



Comparative Assessment of Vapor Pressure Deficit and Fire Weather Index in Predicting Wildfire Occurrence and Burned Area Across European Forest Types Using EFFIS and ERA5 Data

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Wildfires increasingly threaten European ecosystems and communities, highlighting the necessity for effective predictive metrics to enhance fire risk management strategies. This study aims to compare the effectiveness of Vapor Pressure Deficit (VPD) and the Fire Weather Index (FWI) in forecasting wildfire occurrence and the extent of burned areas across various European forest types. Utilizing the European Forest Fire Information System (EFFIS) for comprehensive fire event data and the ERA5 reanalysis dataset from the European Centre for Medium-Range Weather Forecasts (ECMWF) for meteorological variables, daily VPD and FWI values will be derived for multiple fire seasons spanning from 2000 to 2024.

The research will explore how VPD and FWI each predict wildfire occurrence and burned area, with a focus on different forest types are categorized according to the CORINE Land Cover classification into broadleaf, conifer, and mixed forests while encompassing a range of climatic regions across Europe. VPD calculation methods are generally more straightforward and require fewer input parameters. In contrast FWI system is more complex, requiring a broader range of input data to compute its numerous indices.

By comparing these two metrics across diverse forest types and biomes, the study seeks to determine the most effective indicators for wildfire prediction in Europe. The findings are intended to inform policymakers and fire management agencies, aiding in the development of targeted early warning systems and adaptive fire management strategies. This comparative assessment will contribute to a deeper understanding of the climatic drivers of wildfires and support efforts to mitigate their impacts under changing environmental conditions.