This work was produced in the framework of project FRISCO - managing Fire-induced RISks of water quality Contamination (PCIF/MPG/0044/2018), and funding attributed to the CE3C research center (UIDB/00329/2020) and FCT – Fundação para a Ciência e a Tecnologia under LA/P/0121/2020.

Evaluating and Interpreting Post-fire Water Quality Changes in Portuguese Reservoirs

Niels Nitzsche[1] (niels.nitzsche@gmx.de) , João Pedro Nunes[1,2] (joao.carvalhonunes@wur.nl), Joana Parente[1] (joaparente@gmail.com)
[1]cE3c – Centre for Ecology, Evolution and Environmental Changes - Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal
[2]Soil Physics and Land Management Group, Wageningen University & Research, Wageningen, 6700 AA, the Netherlands

More informations

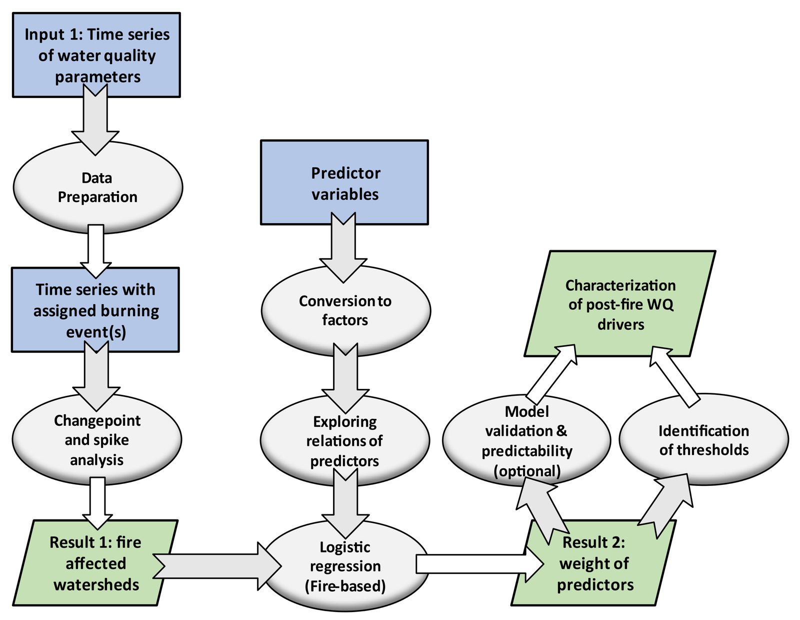
Sharing is encouraged

EGU General Assembly 2022
Vienna, Austria & Online | 23–27 May 2022

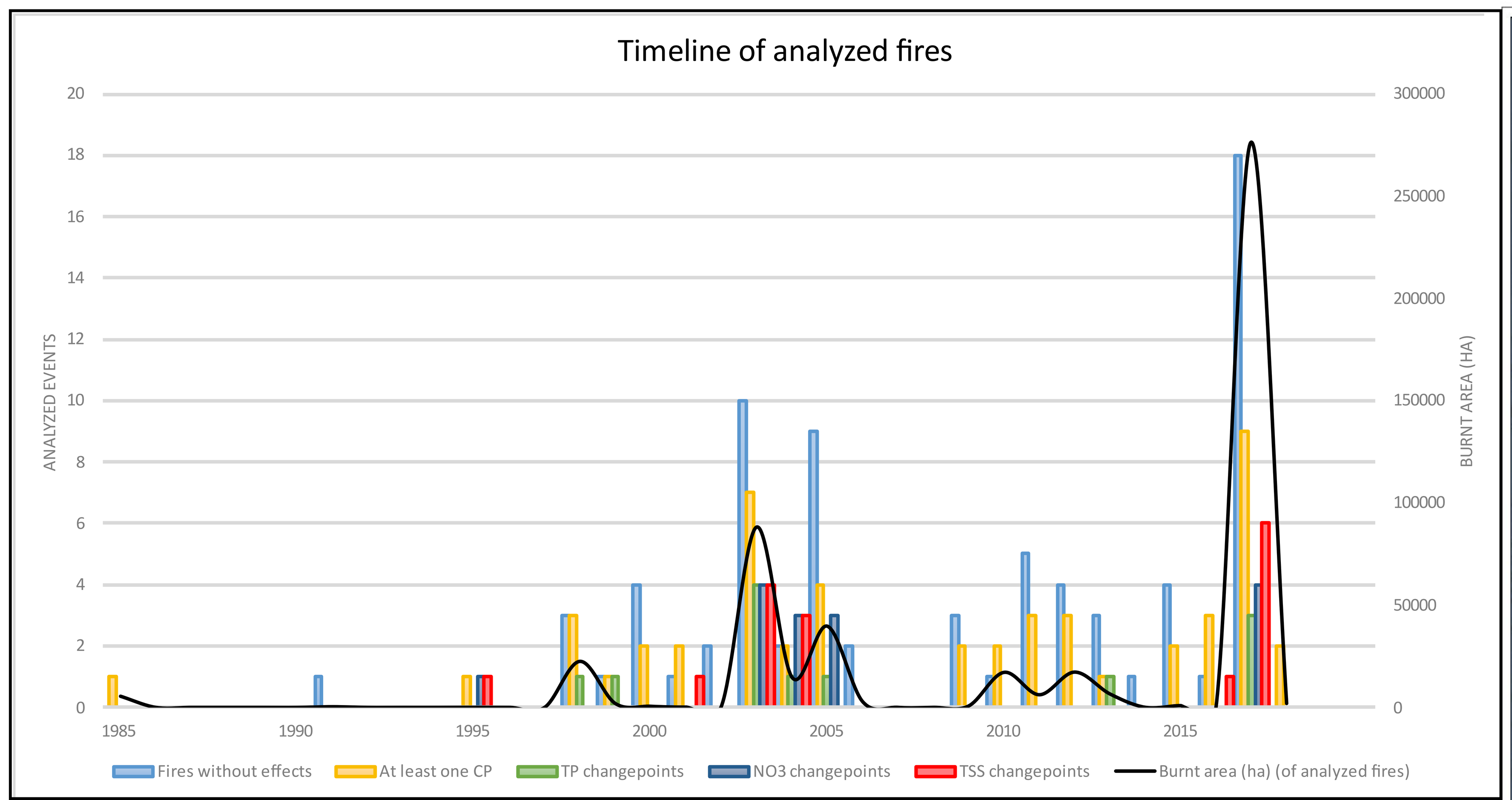
Wildfires can have adverse impacts on adjacent aquatic ecosystems, the hydrological cycle and ultimately water management. Surface waters experience contamination by ash loads and fire-induced erosion, where contaminants, both organic and inorganic are introduced into surface water bodies after precipitation events. These contaminants can be detected directly or indirectly through basic water quality parameters.

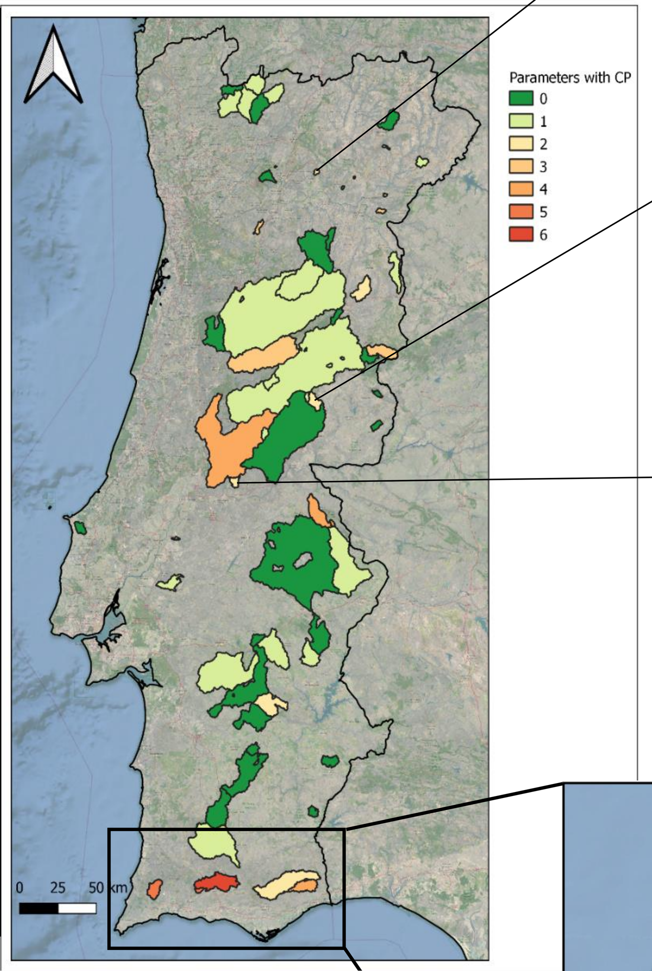
Time series of water quality parameters (BOD, COD, DO, NO_3, TP, Conductivity, TSS and pH) from around 75 different reservoirs in Portugal were explored via changepoint analysis to detect post-fire responses.

The study workflow



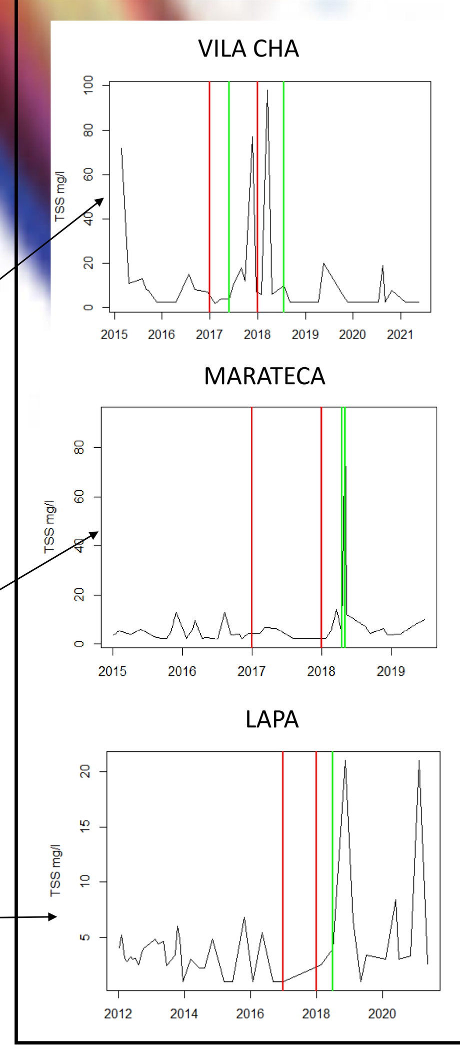
Distributions of impacts in time and space





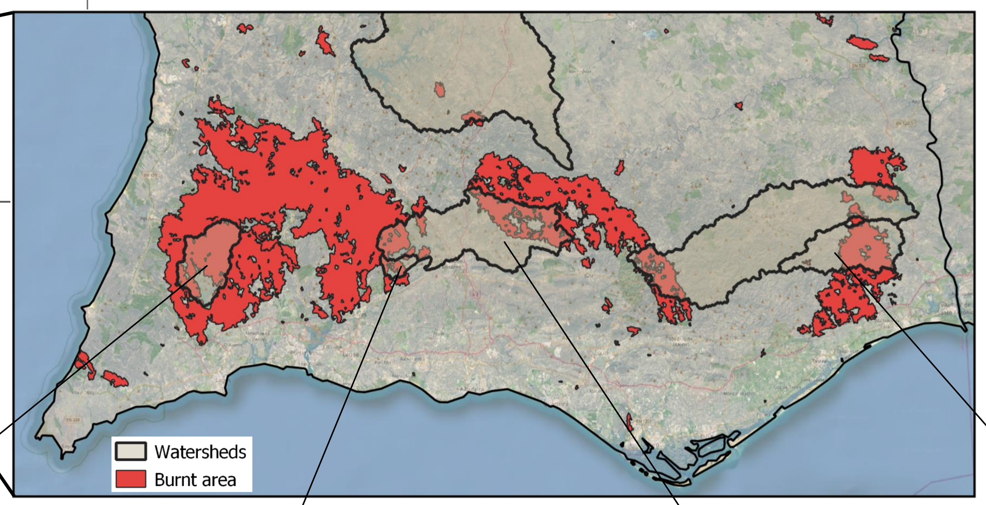
The detected number changepoints of selected Parameters over the course of the sutdy period (left) and the distribution of fire events with the highest numbers of parameters with changepoints (right)

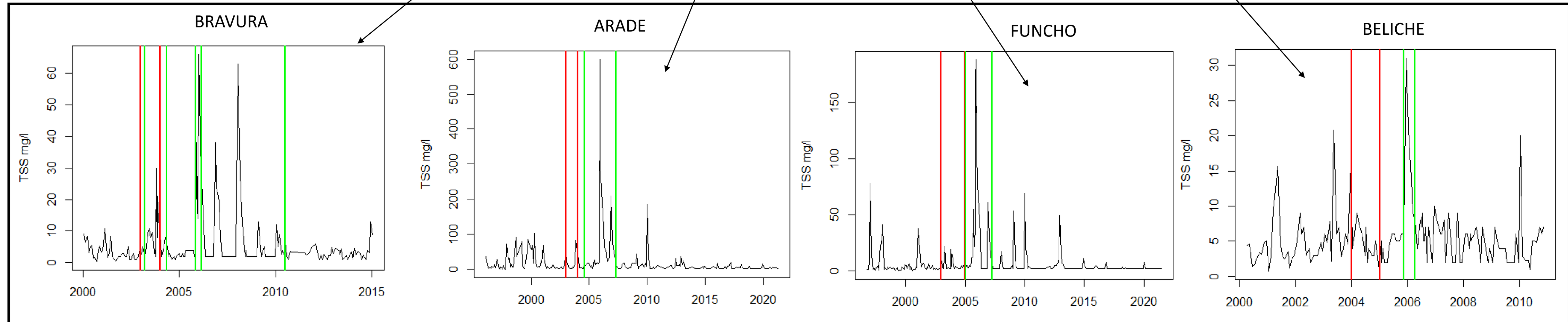
2017 Fireseason



Changepoints (in green) in time series data of total suspended sediments (in mg/l) around the 2017 wildfire season. Shown are examplatory reservoirs were an impact on the parameter was detected. The year of 2017 is outlined in red colour as the possible timeframe of the fire. Impacts in these reservoirs could be characterized as short but intense spikes.

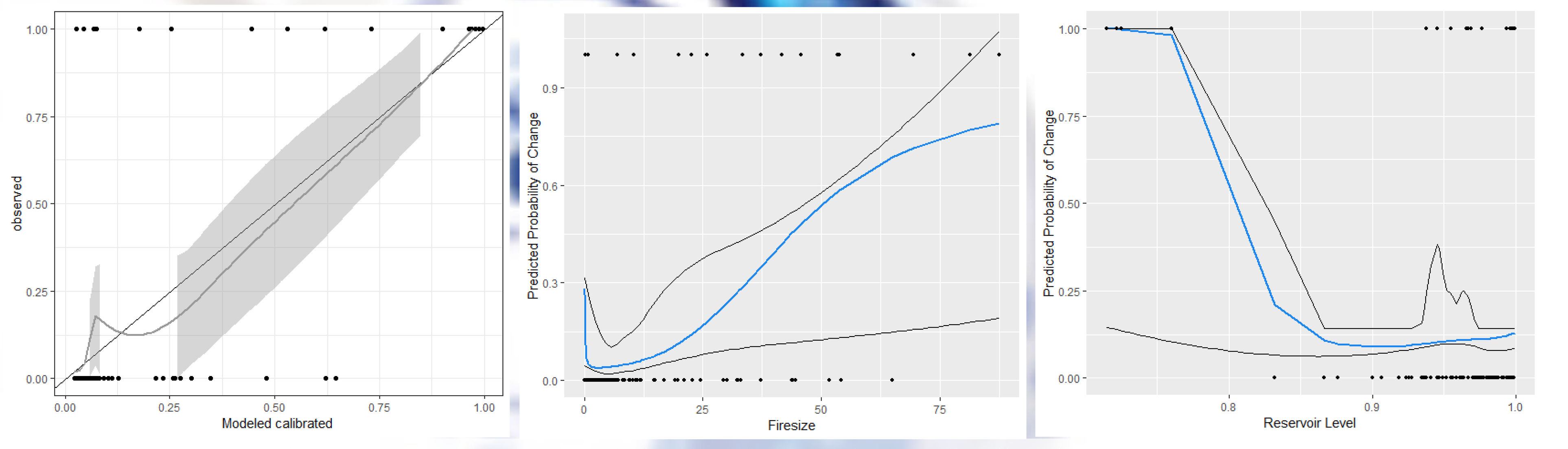
2003 – 2005 Fireseason





Changepoints (in green) in time series data of total suspended sediments (in mg/l) around the 2003 – 2005 fire seasons. The timeframe in which the fires occurred is shown in red. Compared to the effects of the 2017 fire season, the impacts were often longer and stronger (especially seen in the Bravura reservoir; left plot).

Logistic Regression



Regression model for total suspended sediments; left: fitted vs. Observed values; middle: effect plot Firesize; right: effect plot reservoir level

Logistic regression resulted in average fits (adj. R^2 ~ 0.5 depending on the parameter; for TSS: 0.443). However Firesize and post-fire Reservoir Levels were significant predictors for 7/8 and 5/8 models respectively (here TSS: p-value Firesize: 9.24e-05; pvalue post-fire Reservoir Level: 0.0388), indicating a clear impact on the probability of a change. Large fires in combination with low reservoir levels pose the biggest risk of change.