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Relationships between forest fires and weather parameters from long-term national observations on a transect from Europe to North Africa

Nikos Koutsias (1,2), Gianni Boris Pezzatti (1), Amar Madoui (3), Florent Mouillot (4), and Marco Conedera (1)

(1) Community Ecology, WSL Swiss Federal Institute for Forest, Snow and Landscape Research, a Ramél 18, Cadenazzo, CH-6593, Switzerland, (2) Department of Environmental and Natural Resources Management, University of Patras, G. Seferi 2, GR-30100 Agrinio, Greece., (3) Université du Québec à Montréal, C.P. 8888, Succursale, Centre-ville, Montréal, QC H3C 3P8, Canada., (4) UMR CEFE 5175, CNRS, Université de Montpellier, Université Paul-Valéry Montpellier, EPHE, IRD, 1919 route de Mende, 34293 Montpellier Cedex 5, France

Long-term historical fire records extending back to the late 1800s are very rare worldwide. Three such long-term historical fire data spanning for more than one century have been gathered along a north-south transect across (i) Switzerland, central Europe (1900-2014), (ii) Greece, south Europe (1897-2014), and (iii) Algeria, north Africa (1870-2014). Within the context of a Marie Skłodowska-Curie grant (individual fellowship, GRADIENT), these data gave a unique and excellent opportunity to investigate the relationships between forest fire activity and meteorological parameters and to understand fire - weather relationships in a north to south transect.
The time series of fire and weather data were analyzed on the basis of their autocorrelation in order to identify potential temporal structures. Change point estimation methods were also used to detect significant shifts in time series. The relationships between fire occurrence and selected meteorological parameters were investigated using non-parametric as well as parametric statistics. Finally, lagged relationships between fires and weather data were further explored.
Preliminary results underline the dominant effect of meteorological parameters on fire spread by controlling both fuel production and fuel moisture. In all study areas there was a negative relationship between total yearly precipitation and area burned while only in Greece there was a positive correlation of fires with spring precipitation and with yearly precipitation at lag 2 years, which reflects a fuel accumulation process. In Switzerland fires seem to be related to precipitation and temperature depending on the fire causes (anthropogenic or lighting-induced), whereas in Greece they are mostly controlled by both fuel and meteorological conditions (precipitation and max temperature, especially during the fire season). In Algeria, on contrary, no clear influence is detectable despite a marginal negative effect of the total precipitation that enhances the role of humans in determining forest fire occurrence.