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Precipitation experiments in the future - more than just water

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Climate change will affect precipitation patterns in many areas of the world leading to deeper droughts, more severe flooding and stronger variation in precipitation inputs to terrestrial ecosystems. In addition, these changes in water input to ecosystems will interact with simultaneous changes in other drivers such as elevated CO_2 and temperature. Clearly, changes in precipitation inputs to ecosystems will significantly affect ecosystem functioning and biodiversity. In recent decades several experiments have been conducted in terrestrial ecosystems with the aim of studying the impacts of such changes. The majority of these experiments have applied relatively "simple" scenarios of precipitation removal or addition and have provided important information about impacts on ecosystem processes of altered precipitation amounts and changes in moisture conditions including extreme events and conditions. However, climate change scenarios for precipitation changes are not only highly uncertain, but also very complex and in a climate change context the experiments applying "simple" scenarios have generally not been sufficiently relevant. Therefore, we are still left with major questions about the impacts of precipitation change in terrestrial ecosystems unanswered. Recent experimental studies have indicated that in addition to a specific simple change in precipitation input or the extremity of drought and flooding events related to precipitation changes, other factors such as timing, repetition, biome and interactions with other drivers can be equally or more important and significantly determine the impacts. The lack of sufficient relevant experiments limits our understanding of and ability to predict future ecosystem impacts and adaptation to climate change and seriously constrain the amount of data available to to test and validate ecosystem models. There is a strong need for new experiments addressing these aspects.