



The use of the Specht distributed hydrologic balance model for an analysis of vegetation state

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The aim of this research was to investigate the correlation between climatic variables, vegetation indices and potential vegetation. The potential vegetation state for given climatic characteristics was analysed for a two year period in a natural forest, and the variation between this potential vegetation index and the Normalized Difference Vegetation Index (NDVI) obtained from satellite imagery has been calculated for three months, chosen to represent the annual phenological cycle.

The study area is the forested part of the Nebrodi mountain range in north east Sicily, it is an area of approximately 1000 km² characterised by natural woodland vegetation.

The data used include three Landsat images, mean monthly rainfall and maximum and minimum monthly temperatures from local measurement stations during the period August 2001 – July 2002. Precipitation values were spatially distributed using Fourier series analysis, while temperature was interpolated taking into account variability in altitude.

The Specht bioclimatic index has been used to analyse the potential vegetation, that is the maximum state of growth of the natural vegetation that uses the complete water resource available without causing water deficit. This index depends on the available water resource, as well as net solar radiation and the nutrient content of the soil. To calculate this index a distributed hydrologic balance model is used. The contribution of overground flow, groundwater flow, rising water due to the capillary effect, percolation, and irrigation are omitted. The bioclimatic index has been calculated using rainfall, which is the primary resource for natural vegetation in arid, or semiarid climates, and evapotranspiration, which is strictly related to the primary production of the vegetation.

A comparison between the NDVI obtained from satellite imagery and the potential vegetation index calculated reveals the presence of several zones in deficit either due to different phenological types, or due to an effective state of suffering of the vegetation. The methodology applied allows vegetation stress conditions to be monitored through a comparison with the potential vegetation index, it furthermore provides information on the water resource available.