

Can we infer plant facilitation from remote sensing a test across global drylands

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Abstract

Facilitation is a major force shaping the structure and diversity of plant communities in terrestrial ecosystems. Detecting positive plant-plant interactions relies on the combination of field experimentation and the demonstration of spatial association between neighboring plants. This has often restricted the study of facilitation to particular sites, limiting the development of systematic assessments of facilitation over regional and global scales. Here we explore whether the frequency of plant spatial associations detected from high-resolution remotely sensed images can be used to infer plant facilitation at the community level in drylands around the globe. We correlated the information from remotely sensed images freely available through Google Earth with detailed field assessments, and used a simple individual-based model to generate patch-size distributions using different assumptions about the type and strength of plant-plant interactions. Most of the patterns found from the remotely sensed images were more right skewed than the patterns from the null model simulating a random distribution. This suggests that the plants in the studied drylands show stronger spatial clustering than expected by chance. We found that positive plant co-occurrence, as measured in the field, was significantly related to the skewness of vegetation patch-size distribution measured using Google Earth images. Our findings suggest that the relative frequency of facilitation may be inferred from spatial pattern signals measured from remotely sensed images, since facilitation often determines positive co-occurrence among neighboring plants. They pave the road for a systematic global assessment of the role of facilitation in terrestrial ecosystems..

Keywords

Arid ecosystems, Competition, Community structure, Desertification, Individual-based model, Patch-size distribution, Positive interactions, Spatial pattern, Vegetation pattern.