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The relation between drought and vegetation activity on Southeastern Europe

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The dependence of vegetation activity on drought conditions is stronger on areas with low water balance values, such as the Mediterranean basin, where it is often negative, particularly in the summer months. In Southeastern Europe there is a visible trend towards dryer conditions in the winter and spring months, reflecting the decrease in precipitation in the winter and the increase in evapotranspiration in the spring.
The impacts of drought on vegetation over Southeastern Europe were assessed on the period between April 1998 and May 2014, using the Normalized Differences Vegetation Index (NDVI) and the Standardized Precipitation Evapotranspiration Index (SPEI). NDVI with spatial resolution of 1 km was obtained from the SPOT-VEGETATION dataset. The multiscalar drought index SPEI was computed using precipitation and evapotranspiration data obtained from the CRU TS3.23 dataset, which has a spatial resolution of 0.5º. The SPEI timescales used in this work were 1, 3, 6, 9, and 12 months. A correlation analysis was performed between these indexes, for the months of April to October, which showed the highest vegetation activity. The impact on vegetation of the drought episode of the year 2000/2001 was also assessed, by counting the number of months between April and October 2000 showing NDVI anomaly value lower than -0.025. The GlobCover map for the year 2009 was used to identify the different land covers occurring in the study area.
Results show positive correlation between NDVI and SPEI on agricultural areas from May to October, reaching over than 75% of this area on July, which points to the fact that this land cover type present a high vulnerability to drought. The area occupied by forests shows a positive correlation between NDVI and SPEI is smaller than for agriculture, and it occurs mostly on July and August, which reveals that forests are more resilient to drought. The drought episode of 2000/2001 had a strong impact on the vegetation of the study area, provoking a decrease in vegetation activity on more than 99% of the area. The number of months with low NDVI anomalies generally coincided with the number of months with SPEI identifying drought conditions at the studied timescales. NDVI anomalies are persistently lower than -0.025 during 4 or more months on around 70% of the area, and the impact was lower on forests than on agricultural area, reinforcing the higher vulnerability of the latter.

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