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Characterising space-based aboveground biomass change: from global to local

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Recent advances in the spatial resolution and sensitivity of satellite sensors have allowed the mapping of aboveground biomass (AGB) with enhanced levels of detail and a wall-to-wall worldwide coverage. However, determining the magnitude and direction of AGB changes over time remains challenging due to large uncertainties in AGB estimates (biases and random errors), inconsistencies across sensors/instruments and limited availability of ground-truth data (national forest inventories, multi-census plots and airborne lidar). Combining multiple environmental descriptors derived from independent (mainly optical) satellite-based data sources, we apply a framework that infers evidence of pressures and impacts to characterise temporal changes in vegetation (fast or slow, gain or loss) and check agreement with the changes detected in the global ESA CCI Biomass time series product. We deploy the approach at the global scale focusing on forests that we define with a tree cover greater than 10% and tree height greater than 5 m. We illustrate the comparison with local case studies, highlighting processes such as regrowth, degradation and disturbances, and differentiating between natural and anthropogenic causes (e.g., wildfire, flooding, harvest, plantations). Selected sites represent different biomes and continents, including tropical moist forests in the Amazon, tropical drylands in Africa, temperate forests in Europe, Mediterranean woodlands in Australia and boreal forests in Siberia and North America. The results provide enhanced understanding of the processes underlying AGB changes in different regions and allow new insights into the quality of remotely-sensed AGB for tracking changes in carbon stocks and informing decision-making.