

EGU21-2117

<https://doi.org/10.5194/egusphere-egu21-2117>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Abiotic forest disturbances in Europe: mapping distribution and trends from space

Cornelius Senf, Julius Sebald, and Rupert Seidl

Ecosystem Dynamics and Forest Management Group, Technical University of Munich, Germany (cornelius.senf@tum.de)

Abiotic forest disturbances are an important driver of ecosystem dynamics around the globe. In Europe, storms and fires have been identified as the most important abiotic disturbances. Yet, how strongly these agents drive local disturbance regimes compared to other agents (e.g., biotic, human) remains unresolved. Furthermore, whether storms and fires are responsible for the observed increase in forest disturbances in Europe is debated. We here provide a first quantitative assessment of storm and fire disturbances in Europe 1986-2020 using Landsat remote sensing data. For more than 30 million disturbance patches mapped across Europe, we determined whether they were caused by storm or fire, using a random forest classifier and a large reference dataset of true disturbance occurrence. Differentiation between abiotic and other disturbances was made possible by using a set of neighborhood metrics, describing the spatial autocorrelation of each disturbance patch within its local surrounding landscape. This approach allowed for mapping both storm and fire disturbances in a spatially explicit manner. The maps show high correlation with national data and local case studies, but provide a seamless wall-to-wall picture of abiotic disturbance distribution. We subsequently analyzed patterns of abiotic disturbance prevalence (i.e., the share of storm and fire disturbances on the overall area disturbed) in space and time. Storm- and fire-related disturbances each accounted for approximately 7 % of all disturbances recorded in Europe in the period 1986-2020. Storm-related disturbances were most prevalent in western and central Europe, and especially mountain regions, where they locally account for >50% of all canopy disturbances. We however also identified storm-related disturbance hotspots in south-eastern and eastern Europe. Fire-related disturbances were a major driver of forest dynamics in southern and south-eastern Europe, but individual fires also occurred in eastern and northern Europe. Only very limited areas in Europe were affected by disturbances of both agents. The prevalence of storm-related disturbances increased over time. No trend in the prevalence of fire-related disturbances was detected, but several high-intensity fire years related to local drought conditions could be identified. We conclude that abiotic disturbances are an important driver of forest dynamics in Europe, but that their influence varies substantially by region. Our analyses suggest that an increase in storm-related disturbances could be an important driver of Europe's changing forest disturbance regimes, but weaker evidence is present for fires.