clusters selected randomly from deep 48-inch surveys using IIIaJ and 127-04 emulsions.

Magnitudes have been corrected for the K-term to a standard rest-frame wavelength, for galactic absorption, for aperture size, for Bautz-Morgan contrast, and for cluster richness. Of these, the dominant correction is the K-term.



Because of the relatively few data at the faint end and the possible complication due to evolutionary effects, we feel that it is pemature to discuss the deceleration parameter. We note only that a formal value of $q_o = 1$ (without evolutionary correction) is an adequate representation of the data, which fits a line of slope 5 with less than 0.4 mag dispersion. We note also that 3C 295 lies near the faint side of the envelope.

With the technical means now in hand, we hope to further fill in the faint end of the diagram, aiming toward an eventual consideration of the value of q_o.

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DISCUSSION

L. NOTTALE: I want to make some comments about the richness-magnitude correlation found for the brightest galaxies in clusters and groups by Sandage and Hardy (VII) and Sandage (VIII). They corrected for this effect, but Sandage has shown that it seemed incompatible with all known luminosity functions for clusters. In fact, what is actually observed is a correlation between the richness of a cluster and the deviation from Hubble's line of its brightest galaxy: until now this correlation has been assumed to be a magnitude-richness one. But to do the difference between a magnitude and a redshift effect, one needs an independent distance criterium.

So we have looked for possible physically associated clusters in Sandage et. al. data, which can then be assumed to lie at the same mean distance. We considered pairs of clusters, and for each pair, we have plotted the magnitude differences between the brightest galaxies and mean redshifts differences of the clusters versus the population differences, between the largest and the smallest cluster ($\Delta\ N_c^{48}$ is always positive). The results brings a confirmation of the correlation with richness noticed by Sandage, but suggests that it might be a redshift effect instead of the assumed absolute magnitude effect. In this case the correction of this effect in the magnitude-redshift diagram could no more be considered as valid.

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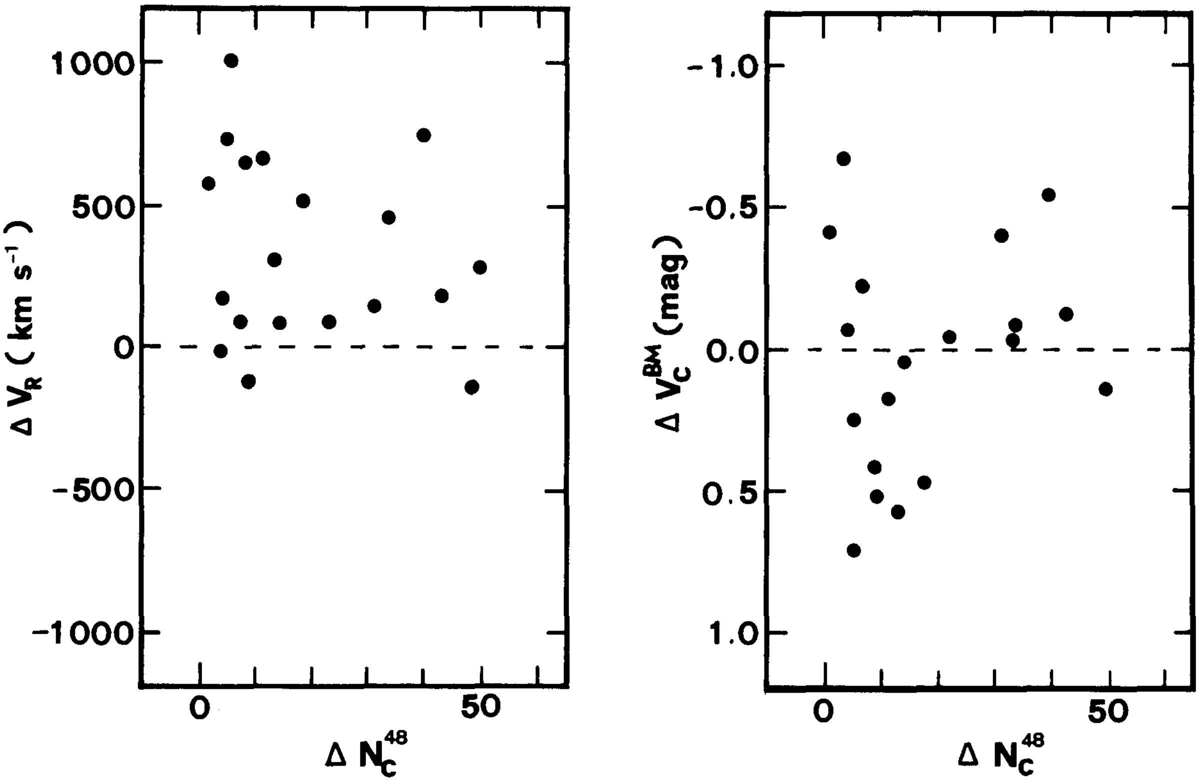

Difference of cluster radial velocities and of corrected magnitudes vs population difference for possibly associated clusters and groups from Sandage and Hardy (VII) and Sandage (VIII) data. As can be seen the greatest cluster is redshifted in the mean with respect to the smallest, while their brightest galaxies have the same mean magnitudes.

J.E. GUNN: The difference between Gunn and Oke's value of $q_o \sim 0$ and the authors' fit of about 1 represents about 0.3 magnitudes at $z \approx 4$. The presented sample is dominated by very rich clusters and radio galaxy clusters at the high redshift end, objects which are absent at lower redshifts. It thus seems likely to me that the difference must be due to the correlation between radio power and optical brightness and/or incorrect corrections for the Scott effect, since our sample is more or less homogeneous for all redshifts.

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