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# 30-year European active fire record from the AVHRR heritage sensor

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Long-term fire records are needed to obtain a mechanistic understanding of the changing role of climate-human drivers of fire dynamics and their impact on atmospheric composition (van der Werf et al., 2017). Active fire is one fire disturbance parameter besides burned area and fire radiative power as defined within the Essential Climate Variables (ECV's; GTOS-T13, 2009). It is primarily derived by various remote sensing sensors, but only few of the sensors cover long enough time spans to derive climatological meaningful time series and to analyse temporal trends in fire activity.

Here, we use the unique potential of the Advanced Very High Resolution Radiometer (AVHRR) heritage sensor for long-term active fire records and highlight the caveats. We employed full-resolution AVHRR imagery on-board morning and afternoon NOAA-9 through 19 (except NOAA-15), MetOp-A and B platforms, received, archived, and homogenized at the University of Bern, Switzerland (46.93 ˚N / 7.41 ˚E). To achieve a high-quality time series of active fire, we (1) expanded on the original two-channel contextual approach of Giglio et al. (1999) to flag fire-affected pixels and (2) performed a rigorous comparison using coinciding MODIS derived active fire maps (MOD14/MYD14) and calculated binary active fire maps from Landsat 5 TM and ASTER L1T data for the validation.

AVHRR daytime active fire records allow the sampling of different times of the diurnal fire cycles revealing its peak of diurnal fire activity in many regions. The daytime retrieval of active fire pixels is hindered by the configuration of the MIR channel, its low saturation temperature (322.5 K (336 K) for AVHRR2 (AVHRR/3; from NOAA-15 onwards)), and the missing on-board calibration of the reflective solar channels. However, the major limiting factor for long-term fire records are differences in diurnal sampling over time due to orbital drift of the satellites (i.e. fire observations observed at different local times) resulting in spurious trends (Giglio, 2007). We investigated the impacts of drifting on the active fire time series for Europe and aim to normalize them to a consistent point in the diurnal fire cycle to overcome these limitations. The work presented here focuses on long-term active fire trends in relation to the mentioned caveats of the AVHRR/2 and AVHRR/3 sensor characteristics, observing and environmental conditions dating back to 1985.

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