Geophysical Research Abstracts
Vol. 14, EGU2012-3432-1, 2012
EGU General Assembly 2012

Weather regimes over Colombia, South America, during the JJA using Self-Organizing Maps

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We present a map-pattern climatology with focus on Colombia, South America. Horizontal wind and specific humidity fields at 00 UTC and at 850 and 500hPa levels were classified jointly into 20 patterns using the SOM technique. Each day during the June July August trimester for the 1958-2000 period is categorized by a map-type. The analysis of the patterns is based in some qualitative and quantitative properties of the time series corresponding to each pattern. Similar comparisons are carried out after discrimination of the data samples according to the ENSO phase in which they occurred.

From the computation of the frequencies of occurrence of each pattern for each year of the period 1958-2000 we found some kind of trends, so further analyses were performed for the subperiods 1958-1978 and 1980-2000 separately.

The analysis of atmospheric patterns at the 850hPa and 500hPa levels derived from the NCEP/NCAR and ERA-40 reanalyses (both available at 2.5˚ resolution) show important further differences between these data sets. In particular, patterns representing one data set do not represent atmospheric states of the other data set, which means that both reanalyses produce atmospheric states in disjoint regions of the corresponding data space. Detailed analysis of the time series of patterns show particular features of each pattern. In general, patterns representing extreme conditions of humidity content (moist or dry) are more persistent and less recurrent than other patterns.

Additionally, the relative frequencies of the patterns indicate that during the Warm phase of ENSO, more events with weak mean easterlies at the 500hPa are observed, while more events with strong easterlies at this same pressure level take place during the Cold phase.

Furthermore, a trend towards more days with moister atmospheres at the end of the 20th century is identified in both reanalyses. However, we found two ERA-40 patterns with both very high frequency and very high persistence in the period 1958-1978. These two patterns could be related with an error in ERA-40 reanalysis on Colombia.

Finally, we find that while the zonal winds become weaker for NCEP/NCAR reanalysis to the end of the period, the zonal circulation gets stronger for ERA-40. Likewise, while the mean southerly flow is weaker at the end of the period for NCEP/NCAR reanalysis, it gets stronger for ERA-40. Recurrent behavior is identified in patterns representing strong zonal flow, which is probably a signature of the passage of Easterly Waves.