Groundwater dependant vegetation identified by remote sensing in the Iberian Peninsula

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Groundwater Dependant Ecosystems (GDEs) are defined as ecosystems whose composition, structure, and function depend on the water supplies from groundwater aquifers. Within GDEs, phreatophytes are terrestrial plants relying on groundwater through deep rooting. They can be found worldwide but are mostly adapted to environments facing scarce water availability or recurrent drought periods mainly in semi-arid to arid climate geographical areas, such as the Mediterranean basin.

We present a map of the potential distribution of GDEs over the Iberian Peninsula (IP) obtained by remote sensing and identifying hotspots corresponding to the most vulnerable areas for rainfed vegetation facing the risk of desertification.

The characterization of GDEs was assessed by remote sensing (RS), using CORINE land-cover information and the Normalized Difference Vegetation Index (NDVI) from VEGETATION recorded between 1998 and 2014 with a resolution of 1km. The methodology based on Gou et al (2015) relied on three approaches to map GDEs over the IP by:
i) Detecting vegetation remaining green during the dry periods, since GDEs are more likely to show high NDVI values during summer of dry years;
ii) Spotting vegetation with low seasonal changes since GDEs are more prone to have the lowest NDVI standard deviation along an entire year, and
iii) Discriminating vegetation with low inter-annual variability since GDEs areas should provide the lowest NDVI changes between extreme wet and dry years.

A geospatial analysis was performed to gather the potential area of GDEs (obtained with NDVI), vegetation land cover types (CORINE land cover) and climatic variables (temperature, precipitation and the Standardized Precipitation-Evapotranspiration Index SPEI). This analysis allowed the identification of hotspots of the most vulnerable areas for rainfed vegetation regarding water scarcity over the Iberian Peninsula, where protection measures should be urgently applied to sustain rainfed ecosystem and agro-systems and biodiversity in the near future.

Keywords: NDVI, CORINE, SPEI, Groundwater, Mediterranean vegetation, Phreatophyte species.

Reference:
Gou S., Susana Gonzales S., and Gretchen R. Miller G. R. (2015). Mapping Potential Groundwater-Dependent Ecosystems for Sustainable Management. Groundwater 53, 99–110.