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Confirming an Accelerating Universe through Cosmological Constraints LINDSEY RAYBORN, University of Texas at Dallas — In the early twentieth century, Edwin Hubble confirmed that the universe was not stationary, but expanding since its origin. More recently, scientists found that the universe is accelerating in its expansion. To explore the possibility of an accelerating universe, cosmologists use the Friedmann–Lemaître–Robertson–Walker (FLRW) metric to model the geometry of the universe determined by its matter and energy density. The model assumes that the universe is homogeneous and isotropic at a large scale and that the universe is either expanding or contracting as a function of time. Furthermore, the standard model of cosmology (Lambda-CDM) provides explanations for the existence of cosmic microwave background, distributions of large-scale structures in the universe, presence of light elements from H to Li, and the acceleration of the expansion of the universe. Cosmologists also use the FLRW metric to obtain exact solutions to the field equations developed by Einstein. The resultant Friedmann equations show that the expansion of space varies with time and with the geometry of the universe. Three possible solutions result from the combination of values that describe the energy density and pressure of matter in the universe in addition to parameters describing the geometry. It is possible to confirm the acceleration of the universe's expansion by constraining and examining several parameters pertaining to the behavior and characteristics of the universe from comparison to various cosmological observations.

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