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4D Forest moisture mapping based on multi-temporal earth observation signatures (4D-FORMAT)

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Integrative and target-oriented forest management requires detailed information about forest variables for large areas. Currently forest inventories are available on very detailed level but as punctual information, which cannot consider spatial variability in high spatial resolution. Especially soil moisture information is an important parameter for understanding the productivity of forest under changing boundary conditions and for estimating the robustness of forest stands e.g. against droughts. A further key parameter is the species composition, which is related to specific tolerance levels of the forest against environmental risks and its susceptibility against diseases. The aim of 4D-FORMAT is the development of geospatial mapping products integrating i) traditional field observations, ii) close-range sensing and iii) satellite remote sensing techniques describing moisture conditions in forests. We make use of Sentinel-1 and Sentinel-2 satellite time series, high-definition topography data from aerial photogrammetry and airborne laser scanning (ALS), 3D point clouds from unmanned aerial vehicle laser scanning (ULS) and terrestrial laser scanning (TLS). The design of an object-based approach for delineating hydrological-relevant forest units provides computational areas of interest. For these areas, moisture conditions are aggregated considering the forest composition, canopy structure and geo-morphometric variability. We report on the investigation of spatio-temporal patterns describing canopy closure and moisture signals considering local topography and phenological status of trees.

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