EMS7/ECAM8 Abstracts,
Vol. 4, EMS2007-A-00464, 2007
7th EMS Annual Meeting / 8th ECAM

Statistical downscaling of southern France High Precipitating Events synoptic forcing conditions and precipitation patterns in a future climate.

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The Cevennol precipitations events can bring on flash floods with serious societal impact over the french southern coast. Some studies [Nuissier et al.(2007a)] have reported theses situations often match with strong synoptic forcing. This study aims at determining over long periods whether these synoptic conditions are necessary or not, and whether they reciprocally could help detect objectively these events even their analogues in future climate simulations. This study has been carried out by the french CYPRIM project.

As a preliminary step, we looked for the large scale patterns that usually come with the High Precipitations Events (HPE) over the present period. The data comes from the ERA40 reanalysis for the synoptic parameters (the 500 hPa geopotential height has been chosen for the classification), and the precipitations from the Meteo France rainfall gauges network, the period is between 1958 and 2001 for autumn seasons (september to december). From the rainfall data, a set of 220 HPEs is selected to caracterize the extreme part of the precipitations. However, a larger set of a thousand significant precipitations days must be used to apply the dynamical clustering method [Michelangeli et al.(1995)] that produced a 4 $Z500$ clusters classification. The composite analysis shows the existence of a strong cyclonic activity over the Atlantic forwarding effects over Spain and western mediterranean, and also a strong ridge over central Europe that could point convergent lower level flows over the concerned region. The reciprocal standpoint is evaluated by selecting among all the whole period $Z500$ fields, the ones that are spatially correlated to the rainfall centroids. The result

shows that the $Z500$ is discrimnating 20 percent of the extreme situations, which is significant but not enough to build a criterion. Then, the lower level 925 hPa moisture flux is sequentially added and brought the detecting potential of the algorithm up to 80 percent. On another hand, a climate simulation has been performed at the CNRM, with the Atmospheric Oceanic Regional Climate Model (AORCM) somot for the GICC A2 scenario. For future period autumn seasons (2070-2099) the detection algorithm shows slight inner class variations of the cyclonic intensity between present and future periods, but also significant transferts between the classes. A present-time class, associated with cut-off situations and a few HPEs, seems to contain more HPEs in the future, against the fourth class.

At this time, a future plan of the CYPRIM project would be to study the structure and rainfall distribution of these events in the future by initiating a meso-scale simulation of a few number of future HPEs with the climate simulation fields and draw some outputs in terms of rainfall intensity and even hydrological consequences.

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