Fire Monitoring, Analysis and Modelling for Climate Change Mitigation and Improved Fire Management

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ABSTRACT – Vegetation and peat fires contribute substantially to global emissions of greenhouse gases (GHG). According to latest estimates, net fire emissions amount to about 6% of global fossil fuel GHG emission. Improving the management of fires in frequently burning ecosystems can help reduce GHG emissions and thus contribute to mitigation of climate change. Monitoring and analysis of fires over large and often remote areas is only feasible with the help of Earth Observation (EO) satellites. Over the last decades, availability of free EO data has increased enormously, as has the availability of computing power, network speed and web based geospatial visualization and analysis technologies. Thermal sensors on geostationary or polar orbiting platforms make it possible to observe active fires with high frequency, while sensors in visible to short wave infrared wavelength on the Sentinel and Landsat satellite series enable the production of burned area maps with high spatial resolution every week. We introduce here an approach to integrate monitoring of fire activity and carbon fluxes, weekly updated burned areas, daily analysis and forecast of relevant weather parameters, long time series of fire emissions to calculate baselines, fire risk and vulnerability maps and tools to monitor success of fire management planning and implementation in a web based solution. Coupling of remote sensing data with weather information and fire spread models enables forecasting and detailed hindsight analysis of the behavior of wildfires. To develop a new information product to analyze fire intensity, we assessed fire spread and fire radiative energy release rate (fire radiative power) over savanna fires using infrared sensors with different spatial, spectral and temporal resolutions. From these results we derive metrics on fire behavior in our study areas. We relate our results to outputs of fire behavior models and to results to published values. Finally, we discuss how organizations can make use of the provided information products to implement, monitor and document success in fire management.

Keywords: Fire monitoring, carbon emissions, fire intensity, remote sensing of fires, information platforms, fire management

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