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Statistical downscaling of daily precipitation over Llobregat river basin in Catalonia (Spain) using three downscaling methods.

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Any long-term change in the patterns of average weather in a global or regional scale is called climate change. It may cause a progressive increase of atmospheric temperature and consequently may change the amount, frequency and intensity of precipitation. All these changes of meteorological parameters may modify the water cycle: run-off, infiltration, aquifer recharge, etc.

Recent studies in Catalonia foresee changes in hydrological systems caused by climate change. This will lead to alterations in the hydrological cycle that could impact in land use, in the regimen of water extractions, in the hydrological characteristics of the territory and reduced groundwater recharge. Besides, can expect a loss of flow in rivers. In addition to possible increases in the frequency of extreme rainfall, being necessary to modify the design of infrastructure.

Because this, it work focuses on studying the impacts of climate change in one of the most important basins in Catalonia, the Llobregat River Basin. The basin is the hub of the province of Barcelona. It is a highly populated and urbanized catchment, where water resources are used for different purposes, as drinking water production, agricultural irrigation, industry and hydro-electrical energy production. In consequence, many companies and communities depend on these resources.

To study the impact of climate change in the Llobregat basin, storms (frequency, intensity) mainly, we will need regional climate change information. A regional climate is determined by interactions at large, regional and local scales. The general circulation models (GCMs) are run at too coarse resolution to permit accurate description of these regional and local interactions. So far, they have been unable to provide consistent estimates of climate change on a local scale. Several regionalization techniques have been developed to bridge the gap between the large-scale information provided by GCMs and fine spatial scales required for regional and environmental impact studies.

Downscaling methods to assess the effect of large-scale circulations on local parameters have. Statistical downscaling methods are based on the view that regional climate can be conditioned by two factors: large-scale climatic state and regional/local features. Local climate information is derived by first developing a statistical model which relates large-scale variables or “predictors” for which GCMs are trustable to regional or local surface “predictands” for which models are less skilful. The main advantage of these methods is that they are computationally inexpensive, and can be applied to outputs from different GCM experiments.

Three statistical downscaling methods are applied: Analogue method, Delta Change and Direct Forcing. These methods have been used to determine daily precipitation projections at rain gauge location to study the intensity, frequency and variability of storms in a context of climate change in the Llobregat River Basin in Catalonia, Spain. This work is part of the European project “Water Change” (included in the LIFE + Environment Policy and Governance program). It deals with Medium and long term water resources modelling as a tool for planning and global change adaptation. Two stakeholders involved in the project provided the historical time series: Catalan Water Agency (ACA) and the State Meteorological Agency (AEMET).