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Atmospheric cryptography: Using weather regimes to 'crack the code' of subseasonal-to-seasonal extreme rainfall events

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Daily atmospheric circulation regimes can often be classified in robust clusters, or weather types (WTs), that describe available synoptic states of the region under study. Figuratively, these patterns can be seen to represent letters of an 'alphabet' that could be used to study the occurrence of impactful phenomena. For example, it has been shown that, statistically speaking, certain WTs tend to occur concomitantly with extreme rainfall events, and thus their frequency of occurrence in a given period (e.g. weeks 3-4, or Dec-Feb) behaves as a candidate predictor for those extremes. Furthermore, particular sequences of WTs (figuratively, words rather than letters) provide better candidate predictors for the occurrence of extreme rainfall events, and thus the associated prediction problem is very similar to an 'atmospheric cryptography' problem in which the decoding process could be informed by daily transition probabilities between the regimes, representing physically acceptable mechanisms. Different examples at subseasonal-to-seasonal scale are discussed in this talk, involving both observations and dynamical models.