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Original
Online self-repair of FIR filters / Benso, A., DI CARLO, S., DI NATALE, G., Prinetto, P.E.. - In: IEEE DESIGN & TEST OF COMPUTERS. - ISSN 0740-7475. - STAMPA. - 20:3(2003), pp. 50-57. [10.1109/MDT.2003.1198686]

Availability:
This version is available at: 11583/1499804 since:

Publisher:
IEEE Computer Society

Published
DOI:10.1109/MDT.2003.1198686

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16 November 2026

EGU23-5694, updated on 27 Apr 2023
https://doi.org/10.5194/egusphere-egu23-5694
EGU General Assembly 2023
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Non-stationary flood frequency analysis: case study in the Po river basin

Luigi Cafiero[1], Paola Mazzoglio[1], Irene Monforte[2], Pierluigi Claps[1], Alberto Viglione[1], and Francesco Laio[1]

[1]Politecnico di Torino, Department of Environment, Land and Infrastructure Engineering, Italy
[2]ARPA Piemonte, Piedmont, Italy

Traditional regionalization methods allow estimating hydrological variables in stationary conditions: in the context of climate change new techniques are sought, which take into account the non-stationarity of climate variables. As part of a project in collaboration between universities and the Po basin authority, different approaches including regionalization procedures are used to characterize the hydrological extremes in the Po River basin. In particular, we use the Spatially Smooth Regional Estimation method, which is based on multiregressive estimation of L-moments that do not require the definition of homogeneous regions. The regression models are based on morpho-climatic descriptors including climate variables such as the mean annual precipitation, and the coefficients of a model for the IDF curves. By analyzing the multi-year variability of the climatic variables in each basin, with this work we aim at: (i) comparing the trends of the climatic variables and the trend of discharges associated with different return periods, (ii) analyzing the sensitivity of the regression equations to changes in time of these variables. Moreover, we compare the rainfall and flood quantiles for each sub-basin, to evaluate the percentage change of the standardised flood discharge for the percentage change in extreme rainfall. This approach allows us to investigate the effects of rainfall mechanisms and catchment characteristics on flood probabilities in the Po River basin.