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Monitoring bio- geodiversity and ecosystem health by traits, remote sensing and data science approaches

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Ecosystems fulfil a whole host of ecosystem functions that are essential for life on our planet. However, an unprecedented level of anthropogenic influences is reducing the resilience and stability of our ecosystems as well as their ecosystem functions. The relationships between drivers, stress and ecosystem functions in ecosystems are complex, multi-faceted and often non-linear and yet environmental managers, decision makers and politicians need to be able to make rapid decisions that are data-driven and based on short- and long-term monitoring information, complex modeling and analysis approaches. A huge number of long-standing and standardized ecosystem health and monitoring approaches of bio-and geodiversity exist and are increasingly integrating remote-sensing based monitoring approaches. Unfortunately, these approaches in monitoring, data storage, analysis, prognosis and assessment still do not satisfy the future requirements of information and digital knowledge processing of the 21st century. This presentation presents new concepts of monitoring of bio-and geodiversity and discusses the requirements for using Data Science as a bridge between complex and multidimensional Big Data in environmental health.

It became apparent that no existing monitoring approach, technique, model or platform is sufficient on its own to monitor, model, forecast or assess forest health and its resilience. In order to advance the development of a multi-source ecosystem health monitoring network, we argue that in order to gain a better understanding of ecosystem health in our complex world it would be conducive to implement the concepts of Data Science with the components: (i) digitalization, (ii) standardization with metadata management after the FAIR (Findability, Accessibility, Interoperability, and Reusability) principles, (iii) Semantic Web, (iv) proof, trust and uncertainties, (v) tools for Data Science analysis and (vi) easy tools for scientists, data managers and stakeholders for decision-making support (Lausch et al., 2019, 2018, 2016).

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