

Regular variation and strong laws for increments of random fields

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Abstract: We consider delayed sums of random fields $(X_{\mathbf{j}}, \mathbf{j} \in \mathbb{N}^d)$ with iid random variables $X_{\mathbf{j}}$. That is, we study the limiting behavior of sums $T_{(\mathbf{n}, \mathbf{n} + \mathbf{a}_{\mathbf{n}})} = \sum_{\mathbf{n} \leq \mathbf{k} \leq \mathbf{n} + \mathbf{a}_{\mathbf{n}}} X_{\mathbf{k}}$ with the ‘length’ of the sum $\mathbf{a}_{\mathbf{n}} = (n_1/L(n_1), \dots, n_d/L(n_d))$, where $L(\cdot)$ is a slowly varying function. We will give exact moment conditions for a strong law with a suitable norming and a law of single logarithm describing the speed of convergence in the strong law. In the moment conditions the de Bruijn conjugates of $L(\cdot)$ play an important role.