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Analysing the historical trends of water resources and land cover in the headwaters of the Llobregat and Ter river basins (Catalonia, Spain).

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The Llobregat and Ter rivers have their headwaters in the South-Eastern Pyrenees and are the main sources for the water resources of eastern Catalonia and particularly for the metropolitan areas of Barcelona and Girona. The historical discharge records of the headwater basins of these rivers have been analysed in relation with the land cover changes occurred in the territory. Flow records showed high interannual variability, with a succession of decadal wet and dry spells that make difficult the detection of long-term trends in most of the gauging stations. The comparison of the measured flows with those simulated with rainfall-runoff models showed some clear divergences. Most of the trends of the measured flows were significantly more negative than those explained by the climate forcing. Differences found between observed and simulated flows were attributed to land use changes. Indeed, middle mountains in the studied catchments suffered an important increase of forest cover between 1957 and 1980, with a more moderate increase afterwards. This change in land cover was caused by the change of land use from agriculture to pasture and forestry, as well as land abandonment. The foreseeable effect of this land cover change is an increase of land evaporation caused by the increase in forest cover, not taken into account by the models used. The results show that the assessment of future water resources in this region must take into account not only the climate scenarios, but also the land cover scenarios, driven by both climate and economical factors.