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Dark Stars: Evolution and First Pulsation Results TANJA RINDLER-DALLER, Department of Physics, University of Michigan, KATHERINE FREESE, NORDITA, Stockholm University and Dept. of Physics, University of Michigan, MICHAEL H. MONTGOMERY, DONALD E. WINGET, Dept. of Astronomy, University of Texas at Austin, BILL PAXTON, KITP, UC Santa Barbara — Among the first stars to form in the Universe may be "dark stars," i.e. stars of primordial composition, but powered by the heating released in the process of dark matter (DM) particle self-annihilation, which also gives the correct relic density of DM today. It has been shown in the past that a DM-powered stellar phase is feasible, due to the high DM densities in the centers of primordial minihalos and the efficiency of DM annihilation. DM could thereby be responsible for an entirely new class of stellar objects, while possible detection of the latter would provide a smoking gun for DM. We have used the stellar evolution code MESA in order to improve upon previous stellar models, which were limited to polytropes. Our more accurate models confirm earlier results which found that dark stars can be very massive ($M > 10^5\ M_\odot$), bright, cool and puffy objects. Once these supermassive dark stars run out of DM fuel, they collapse and could be forming the seeds for the supermassive black holes which are observed in nearby and high-redshift galaxies. I will present our results on the evolution and properties of dark stars on their way of becoming supermassive, as well as new results on possible pulsations of dark stars and predicted observational signatures.

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