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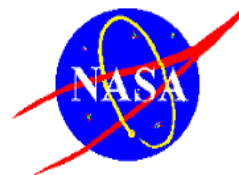
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152 [O-2]: LANDSCAPE CHANGE AND FIRE HAZARD IN A MOUNTAINOUS AREA IN NORTHEASTERN PORTUGAL

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Human abandonment in Mediterranean regions of Europe has led to vegetation encroachment and landscape homogenization reducing biodiversity and favoring the occurrence of wild fires. In Portugal, landscape changes driven by human abandonment were not observed until the late twentieth century. The full extent of these recent changes and their economic, social and ecological consequences, particularly by the creation of favorable conditions for the occurrence of large wild fires, are just partially described and understood. Additionally, research on these issues is urgently required to provide guidelines for future ecosystem and landscape planning and management.

We studied land use and land cover over the last 50 years in the França Parish (Bragança, North-Eastern Portugal) to evaluate change in pattern and to infer on change in function, particularly fire occurrence and propagation. We interpreted digitized and orthorectified aerial photographs from 1958, 1968, 1980, 1993, and 2005, based on the “Carta de Ocupação do Solo” (Instituto Geográfico Português) land use/land cover system. Landscape structure for each of these dates was described based upon landscape metrics calculated for major land cover classes. Fire hazard was evaluated in terms of abundance and configuration of highly combustible cover classes. We also used the FARSITE 4 software (Finney, 1998) to simulate fire propagation at the landscape level based on land cover, terrain, and meteorological data.

The results showed that the study landscape went through important changes over the last 50 years. Agriculture suffered the strongest variation, changing progressively from 22% of the landscape in 1958 to less than 5% in 2005. Agricultural land was replaced by shrublands and forests. Shrublands are the dominant land use in all the dates. With forests, shrublands represent more than 60% of the landscape in every year, reaching a maximum of 73% in 2005. We also observed an increase in plant cover percentage within shrub and forest land classes over time. Structurally, there was an increase in patch size for the more combustible land classes (shrublands and forests), as well as in connectivity for the same classes. Observed changes were stronger during the 1968-78 period. Fire simulations at the landscape level reflected the structural changes in the landscape described above, with increasing average fire size and intensity after 1968. Our study showed that changes caused by human abandonment affected structure and function in the mountain landscapes of the Northeast of Portugal.

Keywords: Landscape Change, Fire Hazard, Montesinho, Bragança, Portugal

281 [P-1]: TIME SERIES ANALYSIS OF RAINFALL AND RUNOFF IN THE UPPER ZAGUNAO CATCHMENT

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To disclose the hydrological response of vegetation change in upper Minjiang River basin, one of the largest reaches of Yangtze River in southwest china, the time analysis methods were used to analyze the dynamics of rainfall and runoff in Upper Zagunao catchment.

Multi-Resolution analysis (MRA) was conducted with Demy wavelet function on the monthly runoff data from 1962 to 2002 observed by Zagunao hydrological station. The result showed that from 1962 to 1978, when intensive deforestation were conducted in Zagunao catchment, the runoff dynamics were relatively stable. While during the period with vegetation cover increasing, 1987-1997, the runoff in the watershed was clearly increased. This pattern indicated that global climate change plays an important role in runoff dynamics in Upper Minjiang River, which was supported by the following stepwise regression result for lineal regression based rainfall-runoff model. Periodicity analysis showed that the rich-short water periodicity at the scale of 120 months and 60 months was 3 and 7 times, respectively.

The rank based non-parametric Mann-Kendall test and change point analysis were then used to identify trends and variation of runoff and precipitation in different time scales of annual, seasonal, and monthly. The result of moving t change-point analysis showed that a significant change of trend in both annual runoff and precipitation occurred around 1987, though no significant trends of rainfall and runoff from 1967 to 2005 showed in any time scale. The trends and variation were further studied separately in the periods before and after 1987. The results are as follows: 1) from 1967 to 1987 no significant change was found in annual runoff while the annual precipitation was significantly descending. 2) From 1988 to 2005 of vegetation restoration, the correlation coefficient between runoff and precipitation was relatively more significant than the period before 1987. 3) The analysis of the 7 days low flow showed a significant downward trend during the period 1958 -1987. The first day of 7 days low flow showed a 1-day-per-year postponement trend. While the 7 days high flow and the first day of 7 days high flow showed no significant trend. 4) The annual base flow index (BFI) showed a significant upward trend from 1962 to 1987, though the base flow displayed no significant trend.

The result of rainfall and runoff dynamics in this study is essential for the further research of the relationship between forest and water as well as for the sustainable utilization and planning of water resources in the region, especially after the tremendous earthquake occurred there in May 2008.

Keywords: Upper Zagunao Catchment, Wavelet transform, Non-parametric test, Change point analysis, Scale