The 36th International Symposium on Remote Sensing of Environment,
11 – 15 May 2015, Berlin, Germany, ISRSE36-201-2

POTENTIAL OF ENMAP AND SENTINEL-2 FOR EARLY DETECTION OF DROUGHT STRESS IN A CENTRAL EUROPEAN FOREST ECOSYSTEM

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THEME: Forests, Biodiversity and Terrestrial Ecosystems, Special Session: EnMAP

KEY WORDS: Hyperspectral, European Beech, water stress, site conditions, EnMAP, Sentinel-2

ABSTRACT:

In most European countries the summer of 2003 was one of the hottest and driest on record: new temperature extremes were reached and the water deficit led to substantial losses in the agricultural production and caused damage to forested areas. The situation was perceived as exceptional, yet it is likely that the frequency and intensity of such events might increase in the future. Earth observation systems have allowed mapping the spatial extent of areas affected in 2003, thereby opening an important perspective for land use planning under harsher climate conditions in the future. With a perspective on tree species selection, repeated Landsat observations of the 2003 drought have been successfully used to identify site-specific stress levels. It could be shown that the development of stress symptoms in European Beech (*Fagus sylvatica*) strongly depends on factors such as elevation, slope and aspect, as well as soil depth and water holding capacities.

The study site "Donnersberg" in Rhineland-Palatinate had not only experienced highly diverse water stress levels during the 2003 drought. During spring and early summer 2014, weather conditions were characterized by even less precipitation and higher temperatures than during the corresponding period in 2003. An airborne hyperspectral data mosaic was collected in early July 2014 with a HySpex camera system and used to produce simulated EnMAP and Sentinel-2 data sets. Based on previous experiments conducted under artificially induced stress conditions, the authors compared several indicators for stand health and water stress (PRI, NDWI, MSI etc.) with official maps on site conditions (i.e. soil water holding capacity) and species distribution. The results provide not only insight into the sensitivity of multi- and hyperspectral imaging systems for identifying drought effects at relatively early stages but also on the reliability of site condition maps derived through a combination of field data collection and geo-statistical mapping procedures.

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