



## **Spatial and Temporal Variability of Moisture Condition in Grassland using Spectral Data and GIS Tools, A Case study: Lower Silesian, Poland**

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In recent years climate changes have been observed. Extreme weather events are becoming increasingly. International organizations related to climate research report that 2016 was the warmest year in the history of measurements, the second in order was the year 2018 and the twenty-warmest years in the history of measurements were the last twenty years.

Drought is the most complicated climatic phenomenon among the hazards related to the weather. Drought monitoring is based on the use of large amounts of data: temperature, precipitation, evaporation, soil moisture data and many others. This monitoring requires conducting a long-term field measurements.

Many different satellite data is commonly used in environmental monitoring e.g.: LIDAR, radar, spectral data, thermal imagery etc. Increased of the spatial resolution up to several meters or even centimeters pixel dimension, enable to carry out analyses in the operating mode even in large areas. Additionally, many of the satellite images are open access data.

The aim of the presented research is to find the relations between indicators characterizing agricultural drought, which were calculated using traditional and remote sensing methods. These relations will help to answer the question, if it is possible to use spectral data for monitoring agricultural drought. The work contains an analysis of changes in the availability of water on grasslands in the context of agricultural drought monitoring.

Preliminary research carried out on grassland in an area with homogeneous weather conditions, did not show any strong correlation between spectral indicators and a meteorological and hydrological indicators, in terms of moisture content in the soil-plant environment. Therefore, it was decided to extend the research in the spatial and temporal aspect and the number of analysed parameters.

The research was conducted on grasslands in lowland areas (< 300 m a.s.l.) in Lower Silesian Voivodship, Poland, the research area was about 15,000 km<sup>2</sup>. CA 800 grassland with a total area about 750 km<sup>2</sup> were analysed. Spectral data were obtained for the period between July 2015 to November 2018 from Sentinel-2 (ESA). Several spectral indicators based on the amount of chlorophyll, anthocyanins, carotenoids and water content were calculated. Spectral indicator values were correlated with an average temperature, precipitation and evaporation for characteristic periods previous the given image date. The analyses showed spatial and temporal variability of the agricultural drought in the grassland in lowland areas, described using spectral data.

Keyword: agricultural drought, remote sensing, satellite data, drought monitoring, Sentinel-2