ASYMPTOTIC BEHAVIOUR OF THE INTEGRAL OF A FUNCTION ON THE LEVEL SET OF A MIXING RANDOM FIELD

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Abstract: Let $X = \{X(t) : t \in R^2\}$ be a centered stationary real random field with a.s. differentiable paths. Let T be a rectangle of R^2 and let $F(f, T)$ denote the integral of the continuous function f over a level curve $\mathcal{C}_x$ of X for a fixed level x, observed in T. We show that if a field X satisfies some mixing condition, then $F(f, T)$, adequately normalized, converges weakly to the Wiener process indexed in T. The limit variance has a precise expression in the Gaussian case and *-mixing case. A geometrical lemma shows cases where the higher order moments of $F(f, T)$ are finite.

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