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Maximal transport in the Lorenz equations[1] CHARLES R. DOERING, ANDRE N. SOUZA, University of Michigan — We derive rigorous upper bounds on the transport $\langle XY \rangle$ where $\langle \cdot \rangle$ indicates time average, for solutions of the Lorenz equations without assuming statistical stationarity. The bounds are saturated by nontrivial steady (albeit often unstable) states, and hence they are sharp. Moreover, using an optimal control formulation we prove that no other flow protocol of the same strength, i.e., no other function of time $X(t)$ driving the $Y(t)$ and $Z(t)$ variables while satisfying the basic balance $\langle X^2 \rangle = \langle XY \rangle$, produces higher transport.

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