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Heat and cold spells over the Alpine region in the future climate

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Climate change is not only a likely prospect for the end of this century, but is already occurring. Part of the changes will include an increment of the temperatures and of their variability, both at global and regional scales. The latter was investigated in this work from the point of view of the occurrence of cold and hot spells in the Alps in the future climate (2071–2100, scenarios A2 and B2), compared with the present climate (1961–1990).
To this end, a regionalisation of climate change effects on the Alpine region was performed. The analysis was performed on the soil surface temperature and moisture. To get realistic values for this variable, a land surface scheme, UTOPIA, was run on the selected domain, using the output of the Regional Climate Model (RegCM3) simulations as the driving force; in turn, the RegCM3 was previously run using the output of the global climate model HadAMH. The choice of using present climate simulations instead of the existing observations was performed in order to exclude any possible source of anomaly caused by the use of different input data, or grid irregularity, or missing observation interpolation. The domain chosen for this study is a rectangular mesoscale area of longitudes 6°-15°E and latitudes 43°-47°N. Grid point distance was 20 km. Soil and vegetation parameters over the grid were evaluated from the ECOCLIMAP database.
The results show that, in general, the number of cold and hot spells is decreasing over the Alps, due to the temperature increment. Also the soil moisture distribution during the year, in general, exhibits several relevant differences between future and present climate. However, there are certain zones where the behaviour is more complicated. The analysis of the model output also allowed a relationship to be found between the number of cold/hot spells and their duration. The significance of these results over the whole area was assessed.