Geophysical Research Abstracts
Vol. 17, EGU2015-6800, 2015
EGU General Assembly 2015

Remote sensing technologies applied to the irrigation water management on a golf course

Celestina Pedras, Rui Lança, Fernando Martins, Cristina Soares, Carlos Guerrero, and Helena Paixão
Universidade do Algarve, FCT, Faro, Portugal (cpedras@ualg.pt)

An adequate irrigation water management in a golf course is a complex task that depends upon climate (multiple microclimates) and land cover (where crops differ in morphology, physiology, plant density, sensitivity to water stress, etc.). These factors change both in time and space on a landscape. A direct measurement provides localized values of the evapotranspiration and climate conditions. Therefore this is not a practical or economical methodology for large-scale use due to spatial and temporal variability of vegetation, soils, and irrigation management strategies. Remote sensing technology combines large scale with ground measurement of vegetation indexes. These indexes are mathematical combinations of different spectral bands mostly in the visible and near infrared regions of the electromagnetic spectrum. They represent the measures of vegetation activity that vary not only with the seasonal variability of green foliage, but also across space, thus they are suitable for detecting spatial landscape variability. The spectral vegetation indexes may enhance irrigation management through the information contained in spectral reflectance data.

This study was carried out on the 18th fairway of the Royal Golf Course, Vale do Lobo, Portugal, and it aims to establish the relationship between direct measurements and vegetation indexes. For that it is required (1) to characterize the soil and climatic conditions, (2) to assessment of the irrigation system, (3) to estimate the evapotranspiration (4) and to calculate the vegetation indices. The vegetation indices were determined with basis on spectral bands red, green and blue, RGB, and near Infrared, NIR, obtained from the analysis of images acquired from a unpiloted aerial vehicle, UAV, platform.

The measurements of reference evapotranspiration (ET_o) were obtained from two meteorological stations located in the study area. The landscape evapotranspiration, ET_L, was determined in the fairway with multiple microclimates and managed stress. The ET_L was obtained thru the use of mobile reference ET stations and also by the development of the surface renewal (SR) measurement technique.

The sprinkler irrigation system installed was evaluated according to the methodology described by ASAE. The Normalized Difference Vegetation Index, NDVI, and Visible atmospherically Resistant Index, VARI, are confronted with the direct localized measurements. The NDVI is the most used indicator to assess the vigor status of the vegetation. However, this index depends of the use of NIR bands which demands quite expensive sensors. The use vegetation indexes obtained by sensors that collect data in the visible wavelength, such as VARI is less expensive and allow the vegetative vigor evaluation with a similar rigor. The information of vegetation indices is crossed with edafoclimatic data obtained in situ, in order to improve the irrigation water management based on aerial imagery.