Geophysical Research Abstracts
Vol. 16, EGU2014-6616, 2014
EGU General Assembly 2014

Predicting future wind power generation and power demand in France using statistical downscaling methods developed for hydropower applications

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For many applications in the energy sector, it is crucial to dispose of downscaling methods that enable to conserve space-time dependences at very fine spatial and temporal scales between variables affecting electricity production and consumption. For climate change impact studies, this is an extremely difficult task, particularly as reliable climate information is usually found at regional and monthly scales at best, although many industry oriented applications need further refined information (hydropower production model, wind energy production model, power demand model, power balance model...). Here we thus propose to investigate the question of how to predict and quantify the influence of climate change on climate-related energies and the energy demand. To do so, statistical downscaling methods originally developed for studying climate change impacts on hydrological cycles in France (and which have been used to compute hydropower production in France), have been applied for predicting wind power generation in France and an air temperature indicator commonly used for predicting power demand in France. We show that those methods provide satisfactory results over the recent past and apply this methodology to several climate model runs from the ENSEMBLES project.