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Estimation of mean and extreme wind speeds over France at the end of the 21st century for industrial needs

V. Leboucher (1), C. Deltel (1,2) and C. Laurent-Ottavi (1,3)

(1) EDF R&D, France (viviane.leboucher@edf.fr), (2) Now at the Laboratoire d'Océanographie et du Climat-Expérimentation et Approches Numériques/IPSL, UMR 7159 CNRS/IRD/UPMC/MNHN, Paris, France, (3) Now at EDF DOAAT, France

The present study is motivated following two different ways. On one hand, the question of the impact of climate change on the mean wind speed arises for the energetic company EDF as the wind power is in strong development in France. On the other hand, within the framework of a French national project investigating future extreme meteorological values (IMFREX, 2003-2005) and in a context of meteorological risk, a study on the change in extreme winds under climate change conditions was realized following two different approaches in order to evaluate the risks on overhead lines for EDF and on buildings for CSTB (Centre Scientifique et Technique du Bâtiment, France). Only the EDF approach is presented here.

To estimate changes in mean and extreme wind speeds in France at the end of the 21st century, the same statistical method was developed and applied. The local weather phenomena such as the 10 m wind speed being less represented than the large scale parameters by the climatic models, the impact of the climate change on the 10 m mean and extreme wind speed was estimated via the large scale fields with a statistic relation between the large scale variables and this local variable. The statistical downscaling method relies on a Singular Value Decomposition. The transfer function parameters were calibrated using the large scale ECMWF ERA40 reanalysis and the local reference daily series of Météo-France. The 850 hPa wind (at around 1400 m) was found to be the most relevant predictor. The statistical model thus established was then applied

to climatic simulations outputs. In order to propose a range of results, three different climatic projections using the SRES Emission Scenario A2 were used. They were obtained from two French climatic models: Arpège-Climat of Météo-France and LMDZ of IPSL (Institut Pierre-Simon Laplace). These simulations were used for the national IMFREX project (2003-2005) and those of Arpège-Climat have been produced as part of the European PRUDENCE project (2001-2004).

This statistical method relies on the strong assumption that the transfer function developed and calibrated for the present climate remains valid in a future climate.