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Ballisticity Conditions for Random Walk in Random Environment

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Consider a random walk in a uniformly elliptic i.i.d. random environment in dimensions $d \geq 2$. In 2002, Sznitman introduced for each $\gamma \in (0, 1)$ the ballisticity conditions $(T)_\gamma$ and (T') , the latter being defined as the fulfilment of $(T)_\gamma$ for all $\gamma \in (0, 1)$. He proved that (T') implies ballisticity and that for each $\gamma \in (0.5, 1)$, $(T)_\gamma$ is equivalent to (T') . It is conjectured that this equivalence holds for all $\gamma \in (0, 1)$. Here we prove that for $\gamma \in (\gamma_d, 1)$, where γ_d is a dimension dependent constant taking values in the interval $(0.366, 0.388)$, $(T)_\gamma$ is equivalent to (T') . This is achieved by a detour along the effective criterion, the fulfilment of which we establish by a combination of techniques developed by Sznitman giving a control on the occurrence of atypical quenched exit distributions through boxes.

This is a joint work with Alex Drewitz.