

## On weak convergence of random fields

Youri Davydov · Ričardas Zitikis

Received: 7 September 2005 / Revised: 14 April 2006 / Published online: 16 December 2006  
© The Institute of Statistical Mathematics, Tokyo 2006

**Abstract** We suggest simple and easily verifiable, yet general, conditions under which multi-parameter stochastic processes converge weakly to a continuous stochastic process. Connections to, and extensions of, R. Dudley’s results play an important role in our considerations, and we therefore discuss them in detail. As an illustration of general results, we consider multi-parameter stochastic processes that can be decomposed into differences of two coordinate-wise non-decreasing processes, in which case the aforementioned conditions become even simpler. To illustrate how the herein developed general approach can be used in specific situations, we present a detailed analysis of a two-parameter sequential empirical process.

**Keywords** Stochastic processes · Random fields · Empirical processes · Weak convergence · Skorokhod spaces