The AMS-02 experiment recently reported several antihelium candidates. Naively, a large number of antideuterons should be observable as well. However, thus far, no strong antideuteron candidates have been reported. These unexpected antihelium observations have spurred an interest in studying the secondary production and propagation of antihelium in our galaxy.

Most studies have relied on simplified numerical scaling of antiproton production cross sections to predict the production cross sections of heavier antinuclei. However, the mechanism of light antinuclei production in hadronic interactions is poorly understood.

This study extends the event-by-event two-particle coalescence model developed by Gomez et al., to estimate the production of larger antinuclei. For the first time, even antihelium-4 differential cross sections could be calculated, by simulating more than 30 trillion p-p collisions which required more than 6000 years of single-CPU processing time. The model was validated by comparing with available experimental measurements, including the latest results from ALICE.

The background antinuclei fluxes were calculated using the galactic propagation software by Poulin et al. This study predicts about an order-of-magnitude lower antideuteron and antihelium fluxes than the simplified numerical scaling models.