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Properties of Cosmic Deuterons Measured by the Alpha Magnetic Spectrometer

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Precision measurements of the cosmic ray D flux are presented as function of rigidity from 1.9 to 21 GV, based on 21 million D nuclei. We observed that over the entire rigidity range D exhibit nearly identical time variations with p, ^3He , and ^4He fluxes. Above 4.5 GV, the D/ ^4He flux ratio is time independent and its rigidity dependence is well described by a single power law $\propto R\Delta$ with $\Delta\text{D}/^4\text{He} = -0.108 \pm 0.005$. This is in contrast with the $^3\text{He}/^4\text{He}$ flux ratio for which we find $\Delta^3\text{He}/^4\text{He} = -0.289 \pm 0.003$. The significance of $\Delta\text{D}/^4\text{He} > \Delta^3\text{He}/^4\text{He}$ exceeds 10σ . In addition, we found that above ~ 13 GV the rigidity dependence of D and p fluxes is identical with a D/p flux ratio of 0.027 ± 0.001 . These unexpected observations show that contrary to expectations, cosmic deuterons have a sizeable primary-like component.

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