EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-217, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
9th European Conference on Applications of Meteorology
High resolution meteorology
- applications and services

High precipitating events in Mediterranean regions : a climate downscaling approach

A.-L. Beaulant, N. Nuissier, B. Joly, V. Ducrocq, A. Joly, S. Somot, F. Sevault, and M. Deque
Meteo-France/CNRM, Toulouse Cedex, France (anne-lise.beaulant@cnrm.meteo.fr)

Mediterranean regions are regularly affected by high precipitating events (HPEs) that often lead to devastating flash floods. The evolution of the occurrence and severity of such extreme events in the frame of the global climate change remains an open question.
In order to address this question, we have designed a statistico-dynamical downscaling method using climate model outputs for an enhanced greenhouse climate at the end of the 21th century i.e. following IPCC-A2 scenario. This statistico-dynamical downscaling is based on a two-step method: first, i) identification of propitious synoptic environments to HPEs for the present climate (1960-2000) and for the future one (2070-2099), by a statistical method based on matching of some 500-hPa geopotential height and low-level moisture flux patterns ; then, ii) high-resolution simulations with initial and boundary conditions provided by the climate model. The climate simulations are performed with the French ARPEGE Climate / OPAMED8 regional coupled model and the methodology has identified in the outputs about twenty cases favourable for HPE triggering equally partitioned between the present and the future climate. The dynamical downscaling is performed by simulating these cases with the French MESO-NH non-hydrostatic numerical model at 2.5 km horizontal resolution.
For the whole synoptic-scale environments selected from the climate model, the fine-scale simulations lead to HPEs triggering and very realistic dynamics for the simulated convective systems. These results show the capability of the method to i) select synoptic scale situations leading to HPEs and ii) correctly reproduce typical features of Mediterranean HPEs. The study has also shown that the number of propitious situations leading to HPEs are increasing (+ 16 %) in the scenario associated with a slight increase of total rainfall amounts and surfaces impacted by strong precipitation. Moreover an increase of the geographical variability of the HPEs in Southern France has been pointed out. To confirm these results a further study is under work in the framework of the MEDUP project, which proposes a multi-model approach to quantify uncertainties.