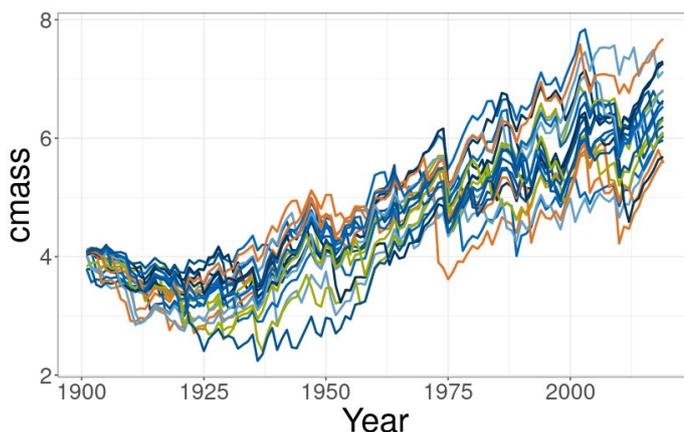


## Uncertainty quantification of stochastic processes in a Global Dynamic Vegetation Model.

The Biosphere, especially vegetation, is an important part of the carbon cycle and the climate system. Therefore, understanding, modeling and predicting vegetation dynamics is a crucial subdiscipline within climate and Earth system science.

Simulating living matter on the ecosystem level is extreme complex and cannot always be modeled mechanistically. Therefore, many important vegetation processes (e.g. establishment, mortality or the impact of extreme events) are instead often implemented stochastically. This in turn means that results are not completely deterministic, but can be seen as random variables generated by a stochastic process.

However, the model uncertainty associated with this source of randomness has so far rarely been investigated systematically. The main task of this project would therefore be to perform ensemble simulations with the DGVM LPJ-GUESS co-developed by our group (<https://www.lsai.wzw.tum.de/lpj-guess/>) to gain an understanding of the ensemble range of key model variables.



Ensemble simulation of a carbon stock subject to stochastic establishment, mortality and extreme events.

Storm damage in a temperate forest. An example of the type of stochastic extreme events modeled<sup>1</sup>.

Further avenues for investigation could then be

- the sensitivity of model outcomes to different numerical implementations of stochastic elements within the model
- the occurrence of qualitatively diverging states due to random fluctuations (noise-induced tipping points)
- We are happy to also discuss further ideas you might have.

This project is ideal for someone, who

- would like to contribute to current and highly relevant research questions in climate and Earth system science
- has an interest and at least some background in Statistics
- has experience with programming (C++, Python, R) and handling large datasets OR is looking for an opportunity to learn those things (and is willing to invest the extra time to gain relevant skills)

If you are interested or have further questions, you are welcome to contact Lucia Layritz ([lucia.layritz@tum.de](mailto:lucia.layritz@tum.de)) or Prof. Dr. Anja Rammig ([anja.rammig@tum.de](mailto:anja.rammig@tum.de))

1 Picture source: <https://www.schwarzwaelder-bote.de/gallery.schwarzwald-baar-kreis-perfekt-inszenierte-naturkatastrophe.9cef9c48-5e63-4568-9631-92e9a1fdb847.html>