A One Parameter Family of
Expanding Wave Solutions of the Einstein Equations
that Induces an Anomalous Acceleration into
the Standard Model of Cosmology

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Abstract

In 1927, the American astronomer Edwin Hubble showed that the Universe is expanding: distant galaxies are receding from each other. This confirmed the so-called Standard Model of Cosmology, that the universe, on the largest scale, is evolving according to the Friedmann-Robertson-Walker spacetime. The starting assumption in this model is the Cosmological Principle—that on the largest scale, we are not in a special place in the universe—that the universe is homogeneous and isotropic about every point like the FRW spacetime. In 1998, more accurate measurements of the recessional velocity of distant galaxies based on Type 1a supernova data, made the astounding discovery that the Universe is actually accelerating relative to the Standard Model. Thus the Standard Model is incorrect. This is referred to as the Anomalous Acceleration of the galaxies, and its explanation is one of the great problems of physics. The only way to preserve the FRW framework and the Cosmological Principle is to modify the Einstein equations by adding an artificial correction term called the Cosmological Constant. Dark Energy, the physical interpretation of the Cosmological Constant, is then an unknown source of anti-gravitation that, for the model to be correct, must account for some 70 percent of the energy density of the universe. This is stated as a fact on the NASA webpage. In this talk I introduce a new family of expanding wave perturbations of the Standard Model, and explore the possibility that these might account for the Anomalous Acceleration within classical General Relativity, without Dark Energy or the Cosmological Constant. [Joint work with Joel Smoler.]