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European-wide High-fidelity Forest Type Maps

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Introduction

The forest system of our planet is significantly influenced by rapid climate change, the demand for wood, and various objective and subjective factors. Given the importance of monitoring forest health, it is important to have up-to-date forest maps. Therefore, there is a pressing need for the timely and cost-effective creation of contemporary forest maps, particularly those that classify European forests by type.

Data and Method

The forest type classification maps were created for European countries. A time series of Sentinel-1 and Sentinel-2 satellite data for 2022 and the prefiltered open data set LUCAS Copernicus 2018 were used for train and testing the Random Forest model in Google Earth Engine cloud platform (GEE).

Results

The forest type map for all European countries was created with 10 meters resolution and with overall accuracy 93%. A comparative forest area analysis of the existing Forest type 2018 product with our product for 2022 showed a coefficient of determination of 0.96 for coniferous and deciduous forests. The product is available in GEE by the link https://code.earthengine.google.com/5874048ea778501b60d67c353ab6a9d2.

Conclusion

A significant advantage of the created forest type map compared to existing analogues is that it is for 2022, has distributions for different types of forests, and also covers some countries that, for example, are not covered by the Forest Type 2018 product (for example, Ukraine or Turkey). The work solves the problem of the lack of ground data for some countries for training the machine learning model (Turkey, Serbia, Albania, Norway and other). The resulting areas compared with existing 10-meter global products (Forest Type 2018 and WorldCover 2021), the accuracy assessed based on independent dataset. The created map will be used in the future to monitor forest diseases, identify wind damage and other damage to forests.

Keywords

Forest monitoring, Satellite monitoring, Machine learning, Forest diseases, Windthrow