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DEVELOPMENT OF DROUGHT MONITORING SYSTEM BASED ON SATELLITE DATA AND GROUND MEASUREMENTS

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THEME: Natural Disasters Monitoring, Warning and Response**:** Understanding risks through long term monitoring; disaster mitigation and alert; supporting disaster response and post-disaster recovery and build-up activities.

KEY WORDS: drought monitoring, satellite data, data synchronisation, time-series analysis, machine learning, Slovenia

ABSTRACT:

The paper describes methodology for building a statistical model for satellite drought monitoring. We have applied machine learning methods to construct a model based on MODIS and MERIS satellite data, meteorological measurements and land characteristics, collected by different authorities in Slovenia. MODIS data are used for their continuous availability and MERIS as a training dataset for the foreseen Sentinel-3 data.

More than 2000 sample points have been carefully studied, assessed and classified for drought conditions by an expert, taking into account the regional drought characteristics, meteorological and agrometeorological data as well as satellite derived vegetation indices, for the vegetation period between 2006 and 2012. The sample points were clustered for different regions and different land cover classes (fields, meadows, plantations, olives, vineyards, coniferous and deciduous forests, mixed land cover). The main goal of the analysis was to obtain an appropriate representation of sample points to distinguish between different states of drought and vegetation types.

This information was fundamental for drought detection statistical modelling. The developed drought detection system is capable of detecting drought conditions for different vegetation types. It was built using Hidden Markov Models (HMMs) and fed by features that were extracted from satellite data. The HMMs were built for different types of land cover classes, where we experimented with different number of states and different number of mixtures in HMM states. The accuracy of the drought detection system varies from 65% to 93% for different land cover classes. At the moment, the results are valid for Slovenia and its neighbourhood, but the methodology is defined in a way to enable simple recalibration of the model to other regions when pertinent ground data is supplied and is particularly applicable in diverse landscapes.

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