Climate extremes and ecosystem resilience in a future world

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Land Use Alters the Drought Responses of Productivity and CO$_2$ Fluxes in Mountain Grassland
Abandoned grassland more resistant and managed grassland more resilient because of plant soil-interactions ...

... shifts in the plant resource economics spectrum and related belowground carbon partitioning to storage versus metabolic use ...
... and biodiversity effects on stability
Effects of climate extremes in warmer future under elevated CO$_2$
Elevated CO₂: faster recovery of CO₂-uptake after drought
Antagonistic effects of warming and eCO$_2$ on soil moisture and soil CO$_2$ fluxes - and extended drought legacies
Bivariate framework for a comparable quantification of resilience across ecosystems and disturbances
How well do we understand tipping points and the underlying mechanisms?

Gradients

Experiments
How can we project the future based on observations from the past, and models based on such observations?

Schwalm et al. (2017) *Nature*
How can we project the future based on observations from the past, and models based on such observations?

54% (drought) and 48% (irrigation) of models not statistically different from experimental observations.
Experiments and meta-analyses need to move towards regression-based approaches to capture nonlinear effects.
Conclusions

To understand and project the consequences of climate extremes in a future world (*increased frequency and severity of extreme events, compound events, interactions with other global change factors*) we need to

- Establish a new generation of (co-ordinated) experiments and meta-analysis pursuing regression-based approaches
- Test for interactive effects of multiple drivers on threshold responses
- Account for implications of human intervention and advance the understanding of the adaptive capacity of social-ecological systems to absorb climate extremes