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Climate and land use change impacts on water resources in Sardinia (Italy)

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The assessment of climate change and land use modifications effects on hydrological cycle is challenging. We propose an approach based on Budyko theory to investigate the relative importance of natural and anthropogenic drivers on water resources availability. As an example of application, the proposed approach is implemented in the island of Sardinia (Italy), which is affected by important processes of both climate and land use modifications. In details, the proposed methodology assumes the Fu's equation to describe the mechanisms of water partitioning at regional scale and uses the probability distributions of annual runoff (Q) in a closed form. The latter is parametrized by considering simple long-term climatic info (namely first orders statistics of annual rainfall and potential evapotranspiration) and land use properties of basins.

In order to investigate the possible near future water availability of Sardinia, several climate and land use scenarios have been considered, referring to 2006-2050 and 2051-2100 periods. Climate scenarios have been generated considering fourteen bias corrected outputs of climatic models from EUROCORDEX's project (RCP 8.5), while three land use scenarios have been created following the last century tendencies.

Results show that the distribution of annual runoff in Sardinia could be significantly affected by both climate and land use change. The near future distribution of Q generally displayed a decrease in mean and variance compared to the baseline.

The reduction of Q is more critical moving from 2006-2050 to 2051-2100 period, according with climatic trends, namely due to the reduction of annual rainfall and the increase of potential evapotranspiration. The effect of LU change on Q distribution is weaker than the climatic one, but not negligible.