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Impact assessment of drought on temporal and spatial vegetation growth in Morocco

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The Sehoul region in Morocco is highly vulnerable to droughts and extreme precipitation events. Due to its sub-humid to semi-arid climate, photosynthetic activity is expected to follow rainfall rather than temperature. Extreme rainfall events in combination with excessive grazing by livestock make this region prone to gully erosion. Quantification of the relationship between rainfall characteristics and land use with temporal and spatial variations in terrestrial vegetation productivity would allow for a better implementation of adaptation strategies to present-day climatic conditions.

Vegetative drought is assessed using SPOT NDVI (1 km) 10-day composite images (1998-2010), observed daily precipitation data (1950-2010) and spatial land use variability generated from a high-resolution (15 m) Aster image (2011). As the rainfall falls very irregular in time, different methods were employed to identify historical drought characteristics like duration, magnitude, onset, frequency and intensity. These quantitative characteristics are used to detect any climate change over the past 50 years and to correlate to the NDVI spatial and temporal fields.

The vegetation growth or greenness is found to be strongly linked with the amount of rainfall in the first part of the rainy season (October – December). The highest correlation is found between the 10-day NDVI change and 20-day rainfall sum with a time lag of 60 days. Approximately 48% of the variance in NDVI could be explained by rainfall sums in the rainy season (October – April). These findings so not significantly change over the 12 rainy seasons studied, which is in agreement with the result of no significant trend in the extreme rainfall event characteristics, neither in the number dry days. Spatial variability in NDVI response to rainfall is strongly linked to land use, where cropland and forest exhibit the most and least sensitivity to dry conditions during the rainy season.