Multi-species grassland dynamics – the fine line between species coexistence and competitive exclusion

Thibault Moulin*[1] and Britta Tietjen[1]

[1]Freie Universität Berlin – Allemagne

Résumé

European permanent grasslands represent a backbone for dairy and meet production, and are hotspots of biodiversity, providing important ecosystem services to society. Understanding how the form of land use and climate variability affect the botanical composition of these grasslands is therefore essential for adequate management adaptations to target sustainable development goals. Here, we present results of the *DynaGraM* modelling approach to understand short- and long-term changes in grassland biodiversity in response to various forms of land use and climatic variations. We question through this model the feedbacks and mechanisms involved in competitive exclusion or contrariwise in plant coexistence.
This study questions the specific role of interspecific competition to explain the emergence of a botanical composition. More specifically, we aim to disentangle the respective influence of two key processes driving the interspecific competition: the disturbances inducing a removal of plant biomass preventing in some extent the competitive exclusion vs. the competition for the mineral resources. We assess the model following two gradients of soil fertility and intensity of disturbances (both grazing and mowing). The functional compositions are represented in CSR triangles, showing the growing strategies of the community. Results show the composition to be highly sensitive to the intensity and type of management, in particular at intermediate level of disturbances, when the soil fertility present a potential of mitigation of the response of the vegetation. Last, we extend this study by comparing simulated outcomes under a water stress to grasslands observations recorded in the GCEF drought experiment (Bad Lauchstädt, Germany).
Overall, this model introduces a novel and relatively simple approach to represent competition and adaptation processes in plant community dynamics, thus providing a response to the key challenge of modelling multi-species grasslands. However, this model shared key modelling processes with other major grassland models, leading to a potential of generalization. This presentation points out the mechanisms involved in the emergence of coexistence within complex ecosystems.

Mots-Clés: Plant community dynamics, Emergence, Permanent grassland, Interspecific competition.

*Intervenant