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Set-Valued Chaos in Linear Dynamics

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We will present several notions of chaos for hyperspace dynamics associated to linear operators. More precisely, we consider a linear operator $T : X \to X$ on a topological vector space X, and the natural hyperspace extensions $\overline{T}$ and $\widetilde{T}$ of T to the spaces $\mathcal{K}(X)$ of compact subsets of X and $\mathcal{C}(X)$ of convex compact subsets of X, respectively, endowed with the Vietoris topology. We show that the topological transitivity of $\overline{T}$ or $\widetilde{T}$ is equivalent to the weak mixing property of T, extending results in [1] and [4]. Analogous results are obtained for topological ergodicity and mixing. When X is a Fréchet space, then Devaney chaos is equivalent for the maps T, $\overline{T}$ and $\widetilde{T}$. Finally, under very general conditions, we obtain the corresponding equivalences for Li-Yorke chaos.

References

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