A multimodel ensemble approach to assessment of climate change impacts on the wind energy ressources in France using a statistical downscaling method

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Statistical downscaling of fifteen coupled atmosphere-ocean general circulation models (CAOGCM) is presented to assess potential changes in 10m wind speeds in France. First, a statistical downscaling method is introduced to estimate daily mean 10m wind speed at some specific sites using general circulation model output. Daily 850hPa wind field has been selected as large scale circulation predictor. The method is based on a classification of the dataset into weather types which are discriminating for the 10m wind speed. Multiple linear regressions are performed using distances from days to the centroids as the predictors and the observed 10m wind speed as the predictand. The pool of observations is used to empirically increase the variance of the downscaled wind speed. ERA40 reanalysis and observed station data have been used to build and validate the downscaling algorithm over France for the period 1974-2002. The method is then applied to outputs of fifteen CAOGCMs of the IPCC AR4 database. Three time periods are focused on: a control period (1961-1990) from the climate of the twentieth century experiment and two climate projection periods (2046-2065 and 2081-2100) from the IPCC SRES A1B experiment. Finally, the evolution of the wind energy resources in France and the result uncertainties are discussed.