Comparison of the Performance of different Drought and Fire Indices in Southern Switzerland

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Among various natural disturbances, forest fires belong to the most important drivers
of vegetation development in many regions of the world, shaping landscapes and deter-
mining species composition. Worldwide, a wide variety of drought and fire indices are
used to predict forest fires. These indices are mostly based on weather and climatic
variables and were developed for specific regions with specific conditions. Some of
them, e.g. the Canadian Forest Fire Weather Index System (CFFWIS) or the Nesterov
Ignition Index, have been tested in different regions under various climatic conditions.
Some indices have even been used for predicting forest fires worldwide.

In the present study, we evaluate a range of forest fire indices for their appropriateness
of characterizing fire occurrence in the southern part of the Swiss Alps, the Canton
Ticino. This is the most fire-prone region in Switzerland. Over the period from 1969
to 2005, 1830 forest fires occurred. We apply eight drought and forest fire indices and
the Canadian Forest Fire Weather Index System (CFFWIS) to identify the most ap-
propriate index for predicting forest fires in mountain forests of southern Switzerland.
Logistic regression models are used to relate index values to daily records of forest
fires in the 36-year period. The results show large differences between the indices.
The best performing indices are the Initial Spread Index (ISI), the Fine Fuel Mois-
ture Code (FFMC, both part of CFFWIS) and the Nesterov Ignition Index. For further
analyses, additional triggering factors such as human activity have to be included to
enhance our predictive capability of forest fires in the study region.