Are plant communities water-stressed?
Karim Barkaoui, Marie-Laure Navas, Catherine Roumet, Pablo Cruz, Florence Volaire

To cite this version:
Karim Barkaoui, Marie-Laure Navas, Catherine Roumet, Pablo Cruz, Florence Volaire. Are plant communities water-stressed?: Seasonal and pluri-annual dynamics of vegetation water stress along a soil depth gradient in a Mediterranean rangeland. EcoSummit 2016 Ecological Sustainability: Engineering Change, Aug 2016, Montpellier, France. 1 p. hal-01604806

HAL Id: hal-01604806
https://hal.archives-ouvertes.fr/hal-01604806
Submitted on 5 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Are plant communities water-stressed?
Seasonal and pluri-annual dynamics of vegetation water stress along a soil depth gradient in a Mediterranean rangeland

Karim Barkaoui1, Marie-Laure Navas2, Catherine Roumet3, Pablo Cruz4, Florence Volaire5

1CIRAD, UMR SYSTÈME, F-34398 Montpellier, France
2Montpellier SupAgro, CEFE UMR 5175, F-34293 Montpellier, France
3CNRS, CEFE UMR 5175, F-34293 Montpellier, France
4INRA, AGIR UMR 1248, F-31326 Castanet-Tolosan, France
5INRA, USC 1338, CEFE UMR 5175, F-34293 Montpellier, France
contact: karim.barkaoui@cirad.fr

Introduction

Predicting the dynamics and impacts of vegetation water stress under increasing droughts is a key issue for water-limited ecosystems. However, assessing water stress at the ecosystem level is not straightforward since several plant species with different water use strategies usually co-exist, especially in heterogeneous environments. This study aimed to evaluate whether plant communities under the same climate but with contrasting edaphic conditions respond differently to temporal fluctuations in soil water availability in a Mediterranean rangeland of Southern France (Larzac Causse).

We addressed the following question:

Does soil water storage capacity influence seasonal and pluri-annual water stress?

Seasonal water stress has similar dynamics and magnitude along the soil depth gradient

Materials & Methods

• Sampling of 36 plant communities along a soil depth gradient
• 5-years monitoring of soil water (Divier 2000 moisture probes)
• Modeling soil water dynamics (using a bucket-type water balance model)

A gradient in soil water storage capacity

Peak of vegetation

Soil water content (cm3)

Day of year

(1) spring

(2) summer

Peak vegetation

Soil water content (cm3)

Day of year

Stress threshold

Real community

Water stress reflects:
• abiotic conditions
• vegetation adapatation

Reference community

Water stress reflects:
• abiotic conditions only
(=‘control’ plant community)

Although decreasing soil water storage capacity creates stressful conditions (see reference community), pluri-annual water stress in real plant communities remains more or less constant

Materials & Methods

• Simulating soil water dynamics for a virtual ‘reference’ plant community
• Determining the pluri-annual integrated water stress over 5 years
• Comparing real vs. reference communities along the soil depth gradient

Conclusion

Our results suggest that water-use rates of vegetation have been ‘adjusted’ to the local soil water storage capacity, resulting in similar soil water dynamics and vegetation water stress along the soil depth gradient. Increasing summer droughts in the Mediterranean may therefore have a similar impact on all plant communities of such rangeland ecosystems. It would be relevant to identify the thresholds of intensity, duration and frequency of drought that trigger permanent shifts in species composition and dominance patterns, in relation with the long term resilience of plant communities.