

Title of the symposium:

Data Science in environmental research, planning and evaluation – for a scalable multi-source environmental monitoring network

Detail of organizer(s):

Responsible

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Symposium abstract

Ecosystems fulfill 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 approaches like the essential variables already 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 therefore discusses the requirements for using Data Science as a bridge between complex and multidimensional Big

Data for 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 vegetation 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 adhering to the FAIR (Findability, Accessibility, Interoperability, and Reusability) principles, (iii) Semantic Web, (iv) proof, trust and uncertainties, (v) complex tools for Data Science analysis and (vi) easy tools for scientists, data managers and stakeholders for decision-making support [1].

1.Lausch, A.; Bastian O.; Klotz, S.; Leitão, P. J.; Jung, A.; Rocchini, D.; Schaepman, M.E.; Skidmore, A.K.; Tischendorf, L.; Knapp, S. 2018. Understanding and assessing vegetation health by in-situ species and remote sensing approaches. *Methods Ecol. Evol.* 00, 1–11. doi:10.1111/2041-210X.13025.

How your symposia will improve landscape ecology science?

Not a single monitoring approach is suitable to record the various driver-stress responses from short- to long-term and local-to global scales. Therefore, monitoring approaches need to be combined and coupled to compensate for the disadvantages of one approach with the advantages of another.

For the future ecosystems it is important to combine single measurements, platforms, sensors, monitoring- or modelling approaches, to focus on a single scale or to consult only one discipline, especially if we aspire to understand environmental health in all of its complexity. It is only by linking multi-source approaches, which requires handling digitalization and big data that the disadvantages of global informatization can be compensated by the advantages of other approaches.

When it comes to developing a future environmental monitoring networks, it is not surprising that big environment data with enormous complexity and syntactic and semantic heterogeneity in data types and formats require new solutions to fulfil the requirements of the 21st century for monitoring, analysis, prognosis and the assessment of FH. Therefore, Data Science bridges the gaps in managing these problems.

Broad thematic areas

Broad thematic areas 1st choice: Technologies and landscape ecology (remote sensing, geomatics, ...)

Broad thematic areas 2st choice: Disturbances in landscapes

Free Keywords

Data Science; Semantic Web; Traits; Ecosystem Integrity; Remote Sensing;

Outcomes of symposium

Special issue in a scientific journal (to be negotiated)