



A first satellite-based estimation of recent (1984-2017) trends in forest disturbances for Central Europe

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Forest disturbances are inherent to forest ecosystem dynamics. They can increase forest structural heterogeneity and forest biodiversity, yet they also impact important ecosystem services such as carbon sequestration and water purification. There is increasing evidence that forest disturbances increase under current climate change. However, evidence is derived from localized studies or spatially and temporally coarse datasets that hinder a comprehensive ecological analysis across administrative boundaries and ecological units. To overcome this knowledge gap, we utilized Landsat time series to systematically reconstruct the recent trends in forest disturbances across Central Europe (from 1984 to 2017). We interactively interpreted 24,000 Landsat pixel time series across six countries (Austria, Czechia, Germany, Poland, Slovakia and Switzerland) to identify disturbances of varying severities and agents (harvest, wind, insects, among others). Annual disturbance rates – given in percentage of forest area disturbed – were estimated per country and for Central Europe using Bayesian hierarchical modelling. Results indicate that disturbance rates varied widely across countries. The lowest mean annual disturbance rate was estimated for Switzerland (0.59 % per year), whereas the highest disturbance rate was estimated for Austria (1.16 % per year). The combined disturbance rate for Central Europe was 0.72 % per year. Overall, we found strong evidence for a positive temporal trend in disturbances for Central Europe (0.01 percentage points per year; probability of positive trend > 99%). Trends varied between countries, ranging from <0.01 percent points per year (Poland) to 0.3 percent points per year (Slovakia). Our study is the first comprehensive estimation of recent disturbance trends for Central Europe, showing that disturbance rates have increased in recent decades, yet that increases are spatially variable depending on disturbance agent and forest stewardship.