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Influence of precipitation variability in vegetation greenness in Portugal

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The influence of precipitation and water availability in the variability of vegetation greenness over mainland Portugal (2000–2014) is analysed. The gridded Standardized Precipitation Evapotranspiration Index (SPEI) on a monthly basis and for different timescales (1–6 months) was used to determine the water availability, while the vegetation greenness was measured using monthly means of the Normalized Difference Vegetation Index (NDVI). It was observed that vegetation greenness is very sensitive to precipitation in southern Portugal and in some innermost northern regions, which are mostly occupied by grassland and low density woodland, showing strong seasonality (maximum in winter and minimum in summer). This dependency is particularly clear in February-March (late winter/early spring) and in September (late summer/early autumn). The vegetation greenness is much less sensitive to precipitation seasonality in the northwestern regions that show predominance of shrublands and evergreen/deciduous forests. Spatial and temporal (intra and inter-annual) NDVI variability and the drought/precipitation role played on different timescales can be explained trough type-specific models. NDVI models explain 88–94% of the observed variability after cross-validation. These models show that precipitation-driven variability considerably influences monthly anomalies in vegetation greenness, though minimum temperatures (TN) are also a significant forcing factor. The combination of SPEI and TN allows the prediction of vegetation greenness up to 6-months in advance and for each vegetation type separately. The full understanding of the relationships between vegetation greenness and precipitation variability can support a better management of water resources, forest and agroforestry systems, ecosystems and landscapes, being also a valuable tool for climate change assessments.