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Erratum to "Multifractal spectra of Birkhoff averages for a piecewise monotone interval map"

(Fund. Math. 208 (2010), 95–121)

by

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The proof of Theorem 10 in [1] is not correct. In [2] Lyapunov exponents for the Manneville Pomeau map $T(x) = x + x^{1+s} \bmod 1$ with $0 < s < 1$ are considered. Examples of level sets L_a are given for which there exists a nonergodic invariant probability measure μ satisfying $\mu(\log |T'|) = a$, $h_\mu = \hat\tau(a)$, and $\mu(L_a) = 0$. Therefore, one has to expect that also the statement of Theorem 10 is wrong. However, the following weaker version of this theorem can be easily deduced from the proof of Proposition 9 in [1].

THEOREM 10. *Let $g : [0,1] \to \mathbb{R}$ be a regular function and let A be a completely invariant topologically transitive closed subset of $([0,1], T)$ with $h_{\mathrm{top}}(T|A) > 0$. For all a in the interior of the interval H and all $\varepsilon > 0$ there is then an ergodic invariant probability measure μ on A with $h_\mu > \hat\tau(a) - \varepsilon$ and $\mu(L_a) = 1$.*

Proof. If a is in the interior of the interval H then the intersection of the graph of the function τ with its tangent $u \mapsto \hat\tau(a) + au$ of slope a is a single point or a bounded interval, since τ is convex. In this case it is shown in the proof of Proposition 9 that there exists a sequence $(\mu_k)_{k\ge1}$ of ergodic invariant probability measures on A which satisfy $\mu_k(g) = a$ for all $k \ge 1$ and $\lim_{k\to\infty} h_{\mu_k} = \hat\tau(a)$. We choose $\mu = \mu_k$ for some k which is large enough. By the ergodic theorem we have $\lim_{n\to\infty} n^{-1} S_n g(x) = \mu(g) = a$ for μ-almost all $x \in A$, which implies $\mu(L_a) = 1$. ∎

Theorem 10 is used only in the proofs of Theorems 17 and 20. Theorem 20 can remain unchanged. In Theorem 17 we have to assume that $[u, v]$ has nonempty intersection with the interior of the interval H instead of assuming only $H \cap [u, v] \ne \emptyset$. The proofs of these two theorems are then easy modifications of those in [1].

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References

[1] F. Hofbauer, *Multifractal spectra of Birkhoff averages for a piecewise monotone interval map*, Fund. Math. 208 (2010), 95–121.

[2] F. Takens and E. Verbitsky, *On the variational principle for the topological entropy of certain non-compact sets*, Ergodic Theory Dynam. Systems 23 (2003), 317–348.

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