The Extreme Climate Index: a novel and multi-hazard index for extreme weather events.

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In this work we introduce the Extreme Climate Index (ECI): an objective, multi-hazard index capable of tracking changes in the frequency or magnitude of extreme weather events, thus indicating that a shift to a new climate regime is underway in a particular area. The main hazards covered by ECI are extreme dry, wet and heat events, with the possibility of adding region-specific risk events such as tropical cyclones for the most vulnerable areas. It is on data coming from consistent, sufficiently long, high quality historical records and is standardized across broad geographical regions, so that extreme events occurring under different climatic regimes in Africa can be comparable.

The first step to construct such an index is to define single hazard indicators. In this first study we focused on extreme dry/wet and heat events, using for their description respectively the well-known SPI (Standardized Precipitation Index) and an index developed by us, called SHI (Standardized Heat-waves Index). The second step consists in the development of a computational strategy to combine these, and possibly other indices, so that the ECI can describe, by means of a single indicator, different types of climatic extremes. According to the methodology proposed in this paper, the ECI is defined by two statistical components: the ECI intensity, which indicates whether an event is extreme or not; the angular component, which represent the contribution of each hazard to the overall intensity of the index. The ECI can thus be used to identify "extremes" after defining a suitable threshold above which the events can be held as extremes.

In this paper, after describing the methodology we used for the construction of the ECI, we present results obtained on different African regions, using NCEP Reanalysis dataset for air temperature at sigma 0.995 level and CHIRP dataset for precipitations.