Analyzing trends of changes in fire regimes on a global scale

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Wildfire is a dominant factor for shaping the landscape ecology in many parts of the world. It also poses an enormous threat to human lives and property. Climate change is expected to influence historical fire patterns, e.g., to intensify the occurrence of fire in already fire-prone ecosystems. This work is an attempt to investigate trends of changes in fire regimes on a global scale, regarding seasonality, intensity, and distribution of fire activity.

Thermal remote sensing allows the monitoring of wildfire activity worldwide. Data from several satellite sensors featuring varying spatial/temporal resolutions and radiometric sensitivities have been used towards that purpose, allowing for a combined temporal resolution of only a few hours between satellite overpasses (in the case of geostationary satellites, such as MSG or GOES, data is even gathered every 15 minutes). The combination of the acquired data therefore allows a fairly seamless monitoring timespan of several decades.

Due to the differences in utilized systems and methodologies, however, these data collections are highly heterogeneous regarding spatial/temporal resolution, utilized data formats, naming conventions, data types and comprised information. In preparation for this work, available datasets have been collected and harmonized, e.g. fire radiative power (FRP) has been corrected to account for the respective spatial resolution. By that, a comprehensive, decade-scale data basis was generated, which is used to derive fire related trends.

This study uses data from AQUA/TERRA MODIS, SUOMI-NPP VIIRS, MSG SEVIRI (covering Europe, South America and Africa), ENVISAT AATSR as well as ERS-2 ATSR-2. The generated data basis covers the time span from June 1995 to October 2019 and contains a collection of more than 250 million active fire locations together with radiated power. The data was transferred into a uniform grid (H3 level 3, ~12,000 km^2 per cell), which was then analyzed regarding temporal developments.