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How can you tell whether Earth is warming Up?[1] JUAN RESTREPO, SHANKAR VENKATARAMANI, Mathematics Department, University of Arizona, DARIN COMEAU, Courant Institute of Mathematical Sciences, NYU, HERMANN FLASCHKA, Mathematics Department, University of Arizona — How does one determine whether the high summer temperatures in Moscow of a few years ago was an extreme climatic fluctuation or the result of a systematic global warming trend? How does one perform an analysis of the causes of this summer's high temperatures in the US, if climate variability is poorly constrained? It is only under exceptional circumstances that one can determine whether a climate signal belongs to a particular statistical distribution. In fact, climate signals are rarely "statistical." It is thus often the case that one relies on statistical assumptions in order to compute a trend. There are other challenges in obtaining a trend: inherent multi-scale manifestations, and nonlinearities/non-Gaussianity, incomplete knowledge of climate variability. We propose a non-parametric notion of a trend, we call the tendency, that can handle multi-scale time series and that does not rely on statistical assumptions. Its primary utility lies in the analysis of time series with the aim of discerning structure from processes that could be modeled as noise.

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