Taking into account the referees' comments, we **would like to withdrawn our manuscript**. While we disagree with the referees' opinion, we thank the three referees for their comments that will allow us to improve our work, which will be submitted to another journal. We present below our response to the specific comments.

Response to Referee #1

While the metrics that we use are known, they have not yet been applied to investigate long-range climate patterns or to compare climate datasets. The novel contribution of our work to the climate literature is the demonstration that these metrics can be very useful for examining and comparing climate datasets.

Response to Referee #2

We agree with the referee that "the adjective stochastic refers to the random behavior of a system…" and we also agree with the referee that "is well-known that deterministic chaotic dynamical systems can have a certain degree of disorder although they have no stochastic components." To explain what we mean by "stochasticity", in the introduction we say that the entropy allows to "…quantify the "noisy" nature of SAT variability (to which we refer to as stochasticity)…" We agree that this idea can explained more clearly by rephrasing this sentence as "…quantify the *degree of unpredictability* of SAT variability" as indicated by Referee #3.

The referee says that "The authors normalize the distances by subtracting the mean and dividing by the variance and claim that this removes all the memory effects."

This is not precise: we do not claim that this removes all memory effects. In the manuscript we say that "Here tau_i is a lag that takes into account inertia and/or memory effects." Moreover, in the introduction we discuss the fact that more general forms could include more than one lag time. Nevertheless, it is remarkable that such a simple expression allows uncovering meaningful long-range climate patterns.

Response to Referee #3

We remark that the relation between Shannon entropy (not entrophy) and the long tail shape of the PDF should be sufficiently clear for anyone that is familiar with the concept of Shannon entropy: the entropy is maximum if the PDF is uniform and is minimum if the PDF is a delta. We have performed additional calculations with the NCEP CDAS1 dataset and found that the resolution (10/20/40 bins) does not significantly modify the entropy maps.

The reviewer says "It is not investigated in any detail why ERA and NCEP are so different in the warm pool (i.e. are the extreme values responsible for the differences reasonable or not and what is the mechanism by which those values appear?)".

We don't know why the two datasets are different in the warm pool and we also don't know if the extreme values are reasonable or not. However, we remark that this difference is a very relevant result of our analysis, and the scientific community should be aware of this difference in this region. We agree with the reviewer that Fig. 4, aimed at explaining the differences, is not sufficiently clear and will be redone.

The reviewer says "Figure 3 has orange squares underneath the black circles and its unclear how meaningful is overall." Of course the separation is not 100% but the bars that indicate the inter-quartile ranges clearly demonstrate the trend: higher entropy – lower distance.

The reviewer says "It is not obvious or proven that extreme values of Shannon entropy for SAT are stochastic or due to stochastic processes". We fully agree and we don't say or mean that idea in the manuscript.