High resolution climate change projections for the Pyrenees region

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Mountain environments are very sensitive to climate. In fact, they represent unique areas for the detection of climate change and the assessment of climate-related impacts. This research addresses generation and analysis of climate change projections over the Pyrenees region. Given that spatial resolution of global climate models is too low for regional impact studies, we have applied –and this is the main novelty of our approach- downscaling techniques to a collection of global model outputs over a high-resolution observational daily grid. The application of two statistical downscaling methods to a sufficient number of global climate models from the CMIP5 project (Coupled Model Intercomparison Project Phase 5) for three different Representative Concentration Pathways (RCP4.5, RCP6.0 and RCP8.5) allows a reasonable estimation of the uncertainties coming from downscaling methods, global models and emission scenarios. Furthermore, the high-resolution (5 km) observational daily grid, based on an optimal interpolation algorithm and making use of all temperature and precipitation observations available over the region, allows the generation of fine scale climate change projections (from 2010 to 2100) complementing other downscaling approaches based on dynamical methods (e.g., EUROCORDEX). For our analysis we particularly focus on: a) maximum and minimum temperatures and precipitation changes and b) changes in some extreme indexes, being 1986-2005 the reference period. Results show outstanding changes in the last period of this century with increases of temperature between 4ºC and 6ºC for the most emissive scenario. As far as precipitation is concerned, the agreement between the simulations is lower than in the case of temperatures. Nevertheless, it seems that a differentiated behavior is observed between the west and southeast zones. This study has been developed in the framework of the "Characterisation of climate change and provision of information for adaptation in the Pyrenees (CLIMPY)" project.