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| **deadtrees.earth - an open database to bridge drone and spaceborne imagery for tree mortality mapping** |
| Excess tree mortality in the wake of climate extremes has been observed globally. We are currently limited in understanding the mechanisms of tree mortality, as we lack tools and datasets to assess the spatial and temporal patterns of tree mortality at continental scale**.**  Multispectral data of the Sentinel-2 satellites mission cover the entire globe on average every five days at a finest spatial resolution of 10 m. One requires high-quality, in-situ reference data to detect tree mortality from Sentinel-2 imagery. However, standard forest inventories are rarely publicly available, have limited information on tree mortality, and are challenging to align with raster images.  Consumer drones offer a way to obtain orthomosaics which clearly depict dead trees. Furthermore, with the increased user-friendliness and decreasing cost of drones, high-resolution imagery of forests is now becoming widely available. Detecting tree mortality in such generated orthophotos has become a classic segmentation task. Those dead tree segments can be extrapolated to the Sentinel-2 10 m raster and have successfully been used as training data to infer tree mortality from Sentinel-2 data in German forests (Schiefer et al., 2023).  In this study, we aim to create a global database for tree mortality orthophotos and annotations and that acts as reference data to build a model that can globally detect deadwood in Sentinel-2 imagery. Such an ambitious scale introduces several challenges, such as computational cost, but most notably, the demand for an enormous collection of diverse high-resolution orthoimagery across all tree ecosystems. To obtain such a collection we rely on community contributions. This work makes the following efforts:  1) We present an open database of RGB orthoimagery of forests with a focus on high-resolution imagery with more than 10 cm resolution. deadtrees.earth launches with more than 1000 orthophotos from almost 20 countries through the collaboration of almost 30 research institutions and aims to grow into the state-of-the-art database for remotely sensed tree mortality.  2) We developed a CNN-based segmentation framework for delineating standing deadwood across image resolutions and forest ecosystems, which can be applied to any RGB orthophoto and is offered to users as a service.  3) We created a transformer-based model that identifies the fractional cover of standing deadwood across forest ecosystems through Sentinel-2. |

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