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Estimating fire severity using satellite ASTER data and local Spatial autocorrelation statistics

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What are the ecological effects of fires? The evaluation of fire-affected areas and fire severity is of primary importance to answer this question, because fire strongly affects the ecological processes, such as, productivity level, creation of altered patches, modification in vegetation structure and shifts in vegetation cover composition, as well as land surface processes (such as surface energy, water balance, carbon cycle). Traditional methods of recording fire burned areas and fire severity involve expensive and time -consuming field survey. The available remote sensing technologies may allow us to develop standardized burn-severity maps for evaluating fire effects and addressing post fire management activities. This paper is focused on preliminary results we obtained from ongoing research focused on the evaluation of spatial variability of fire effects on vegetation. For the purposes of this study satellite ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) data have been used. Both single (post-fire) and multi-date (pre and post fire) ASTER images were processed for some test areas in Southern Italy. Spatial autocorrelation statistics, such as Moran's I, Geary's C, and Getis-Ord Local Gi index (see Anselin 1995; Getis and Ord 1992), were used to measure and analyze the degree of dependency among spectral features of burned areas. The preliminary results pointed out that spatial autocorrelation statistics applied to ASTER data allow us to discriminate fire severity and to improve the monitoring of fire effects over time. Such information are effective data source for evaluating erosion/runoff, biomass and carbon issues, and other issues using mapped burn severity.
Keywords: satellite; fire, burned area, Spatial autocorrelation statistics,