Assessing late spring frost effects on beech forests in the Mediterranean region by a remote sensing approach

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Changing climate represents the most important driver of change for mountain forests in the Mediterranean region, by affecting forests vitality and productivity. Increased intensity and frequency of temperature extremes such as late spring frost and heat waves represents the main driver affecting forest ecosystem structure and composition, with consequent changes in biomass distribution. In particular the temperature extremes (cold and heat waves), combined with low precipitation regimes characterizing the Mediterranean region, affect the carbon cycle of forest ecosystems via a lagged effect exceeding the duration of the single event. In this study we evaluate the effects of a late spring frost disturbance occurred during 2016 spring in south-central Italy, through a remote sensing based detection of the area affected and through the analysis of the spectral recovery pattern of beech forests related to local geomorphologic factors.

We implemented the NDVI differencing technique to detect frost affected forest area, and analysed forest NDVI recovery patterns using a Landsat-8 (OLI/TIRS) imagery time series. The implementation of NDVI differencing technique provide a detailed map of regional beech forests affected by the late spring frost disturbances. The analysis of the NDVI recovery patterns showed the partial recovery of forest NDVI during the same growing season according to local variability of geomorphologic factors. The analysis of forest NDVI seasonal patterns related to local geomorphologic factors contribute to a better understanding of beech forest recovery potential suggesting effective management strategies in order to cope with increasing climate change threats.