Parameterization of Vegetation under States of Co-limitation and Constrained Resources

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Abstract. Vegetation responds to, and interacts with, the environment on many temporal scales. Over longer scales, vegetation adjusts to available resources, including water and nitrogen. Vegetation can adjust its resource allocation and use (photosynthetic up/down regulation) over a period of days, or weeks, to changing water availability and nutrient supplies. As such, determining how to parameterize vegetation through a dynamic environment is challenging. Many studies simply utilize a static parameterization that characterizes the vegetation (*e.g.* Plant Functional Types) and assume it remains constant over time. Although this may provide reasonable results under well-watered conditions or over shorter periods of time, it does not reflect actual vegetal dynamic adjustments to the changing environment. To address this question, we consider vegetal states of co-limitation, such that resources are used optimally. We then evaluate observed data for a range of species in a range of conditions, from well-watered to stressed states, demonstrating that individual resource-use strategies follow well-described patterns of co-limitation. Using this approach, it then becomes possible to include a dynamic parameterization of leaf-level processes based on a resource use strategy and the current state of resource availability.