Spatio-temporal correlation of vegetation and temperature patterns

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Temperature is one of the variables largely influencing vegetation species distributions (biogeographical regions) and plant development (phenological cycle). Anomalies in temperature regional patterns and in microclimate conditions induce modifications in vegetation cover phenology; in particular in European regions, the responsiveness of vegetation to temperature increase is greater in warmer Mediterranean countries. In order to assess the spatial arrangement and the temporal variability of vegetation and temperature patterns in a typical Mediterranean environment, we investigated monthly NDVI-AVHRR and temperature time series over Southern Italy, core of Mediterranean Basin. Temperature data, obtained from 35 meteoclimatic stations, were rasterized by adopting a combined deterministic-stochastic procedure we suitably implemented for the investigated region in order to obtain spatial data comparable with NDVI maps. For the period 1996-1998, monthly MVC data were clusterized on annual basis by means of a classification procedure to aggregate areas with similar phenological cycles. The same procedure was adopted to jointly evaluate temperature and vegetation profiles and identify areas having similar phenological and temperature patterns. The comparison of the identified clusters showed that the classification obtained with and without temperature profiles are very similar enhancing the strong role of this variable in vegetation development. Some exceptions in the cluster arrangement are due to local anomalies in vegetation distribution, such as forest fires.

In order to spatially analyze such a dependence, we also elaborated a time correlation map for each year and we found that the correlation patterns are persistent on the year basis and generally follow the land cover distributions. The correlation values are very high and positive for the forested mountainous areas (R>0.8), whereas they are negative for plan coastal areas (R<-0.8). Low correlation values (R= -0.4/0.4) were found for the transitional zones and agricultural areas mainly dominated by irrigated herbaceous cultivations.

On average, in southern Italy the analysis showed a strong dependence of NDVI and temperature profiles during the spring and summer time (greening period) and a reduced responsiveness in autumn when precipitations control the vegetation recovery after the water shortage period.