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Assessing the temporal sensitivity of the differenced Normalized Burn Ratio (dNBR) to estimate burn severity using MODIS time series

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The temporal sensitivity of the differenced Normalized Burn Ratio (dNBR) to assess burn severity was evaluated for the case of the 2007 Peloponnese (Greece) wildfires. Prior to the analysis, a pixel-based control plot selection procedure was initiated for each burned pixel based on time series similarity of the pre-fire year 2006. Post-fire near infrared (NIR) dramatically dropped immediately post-fire, while the highest MIR reflectance values were reached three weeks after the fire. Both NIR and MIR reflectance showed an increased variability during the wet Mediterranean winter. Due to the process of early vegetation recovery, the burned pixels' NIR reflectance approached the control pixels' values during the productive spring-time. Because of the three weeks post-fire delay in MIR reflectance increase, the NBR drop and dNBR peak were obtained synchronously. Both the standard deviation of the NBR and dNBR were high during winter, as a consequence of the simultaneous increase in NIR and MIR reflectance variability. In spite of the high variation in dNBR during winter, this moment is suboptimal to estimate burn severity due to low rates of image availability and low optimality values. Index performance was clearly lower during winter and spring because vegetation regeneration clearly diminishes the distance in the bi-spectral feature space to which the dNBR is sensitive at the favor of displacements to which the index is insensitive. In contrast, NIR reflectance, MIR reflectance, NBR, dNBR and dNBR optimality changes achieved a maximum three weeks post. Consequently this was the optimal time to estimate burn severity in our case study retaining a maximal degree of information with a high reliability. Conclusions should be verified for other fires and in other ecoregions.