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Site monitoring and activity detection of wind turbines with Planet and Sentinel-2 satellite data

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The ongoing energy transition presents us with the challenge of finding sustainable and efficient ways to generate renewable energy. In this context, wind energy plays a decisive role and contributes significantly to increasing the share of renewable energies in the energy mix. Strategic energy planning, effective repowering, decommissioning and the seamless integration of wind energy into the power grid require accurate location information of existing wind turbines. In this work, we present a) the precise, automated, Germany-wide identification and localization of wind turbines using high-resolution planetary data and b) an innovative approach to detect wind turbine activity using Sentinel-2 data. The detection of wind turbine activity is based on the different blade positions, including their shadow position, which is caused by slightly offset recording times of the spectral bands. The change is highlighted and classified using a Convolutional Neural Network. The presentation also discusses possible limitations and peculiarities of the methods used and emphasizes the relevance of remote sensing-based monitoring for the wind energy industry and environmental monitoring.