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Non-linear response of European fire size to weather conditions

Lasse Loepfe (1), Francisco Lloret (1,2), Anselm Rodrigo (1,2)

(1) Center for Ecological Research and Forestry Applications (CREAF), Bellaterra (Barcelona),Spain (lasse.loepfe@gmail.com/+34 93 5814151), (2) U. Ecology, Dept. Animal Biology, Plant Biology and Ecology, Autonomous University of Barcelona, Bellaterra, Spain

It is beyond controversy that fire weather affects fire size. Yet the response shape of this relationship is far from clear. Whereas exponential fitting often performs better than linear fitting, extrapolation of the former can lead to unrealistically high burnt area estimations for future climate change scenarios. We propose that the response type of fire size towards fire weather is segmented. Below a first breakpoint, fires would hardly spread, above it fires size grows with fire weather severity until reaching a second break-point of saturation when no further increase of fire size with drier fuel is expected. We test this hypothesis using MODIS Active Fire Data for Europe (2001-2009) drought code (DC) of the Canadian Fire Weather Index calculated from daily E-OBS weather data. The individual hotspots were grouped into fires, according to spatial and temporal vicinity. The resulting fire size distribution has been validated against ground observations. Preliminary results point out the importance of both breakpoints, which seem to be independent of average fire weather conditions and land cover. Many parts of Europe that so far have been on the safe side of the first breakpoint are likely to suffer from increased fires sizes in the future, due to climate change. On the other hand, fire size in regions that currently show a dry climate would not increase due to climate change; actually even a reduction is possible, due to limited fuel amount.