Land cover monitoring for water resources management in Angola

Executive Summary

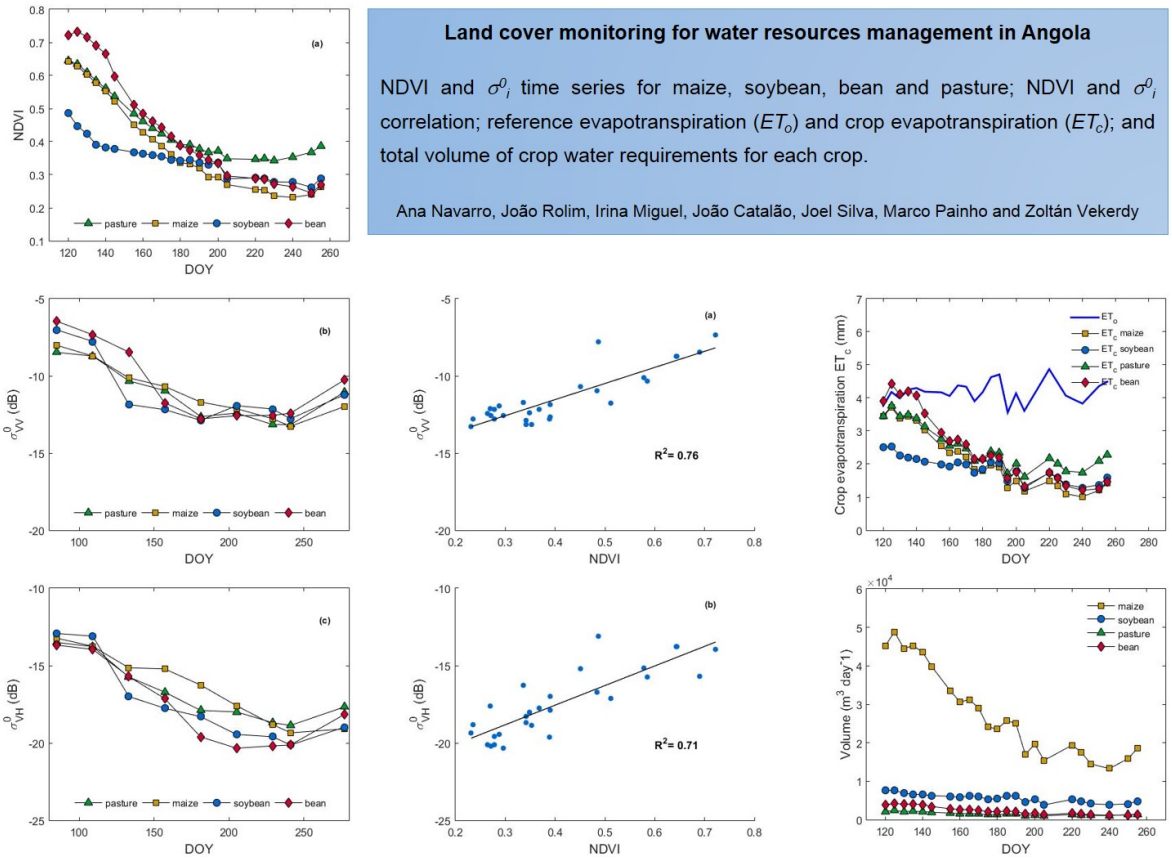
Study team members: Irina Miguel[1], Ana Navarro[2], João Catalão[2], João Lopes[3], Zoltán Vekerdy[4].

Research centres: [1]Agostinho Neto University, Faculty of Sciences, Luanda, Angola; [2]University of Lisbon, Faculty of Sciences (FC), IDL, 1749-016 Lisbon, Portugal; [3]University of Lisbon, ISA, School of Agriculture (ISA), 1349-017 Lisbon, Portugal; [4]University of Twente, Faculty of Geoinformation Science and Earth Observation (ITC), Drienerlolaan 5, 7522 NB Enschede, The Netherlands.

ESA study manager: Benjamin Koetz, Dr. sc. nat.

Alcantara Study Reference No.: 14-P13
Study Type: Pilot
Contract Number: 4000112463/14/F/MOS

Picture:



Land cover monitoring for water resources management in Angola

NDVI and σ^0_i time series for maize, soybean, bean and pasture; NDVI and σ^0_i correlation; reference evapotranspiration (ET_o) and crop evapotranspiration (ET_c); and total volume of crop water requirements for each crop.

Ana Navarro, João Rolim, Irina Miguel, João Catalão, Joel Silva, Marco Painho and Zoltán Vekerdy

Motivation:

The water resources management has become a challenging problem worldwide, especially in developing countries. The potential of Earth Observation (EO) data and techniques has been widely acknowledged for the management of land and water resources mostly in agriculture sector [FAO, 1995; Schultz and Engman, 2000].

Methodology:

Many studies have combined optical and microwave images to improve mapping accuracy in agricultural scenarios [Ban, 2003; Blaes *et al.*, 2005; Michael *et al.*, 2005; McNairn *et al.*, 2009].

In this study were used SAR and optical images.

The pre-processing of SAR images includes radiometric calibration and coregistration to a common geometry. Due to its improved pre-processing level, no further pre-processing steps were required for SPOT-5 images.

NDVI images were computed from SPOT-5 bands it was possible to calculate the average NDVI and the standard deviation values for each crop parcel. Likewise, the sigma bands were used to determine the mean value for each crop parcel.

Four combinations of bands were tested and the Maximum Likelihood classifier was applied to each combination.

The Crop Irrigation Requirements were computed in this study according to the FAO 56 approach [Allen *et al*., 1998], through the use of the IrrigRotation soil water balance simulation model [Rolim and Teixeira, 2008].

Results:

- Independently of the crop type, and the acquisition date, it is clear that the overall classification accuracy and Kappa index are highest when both polarizations (VV+VH) are considered together with the optical bands.

- The consistency observed between the optical and microwave time series for all crop types, enables the replacement of optical data, affected by clouds, by microwave data in order to increase the temporal resolution of the time series.

- EO data allow to compute more frequent basal crop coefficient that are used to compute more reliable crop evapotranspiration values and subsequently to a better estimation of the crop irrigation requirements based on a soil water balance model.

Publications:

Journal name: Remote Sensing

Manuscript ID: remotesensing-127425

Type of manuscript: Article

Title: Crops monitoring based on Sentinel data for water resources management

Authors: Ana Navarro *, João Rolim, Irina Miguel, João Catalão, Joel Silva, Marco Painho, Zoltán Vekerdy
Received: 31 March 2016

Highlights:

The improved temporal resolution of the SPOT-5 Take-5 images, used in this study to simulate the ESA Sentinel-2 time series, is relevant for a better identification of the different growth cycle stages that are often imperceptible when using more sporadic data. However, this aspect was not fully exploited for reason such as the lack of EO data for the complete growing season.