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Goldstini as the decaying dark matter

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We consider a new scenario for supersymmetric decaying dark matter without R -parity violation in theories with goldstini, which arise if supersymmetry is broken independently by multiple sequestered sectors. The uneaten goldstino naturally has a long lifetime and decays into three-body final states including the gravitino, which escapes detection, and two visible particles. The goldstini low-energy effective interactions are derived, which can be non-universal and allow the dark matter to be leptophilic, in contrast to the case of a single sector supersymmetry breaking. In addition, the three-body decay with a missing particle gives a softer spectrum. Consequently, it is possible to fit both the e^+/e^- excess observed by the PAMELA and the $e^+ + e^-$ measurements by the Fermi-LAT using universal couplings to all three lepton flavors or 100% branching fraction into electrons/positrons, both of which are disfavored in the conventional scenario of dark matter decays into two or four visible particles without missing energy.

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