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A trend analysis of global fire activity. Is it land use or climate the main driver?

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We perform a global trend analysis of active fire counts at 0.5o spatial resolution, using 156 months (January 2001 – December 2013) of MODIS Climate Modelling Grid data (TERRA). We use the Contextual Mann-Kendall (CMK) test to assess the statistical significance at cell level and found that 13% of the global land area displays statistically significant active fire count trends, with a slight predominance of negative trends (50.63% of the total significant cells). We perform the same trend analysis with the unexplained variability (residuals) between active fires and the Fire Weather Index (FWI) that is used as a proxy for climate. There is agreement between the main patterns from the trend analysis coming from the residuals and the active fire trends, implying that the main contemporary fire trends are not climate driven.

Spatially coherent patches with significant trends were found in all continents (with the obvious exception of Antarctica). The majority of significant trends occur in areas of high fire incidence, and both increasing and decreasing trends appear to be associated with land use change processes. The analysis reveals large negative trends at the Sahel and between Russia and Kazakhstan, whereas a massive and coherent positive trend appears in southeastern Asia. Smaller patches of positive trends appear in southeastern United States and in Mexico, as well as in Brazil and between Argentina and Paraguay, and in Asia in India. There are also negative trends in Brazil, Argentina and in Australia. The study highlights the land use activities as the main driver of these trends, but also the need for data driven analyses and longer time series for future studies in order to gain better knowledge on fire occurrence.