Spatial and temporal analysis of vegetation response to meteorological droughts in California, 1984-2018

Felipe Fileni, Shunan Feng, Johannes Erikson, Rickard Pettersson, and Mattias Winterdahl
Uppsala University, Department of Earth Sciences, Uppsala, Sweden (felipef93@gmail.com)

Vegetation productivity is directly influenced by weather characteristics such as precipitation and temperature. The response is usually not immediate, with a time lag period between a weather anomaly and vegetation response. This study focusses on the vegetation response to droughts in California, USA. The Standard Precipitation Evapotranspiration Index (SPEI) for the timescales of 1 to 6 months was computed using evapotranspiration and precipitation data from the Global Land Data Assimilation System, Noah Land Surface Model climatic data. The different timescales of SPEI were compared to the vegetation health in the next three months to determine the impact of droughts on vegetation. The comparison was performed in Google Earth Engine (GEE) using the previously calculated SPEI and the Normalized Difference Vegetation index (NDVI), computed with Landsat Imagery, available from 1984 to 2018. The results indicated that the 2-month time scale of SPEI (SPEI2m) was a significant predictor, both spatially and temporally, to the following three-month vegetation anomaly in net water deficit regions. A correlation map was generated from the 34-year comparison of SPEI2m with NDVI anomalies. The areas where the vegetation cover correlated with meteorological droughts were identified. An analysis of the time-series was performed in those areas, aiming to identify trends in the data. As the SPEI2m has been proven an accurate predictor for the vegetation health in the region, the index could be applied in water demand prediction for agriculture and in the identification of areas that are vulnerable to forest fires.