

Abstract Submitted
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**Interactive Cosmological Modeling with Easy Java Simulations:
Constraints from a New Growth of Structure Module of CosmoEJS¹** JACOB MOLDENHAUER, WILLIAM ZIMMERMAN, University of Dallas — Several cosmological observations suggest the universe's expansion is accelerating. Some possible explanations include a cosmological constant, or other form of repulsive dark energy, i.e. negative pressure and negative equation of state, a modification to general relativity at cosmological scales of distances, or an apparent effect of inhomogeneities in the universe. CosmoEJS is an interactive simulation package that allows educators and researchers to investigate cosmological models by simultaneously fitting several observations numerically. Previously, this package only used expansion history data sets, like supernovae, gamma ray bursts, baryon acoustic oscillations, the Hubble parameter, and the cosmic microwave background radiation; but data sets which measure the growth of galaxy structure formation, or clustering, have been shown to be more constraining for particular sets of models. We present a new module that enables constraints from growth data sets for various cosmological models. When combined with expansion history observations, these constraints from the growth of structure can drastically reduce the number of competitive cosmological models. CosmoEJS is available from Compadre Open Source Physics website, i.e. <http://www.compadre.org/osp/items/detail.cfm?ID=12406>.

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