

An Ultra Metal-poor Star Near the Hydrogen-burning Limit

Monday, 3 December 2018 16:00 (20 minutes)

While theoretical simulations of Population III star formation show that protostellar disks can fragment, it is impossible for those simulations to discern if those fragments survive as low-mass stars. We report the discovery of a low-mass star on a circular orbit with orbital period $P = 34.757 \pm 0.010$ d in the ultra metal-poor (UMP) single-lined spectroscopic binary system 2MASS J18082002–5104378. The secondary star 2MASS J18082002–5104378 B has a mass $M_2 = 0.14^{+0.06}_{-0.01} M_{\odot}$, placing it near the hydrogen-burning limit for its composition. The 2MASS J18082002–5104378 system is on a thin disk orbit as well, making it the most metal-poor thin disk star system by a considerable margin. The discovery of 2MASS J18082002–5104378 B confirms the existence of low-mass UMP stars and its short orbital period shows that fragmentation in metal-poor protostellar disks can lead to the formation and survival of low-mass stars. We use scaling relations for the typical fragment mass and migration time along with published models of protostellar disks around both UMP and primordial composition stars to explore the formation of low-mass Population III stars via disk fragmentation. We find evidence that the survival of low-mass secondaries around solar-mass UMP primaries implies the survival of solar-mass secondaries around Population III primaries with masses $10 M_{\odot} \leq M_* \leq 100 M_{\odot}$.

Affiliation

Johns Hopkins University

Talk/Poster

Talk

Primary author: Prof. SCHLAUFMAN, Kevin (Johns Hopkins University)

Co-authors: Dr THOMPSON, Ian (Carnegie Observatories); Dr CASEY, Andrew (Monash University)

Presenter: Prof. SCHLAUFMAN, Kevin (Johns Hopkins University)

Session Classification: EMP Stars: Observation