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HI Shielding of H_2 in UV Irradiated Protogalaxies: Building the First Massive Black Holes MEREDITH NEYER, JEMMA WOLCOTT-GREEN, University of California, Santa Barbara — Observations of supermassive black holes in the early universe have necessitated new theories to explain the rapid formation and growth of early black holes. One of the most prominent of these theories is direct collapse, which suggests that suppressing molecular hydrogen (H_2) abundance in protogalactic halos can cause inefficient H_2 cooling leading to rapid accretion onto a dense core, forming a supermassive star, and ultimately a black hole. Since H_2 is the primary cooling agent in primordial gas, a high UV flux can dissociate enough H_2 to prevent the halo from cooling below the virial temperature. Simulations of these protogalaxies require precise modeling of chemical processes to determine the critical UV flux that will suppress enough H_2 to keep the halo "hot". We use three-dimensional cosmological simulations to study a process not previously included: neutral atomic hydrogen (HI) shielding of H_2 and its impact on the critical flux. HI can absorb some of the H_2-dissociating UV radiation, and as a result, we find that the critical flux increases significantly when HI shielding is included.

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