Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00237, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00237
EGU General Assembly 2008


# Predicting the occurrence of fires in Africa

M. Buitrago (1), F. van Langevelde (1), C. Carmona-Moreno (2), A. Bregt (3), A. Bergsma (3) and T. Groen (1)

(1) Resource Ecology Group, Wageningen University, The Netherlands, (2) Joint Research Center of the European Commission, Ispra, Italy, (3) Laboratory of Geo-information Science and Remote Sensing, Wageningen University, The Netherlands (mariafernanda.buitrago@wur.nl / Phone: +316 28065221)

Fires are among the most important processes in shaping natural ecosystems, acting as an evolutionary force both directly for humans and for their environment by changing the ecosystem structure and their biodiversity. Although the driving factors that influence the occurrence of fires in the world are still not widely understood, current studies on the spatial and temporal interrelations between fire, climate, and other environmental and anthropogenic variables are the key for understanding this influence.

This research investigates this complex process in Africa by spatial and temporal correlation of fire occurrence and explaining climatological, environmental and anthropogenic variables. The following explaining variables were reselected: temperature, relative humidity, wind speed, rainfall, land cover (MODIS product), soil characteristics, livestock (number of cattle, sheep and goats), NDVI, population density, population growth and elevation.

The weekly global burnt surface product (GBS 1982-1999) generated by the Joint Research Centre of the European Commission, was used for fire occurrence . This product register weekly the presence or absence of fire scars and is based on the observations from the Advanced Very High-Resolution Radiometers (AVHRR) on the series of meteorological satellites operated by the National Oceanic and Atmospheric Administration (NOAA) between 1982 and 1999. This fire data set consists of a weekly time series, over the period lasting from 1982 to 1999. Because a malfunction of the satellite during 1994, only 17 years of data are available. Fire occurrence was quan-

tified using fire frequency, or number of weeks with fires in a year. The analysis was performed at 8km resolution, using the original resolution of the fire occurrence data.

All data sets were rescaled to 8km resolution and the averaged value for the study period was calculated. Correlations between the fire time series and the other explanatory variables were computed. An analysis for the whole continent was performed using bootstrap techniques in MATLAB., sampling 1000 records at a time, and calculating the averaged mean of the samples.

The strongest correlation was found between fire frequency and NDVI (correlation coefficient R=0.33), precipitation (R=0.23), and the MODIS land cover represented by bare soil (R=-0.47) and herbaceous (R=0.58)and bare soil coverage. NDVI shows a hump shape response: at low NDVI values, such as desert areas, the fire frequency is very low, and rises with increasing NDVI, until the point that high NDVI values like in the rainforest imply again a drop in the fire response. The percentage of herbaceous and bare soil coverage have different responses: places with a dense vegetation and low bare soil results in a decrease in fire frequency such as in dense forest fire hardly occurs, while in contrast, an increase in herbaceous vegetation such as savannas, results in an increased fire frequency. Temperature and precipitation had the expected responses: high temperatures result in a higher fire frequency, and an increase in precipitation results in a decrease of fire frequency. Anthropogenic variables such as population density and livestock, which were expected to influence the fire occurrence, did not show strong correlations.

A regression model was adjusted between fire frequency and all the explanatory variables. After a backward linear regression analysis ($R_a^2$=0.48, P-value$<$0.00), the most important variables to predict fire frequency are: tree coverage, temperature, precipitation and elevation. Finally, a per month analysis for the period 1982–1999 (17 years) for fire occurrence (presence or absence in each pixel) and NDVI, was developed. The regression model was adjusted between fire and NDVI, showing that the fire occurrence (presence or absence) depends not only in the NDVI of the corresponding month but also of the preceding months. . With these results, this study contributes to a better understanding of the driving factors that influence the occurrence of fires.