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*ZHAW School of Life Sciences und Facility Management*

## **First global database of the Earth's vegetation**

**The first global vegetation database contains over 1.1 million vegetation records. This will make it easier to predict the consequences of climate and land use change in the future, as an international study involving researchers from the ZHAW, the WSL and the University of Zurich published in the journal "Nature Ecology & Evolution" shows.**

To describe the diversity of global vegetation, only a few traits of each plant species must be known. This is the conclusion of an international team of researchers led by the German Centre for Integrative Biodiversity Research (iDiv) in Halle-Jena-Leipzig, in which Swiss researchers of the ZHAW, the Swiss Federal Institute for Forest, Snow and Landscape Research WSL and the University of Zurich were also involved. In a new study published in the science journal „Nature Ecology & Evolution“ they present the first global vegetation database including over 1.1 million complete vegetation records for all mainland ecosystems. The database should grow continuously and help to better predict the consequences of global climate and land use change or the impact of invasive species. In addition, for the first time, numerous questions of species diversity can be researched globally.

### **Plants live in communities**

Whether grasses, shrubs or trees - all plants have to cope with the same challenges. “On the one hand, they must photosynthesize efficiently, in order to supply themselves with energy. On the other hand, they compete with neighbouring plants for water or nutrients from the soil”, explains vegetation ecologist Jürgen Dengler from ZHAW. Each species has developed very particular properties over time to react to environmental conditions. These include, for example, the size of a plant, the thickness of its leaves or leaf constituents. These so-called functional traits influence, for example, how much biomass plants produce or how much carbon dioxide they absorb from the air. So far, research has focused on the possible combinations of these functional traits at the level of individual plant species. „In reality, however, a plant species hardly ever occurs alone, because plants live in communities“, adds Dirk Karger of the Swiss Federal Research Institute WSL. With so-called vegetation surveys, defined sample areas of up to 1000 square metres in size are therefore used to list which plant species occur in which proportions.

### **Swiss contribution to database**

While regional and national vegetation databases have increasingly emerged in recent years, a superordinate database has been lacking. This is why the research centre iDiv started the research initiative “sPlot” to develop and build the first global vegetation database. In extensive work, the existing data sets were standardized and merged. The ZHAW's researcher Jürgen Dengler coordinated this work in the first three years of the project. Dirk Karger of the research institute WSL contributed the global climate model “CHELSA”, which is central to the evaluation of the database.

The vegetation database "sPlot" currently contains more than 1.1 million vegetation records from all continents, which have been collected by hundreds of researchers from all over the world in the past decades. For instance, Michael Kessler from the University of Zurich contributed two vegetation databases from tropical rainforest areas that had hardly been investigated.

### **Temperature and precipitation not decisive**

The research group combined the extensive data set of the "sPlot" vegetation database with the "TRY" database, the world's largest database for plant characteristics. "This will make it possible to investigate ecological issues for which the data basis was previously lacking," says the ZHAW researcher. For example, the research team wanted to know whether global factors influence the functional characteristics of plant communities. It turned out that temperature and precipitation have a relatively small influence, contrary to

current opinion. Instead, the researchers found a close relationship between climate variables and phosphorus supply in the leaf. The longer the vegetation period, the lower the phosphorus content in the leaf - and this also influences the leaf thickness. Land use by humans or interactions between plants - such as competition for nutrients, water and light - also have a much greater influence than assumed. Future calculations of plant production in a region cannot therefore be carried out on the basis of simple temperature-precipitation models alone.

#### **ZHAW starts initiative**

The basis for this study was laid by geobotanists who collected and published so-called vegetation surveys over more than a century. This method was developed by the Swiss geobotanist Josias Braun-Blanquet, so there are many historical data from Switzerland. "Unfortunately, training at Swiss universities in vegetation ecology data collection has been greatly reduced in recent decades," says Dengler. The ZHAW has therefore launched an initiative to digitise Switzerland's vegetation-ecological data records and to compile them in a national database. This will enable detailed studies to be carried out in future on changes in biodiversity in the Swiss vegetation and their causes.

**Original publication:** Bruelheide, H., Dengler, J. et al. Global trait-environment relationships of plant communities. *Nature Ecology & Evolution* (2018). doi: 10.1038/s41559-018-0699-8

**Publication of the database:** Bruelheide, H., Dengler, J. et al. sPlot – a new tool for global vegetation analyses. *Journal of Vegetation Science* (in press).

**sPlot:** <https://www.idiv.de/splot>

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