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Future and present regional wind

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Accurate and rapid determination of near-surface wind fields in a complex area (orography, inhomogeneous surface properties) is a challenge for applications like the evaluation of wind energy production, the prediction of pollution transport and hazardous conditions for aeronautics and ship navigation, among others. This work presents a statistical downscaling approach for regional near-surface wind field in the region of southern France (characterized by the presence of major mountain ranges). It is based on generalized additive models (GAM, Salameh et al. 2008), relating large-scale upper air to local-scale surface atmospheric fields.

We apply our statistical downscaling model conditionally on regional circulation patterns defined from measurements. Hence, near-surface wind components in southern France are simulated based on large-scale information from ERA-40 reanalyses (1991-2001) and from IPCC scenarios (1991-2001 and 2040-2050). The performances of our method are evaluated, (1) by comparing downscaled wind from ERA-40 and from IPCC, and (2) by comparing them with measurements, for the period 1991-2001. Then, we evaluate the change in regional atmospheric circulations in southern France, by comparing future and present downscaled wind.