Project Database of ICP Forests

PROJECT DESCRIPTION

PROJECT INFORMATION

Project title:	The ecological consequences of declining nitrogen concentration in plants worldwide
Project ID:	213
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The data will be used as part of a project entitled "The Ecological Consequences of Declining Nitrogen Concentration in Plants Worldwide", which is being carried out by A. Elmore, R. Mason, M. Jonard, J. Angerer, J. Craine, P. Groffman, N. Lany, S. Ollinger, and R. Fulweiler.

The ICP Forests data will be combined with a global compilation of foliar nitrogen measurements that we are in the process of creating, which contains about 68000data points at the time of writing. We plan to use this compilation to understand the extent and significance of declines in foliar [N] that have been reported in a number of recent studies of forests and grasslands around the world. With measurements dating back as far as 1992, the ICP Forests data will be a particularly valuable addition to this collection.

The global database, including the ICP Forests data, will first be used to test the hypothesis that an overall, global decline in foliar [N] is underway. We are currently running simulations to determine the most suitable statistical model for detecting a temporal trend in this data set. Preliminary results suggest that the mixed effects model used by Jonard et al. (2015) will be effective. We are also evaluating multiple linear regression models of the kind used by Craine et al. (2018).

The data will also form part of two global maps which will show (1) time-averaged foliar [N] and (2) rates of change in foliar [N]. We are evaluating methods for creating these maps, which will likely be based on machine-learning techniques (see, for example, Penuelas et al. 2020).

After establishing spatial and temporal patterns in the data, we will investigate both the underlying mechanisms and potential consequences of changes that are observed, with particular attention to herbivorous insects and grazing livestock. Of mostrelevance to the ICP Forests data, we are in the process of comparing candidate insect population models that take into account the nutritional quality of insect diets.

References

Craine, Joseph M. et al. 2018. "Isotopic Evidence for Oligotrophication of Terrestrial Ecosystems." Nature Ecology and Evolution2(11): 1735–44. http://dx.doi.org/10.1038/s41559-018-0694-0.

Jonard, Mathieu et al. 2015. "Tree Mineral Nutrition Is Deteriorating in Europe." Global Change Biology21(1): 418–30.

Penuelas, Josep et al. 2020. "Increasing Atmospheric CO2 Concentrations Correlate with Declining Nutritional Status of European Forests." Communications Biology3(125): 1–11. http://dx.doi.org/10.1038/s42003-020-0839-y%0Ahttp://www.nature.com/articles/s42003-020-0839-y.

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