



# Joining biodiversity experiments, climate change research and invasion biology to assess European gradients of grassland resilience in the face of climate extremes

Anke Jentsch (1), Jürgen Kreyling (2), Iva Apostolova (3), Michael Bahn (4), Sándor Bartha (5), Carl Beierkuhnlein (2), Juliette Bloor (6), Hans de Boeck (7), Jürgen Dengler (1,8), Catherine Picon-Cochard (6), Giandiego Campetella (9), Roberto Canullo (9), Ivan Nijs (7), Andreas Stampfli (10), Marcelo Sternberg (11), Emin Uğurlu (12), Julia Walter (1), Camilla Wellstein (13), Michaela Zeitler (10) and the SIGNAL PhD students

- 1) Disturbance Ecology, Bayreuth Center of Ecology and Environmental Research (BayCEER), University of Bayreuth, Universitätsstraße 30, D-95447 Bayreuth, Germany
- 2) Biogeography, University of Bayreuth, Universitätsstraße 30, D-95447 Bayreuth, Germany
- 3) Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, G. Bonchev St., Block 23, 1113 Sofia, Bulgaria
- 4) Institute of Ecology, University of Innsbruck, Sternwartestraße 15, A-6020 Innsbruck, Austria
- 5) Centre for Ecological Research, Hungarian Academy of Sciences, Alkotmány ú. 2-4, H-2163 Vácrátót, Hungary
- 6) INRA, UR0874 Grassland Ecosystem Research Unit, 5 Chemin de Beaulieu, F-63100 Clermont-Ferrand, France
- 7) Research Group Plant and Vegetation Ecology, Department of Biology, University of Antwerp, Universiteitsplein 1, B-2610 Wilrijk, Belgium
- 8) Synthesis Centre (sDiv), German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Deutscher Platz 5e, D-04103 Leipzig, Germany
- 9) Plant Diversity and Ecosystems Management Unit, School of School of Biosciences and Veterinary Medicine, University of Camerino, Via Pontoni 5, I-63032 Camerino (MC), Italy

**Background & Aim:** Grasslands are spatially and economically highly important for European agriculture and biodiversity. However, their species diversity and ecosystem functioning might increasingly be threatened by climate extremes and invasion dynamics. SIGNAL is a coordinated, distributed field and mesocosm experiment across a pan-European precipitation and continentality gradient connecting 10 experimental sites between Belgium and Israel. We address vulnerability and resilience of grasslands towards extreme drought and invasive pressure.

**Materials & Methods:** By newly implementing a coordinated distributed experiment, we test the following 4 hypotheses: Extreme weather events (Hypothesis H1) and the presence of invasive species (H2) can act as pressures threatening biodiversity, resilience and ecosystem services of semi-natural grasslands and can suddenly drive them beyond thresholds of system integrity (tipping points and regime shift). On the other hand, biodiversity itself may buffer against change. Potential stabilising mechanisms include species richness, presence of key species such as legumes (H3) and within species diversity (H4).

**Main Results & Conclusions:** Data from the SIGNAL field-experiment clearly suggest, that mesic grasslands throughout Europe are surprisingly stable under drought and invasive pressure. In contrast, drier sites are more endangered. In mesic grasslands, biomass production was not reduced by a severe drought event, invaders were not able to spread and showed high mortality. However, drier (more southern and more continental) sites along the gradient suffered more from drought, showing losses in biomass production directly after drought (which did not persist until the end of the growing season, though). Our multisite-experiment highlights a surprising degree of stability against extreme drought and invasive species in mesic grasslands.

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- 10) Institute of Plant Sciences, University of Bern, Altenbergrain 21, CH-3013 Bern, Switzerland
- 11) Department of Molecular Biology and Ecology of Plants, Tel Aviv University, Tel Aviv, Israel
- 12) Department of Biology, Faculty of Science and Letters, Celal Bayar University, Muradiye, Yagcilar Campus, 45140 Manisa, Turkey
- 13) Faculty of Science and Technology, Free University of Bozen, Universitätsplatz 5, I-39100 Bozen, Italy

Correspondence: Anke Jentsch, [anke.jentsch@uni-bayreuth.de](mailto:anke.jentsch@uni-bayreuth.de)

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