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Power Law and Scaling in the Energy of Tropical Cyclones

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The influence of climate variability and global warming on the occurrence of tropical cyclones is a controversial issue. Existing historical databases on the subject are not fully reliable, but a more fundamental hindrance is the lack of basic understanding regarding the intrinsic nature of tropical-cyclone genesis and evolution.
It is known that tropical cyclones involve more than a passive response to changing external forcing, but it is not clear which dynamic behavior best describes them.
We present an approach based on the application of the power dissipation index, which constitutes an estimation of released energy, to individual tropical cyclones.
A robust law emerges for the statistics of power dissipation index, valid in four different ocean basins and over long time periods. In addition to suggesting a description of the physics of tropical cyclones in terms of critical phenomena, the scaling law enables us to
quantify their response to changing climatic conditions, with an increase in the largest power dissipation index values with sea surface temperature or the presence of El Niño phenomena, depending on the basin under consideration.
In this way, we demonstrate that the recent upswing in North Atlantic hurricane activity does not involve tropical cyclones that are quantitatively different from those in other sustained high-activity periods before 1970.
Ref: A. Corral, A. Osso, and J.E. Llebot, Nature Phys. 2010.