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Growth of Structure in the Szekeres Inhomogeneous Cosmological Models and the Matter-Dominated Era[1] AUSTIN PEEL, MUSTAPHA ISHAK, Univ of Texas, Dallas — Observations reveal that the universe is not truly homogeneous–large voids and galaxy superclusters can occupy significant fractions of the observable universe. Light that reaches us travels through and is influenced by these inhomogeneous structures. As cosmological data become ever more precise, it is important to explore frameworks that relax the usual assumptions of perfect homogeneity and isotropy to determine how inhomogeneities might affect our interpretation of observations. As a step toward this, we study large-scale structure growth in the Szekeres inhomogeneous cosmological models. The Szekeres metric is an exact solution of Einstein's field equations with an irrotational dust source that in general has no symmetries. We use the Goode and Wainwright formulation of the models, which can be considered as exact perturbations of some associated Friedmann-Lemaître-Robertson-Walker (FLRW) background, and identify a density contrast that we evolve through the matter-dominated era. The equation for the density contrast turns out to contain the usual linearly perturbed FLRW terms plus two nonlinear terms. We find that the Szekeres growth rate is stronger than the linearly perturbed FLRW approach by up to a factor of five, reflecting the exact Szekeres nonlinear effects.

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