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On the use of satellite VEGETATION time series for monitoring post fire vegetation recovery

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Fire is one of the most critical factors of disturbance in worldwide ecosystems. The effects of fires on soil, plants, landscape and ecosystems depend on many factors, among them fire frequency, fire severity and plant resistance. The characterization of vegetation post-fire behaviour is a fundamental issue to model and evaluate the fire resilience, which the ability of vegetation to recover after fire. Recent changes in fire regime, due to abandonment of local land use practice and climate change, can induce significant variations in vegetation fire resilience.
In the Mediterranean-type communities, post fire vegetation trends have been analysed in a wide range of habitats, although pre- and post-fire investigation has been widely performed at stand level. But, factors controlling regeneration at the landscape scale are less well known.

In this study, a time series of normalized difference vegetation index (NDVI) data derived from SPOT-VEGETATION was used to examine the recovery characteristics of fire affected vegetation in some test areas of the Mediterranean ecosystems of Southern Italy. The vegetation indices operate by contrasting intense chlorophyll pigment absorption in the red against the high reflectance of leaf mesophyll in the near infrared.
SPOT-VEGETATION Normalized Difference Vegetation Index (NDVI) data from 1998 to 2005 were analyzed in order to evaluate the resilient effects in a some significant test sites of southern Italy. In particular, we considered: (i) one stable area site, one site affected by one fire during the investigated time window, (iii) one site affected by two consecutive fires during the investigated time window.
In order to eliminate the phenological fluctuations, for each decadal composition of each pixel, we focused on the departure NDVId = [NDVI - <NDVI>]/[U+F073], where <NDVI> is the decadal mean and [U+F073] is the decadal standard deviation. The decadal mean <NDVI> and the standard deviation were calculated for each decade, e.g. 1st decade of January, by averaging over all years in the record.
We analyzed both:
1) Time variation of NDVI from 1998 to 2005 of pixels for the fire affected and fire unaffected areas.
2) Post-fire NDVI spatial patterns on each image date were compared to the pre-fire pattern to determine the extent to which the pre-fire pattern was re-established, and the rate of this recovery.

Results show the ability of vegetation to recovery after a single fire. Nevertheless, such ability can be strongly reduced by successive fires. The recursive fire occurrence can significantly diminish the green biomass especially when disturbances occur at short intervals of time.