de Moura and Lyra Reply: In the previous Comment [1], it is pointed out that the one-dimensional Anderson model with long-range correlated disordered potentials having fluctuations increasing with the system size does not exhibit extended states. The authors are correct on this specific point and are led to the conclusion that our finding of an Anderson transition for long-range correlated energy landscapes is "not valid." This conclusion does not follow for the reasons discussed below.

Without any normalization, the disorder width ω and hence the band width ΔE diverge in the thermodynamic limit. Therefore, all one-particle eigenstates become localized even in higher dimensions, thus preventing the occurrence of an Anderson transition. When comparing systems with distinct sizes, the authors in [1] are actually comparing systems with distinct disorder and band widths which shall not, in principle, be expected to have similar physical properties.

In order to avoid the divergence of the disorder width and to allow for nontrivial thermodynamic limit, we normalized the local potentials in such a way that keeps ω and ΔE finite and size independent [2]. The normalization of the physical parameters is a traditional procedure in model systems with a divergent relevant energy scale. This is done, for example, in the tight-binding model in infinite d dimensions, in the spherical d-vector model, and in long-range interacting spin systems.

In our Letter [2], we used a size dependent normalization factor which is equivalent to dividing the local potentials by L^H. This procedure imposes that the disorder and bandwidths are kept fixed for distinct chain sizes. With this normalization, the 1D Anderson model does exhibit a phase with eigenstates delocalized all over the chain with mobility edges separating localized and delocalized states, provided that the spectral density of the potential decays faster than $S(k) \propto 1/k^2$. For long-range correlated off-diagonal disorder, the transition can take place for potentials with weaker correlations, i.e., spectral densities decaying faster than $1/k$ [3].

Our finding has been recently supported by the work of Izrailev and Krokhin [4]. Using a second order perturbation theory, they show the existence of mobility edges in the presence of long-range correlated potentials with finite fluctuations. The precise location of the mobility edges naturally depends on ω and eventually disappears for large disorder widths. Furthermore, it is also dependent on the specific disorder configuration due to the lack of self-averaging in long-range correlated disordered systems [5]. Therefore, configurational averages, as used in Fig. 1b of the previous comment, are of a limited physical meaning once sample-to-sample fluctuations remain large in the thermodynamic limit.

As a final remark, we stress that with the proposed normalization the disorder width remains finite in the thermodynamic limit. A phase of delocalized states exists even in the presence of this finite disorder with mobility edges separating localized and delocalized states within the energy band. This Anderson transition is absent in the uncorrelated Anderson model with vanishing disorder, mentioned in the last paragraph of the previous Comment [1], which has either all states localized or all states apparently extended.

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[1] J. W. Kantelhardt *et al.*, previous Comment, Phys. Rev. Lett. **83**, 198 (1999).
[2] F. A. B. F. de Moura and M. L. Lyra, Phys. Rev. Lett. **81**, 3735 (1998).
[3] F. A. B. F. de Moura and M. L. Lyra, Physica (Amsterdam) **266A**, 465 (1999).
[4] F. M. Izrailev and A. A. Krokhin, Phys. Rev. Lett. **82**, 4062 (1999).
[5] S. Weiseman and E. Domany, Phys. Rev. Lett. **81**, 22 (1998).

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