Networking the forest infrastructure towards near real-time monitoring - A white paper

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Forests account for nearly 90 % of the world's terrestrial biomass in the form of carbon and they support 80 % of the global biodiversity. To understand the underlying forest dynamics, we need a long-term but also relatively high-frequency, networked monitoring system, as traditionally used in meteorology or hydrology. While there are numerous existing forest monitoring sites, particularly in temperate regions, the resulting data streams are rarely connected and do not provide information promptly, which hampers real-time assessments of forest responses to extreme climate events. The technology to build a better global forest monitoring network now exists. This white paper addresses the key structural components needed to achieve a novel meta-network. We propose to complement - rather than replace or unify - the existing heterogeneous infrastructure with standardized, quality-assured linking methods and interacting data processing centers to create an integrated forest monitoring network. These automated (research topic-dependent) linking methods in atmosphere, biosphere, and pedosphere play a key role in scaling site-specific results and processing them in a timely manner. To ensure broad participation from existing monitoring sites and to establish new sites, these linking methods must be as informative, reliable, affordable, and maintainable as possible, and should be supplemented by near real-time remote sensing data. The proposed novel meta-network will enable the detection of emergent patterns that would not be visible from isolated analyses of individual sites. In addition, the near real-time availability of data will facilitate predictions of current forest conditions (nowcasts), which are urgently needed for research and decision making in the face of rapid climate change. We call for international and interdisciplinary efforts in this direction.
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