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ORIGINAL ARTICLE

Interesting evidence for a low-level oscillation superimposed on the local Hubble flow

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Abstract Historically the velocity scatter seen on local Hubble plots has been attributed to the peculiar velocities of individual galaxies. Although most galaxies also have uncertainties in their distances, when galaxies with accurate distances are used recent studies have found that these supposed peculiar velocities may have preferred, or discrete, values. Here we report the interesting result that when these discrete components are identified and removed from the radial velocities of the SNeIa galaxies studied in the Hubble Key Project, there is evidence for a residual oscillation, or ripple, superimposed on the Hubble flow. This oscillation has a wavelength near 40 Mpc and, because its amplitude is small compared to that of the scatter in velocities, it becomes visible only after the discrete components are removed. This result is interesting because even if this ripple has been produced by a selection effect, the fact that it is only revealed after the discrete velocities are removed implies that the discrete velocities are real. Alternatively, if no selection effect can be identified to explain the ripple, then both the discrete velocities and the ripple together become very difficult to explain by chance and these results could then have interesting cosmological consequences.

Keywords Galaxies · Cosmology: distance scale · Distances and redshifts · Quasars: general

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1 Introduction

It has been demonstrated (Tifft 1996, 1997), (and related papers) that there appear to be discrete "velocity periods" present in the redshifts of galaxies. The most obvious of these was found in common spirals and showed discrete velocity components near 36, 72, 145, 290, etc., $\mathrm{km\,s^{-1}}$. In each of the other period groups detected, the velocities showed this same octave related, or doubling nature. More recently we have found evidence that the extrapolation of Tifft's periods to higher components, using this doubling relation, leads to discrete velocity components that appear to be visible in the radial velocities of all galaxies whose distances are accurately known (Bell and Comeau 2003a, 2003b; Bell et al. 2003, 2004).

These small non-cosmological redshift components in galaxies introduce a scatter in the Hubble plot that is much larger than can be explained by the errors of measurement. This scatter has been explained historically by peculiar velocities, although in some cases this has been questioned simply because of their large size (Russell 2005a, 2005b, 2005c). If the quantization found in these velocities is real it would appear to rule out the peculiar velocity interpretation.

In this paper we report a remarkable result in which a low-level ripple is clearly seen to be present in the residual Hubble plot after the discrete velocities are identified and removed from the velocities of the SNeIa galaxies studied in the Hubble Key Project. Because its amplitude is small compared to the scatter in velocities it is not visible before the discrete velocity components are removed. One model that might explain this type of oscillation in the Hubble flow has been discussed previously by Morikawa (1990, 1991).