

Abstract Submitted
for the APR06 Meeting of
The American Physical Society

Singular behavior in Lemaître-Tolman-Bondi cosmological models and the difficulties in using them as realistic models of the Universe
ALI VANDERVELD, EANNA FLANAGAN, IRA WASSERMAN, Cornell University — There has been much debate over whether or not one could explain the observed acceleration of the Universe with inhomogeneous cosmological models, such as the spherically-symmetric Lemaître-Tolman-Bondi (LTB) models. It has been claimed that the central observer in these models can observe a local acceleration, which would contradict general theorems. We resolve the contradiction by noting that many of the models that have been explored contain a weak singularity at the location of the observer, which makes them unphysical. In the absence of this singularity, we show that LTB models must have a positive central deceleration parameter q_0 , in agreement with the general theorems. We also show that at nonzero redshifts the apparent deceleration parameter measured by the central observer can be negative. However, we find other singularities that tend to arise in LTB models when attempting to match luminosity distance data, and these generally limit the range of redshifts for which these models can mimic observations of an accelerating Universe.

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Date submitted: 13 Jan 2006

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