Possibilities of using RGB based vegetation index to monitor forests: a case study in Sardinia (Italy)

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Introduction. Study Area

In recent decades the increase of the availability and simplicity of the acquisition of high resolution photographic material leads to evaluating the possibility of their use in the field of environmental monitoring, especially in agricultural and forest management. A recent case, which holds particular interest due to the rapid diffusion, is that of the data acquired through Unmanned Aerial Vehicle (UAV) in the presence of a camera with traditional RGB channels. The present work has been conceived with the aim of testing the effectiveness of the support of RGB vegetation indexes to the diachronic analysis process and more generally to monitoring the evolution of vegetation. The studied area is located in the soutwestern part of Sardinia Island (Italy), with an area of 22,14 hectares. In this study area, during the three-year period 2010-2013, a series of coppicing interventions were carried out in woodlands. The analyzed territory have been historically characterized for the production of firewood and material for the use of neighboring mining activities..
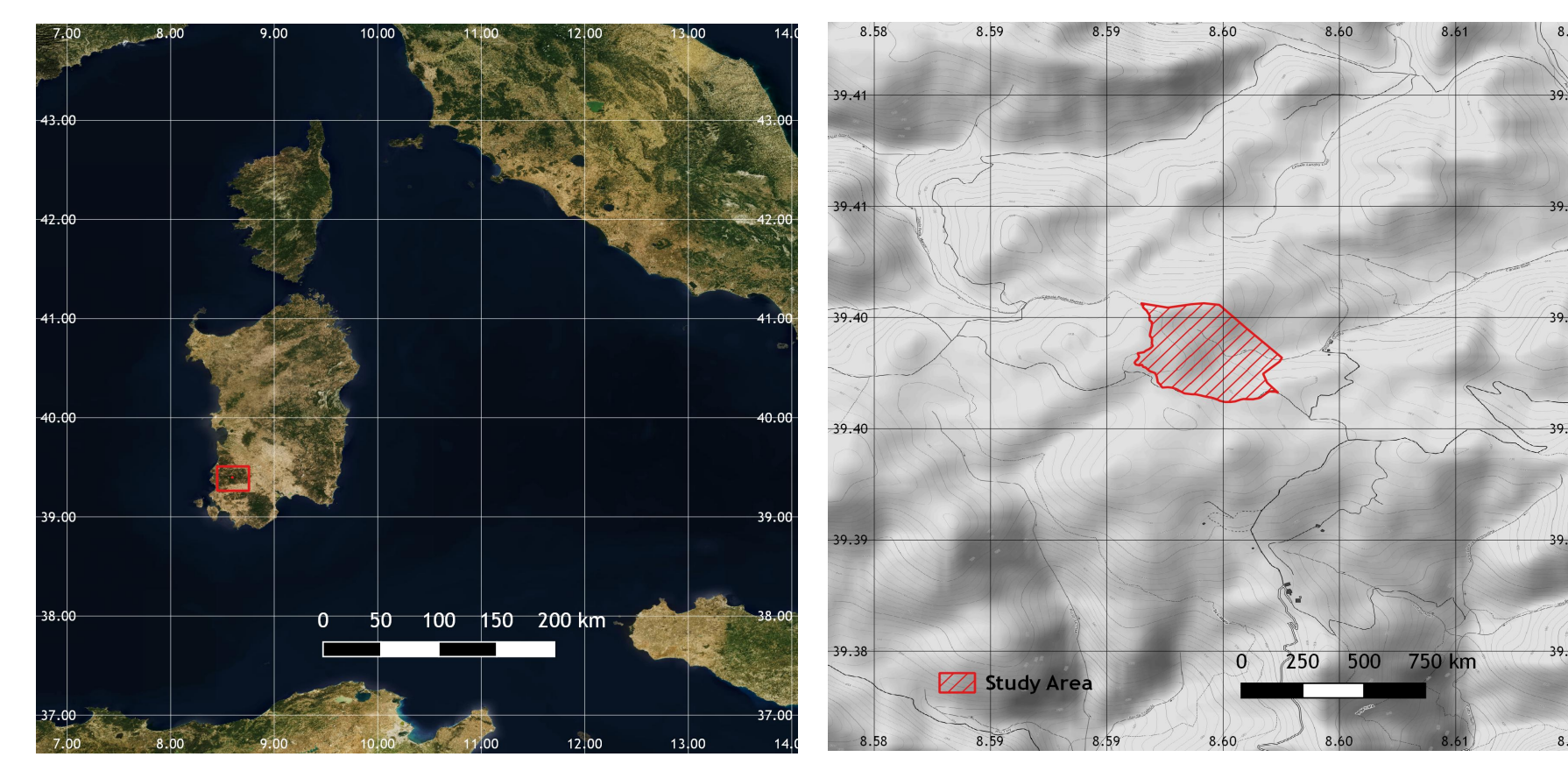

Figure 1. Area study – © OpenStreetMap-Mitwirkende, SRTM | Kartendarstellung: © OpenTopoMap (CC-BY-SA)
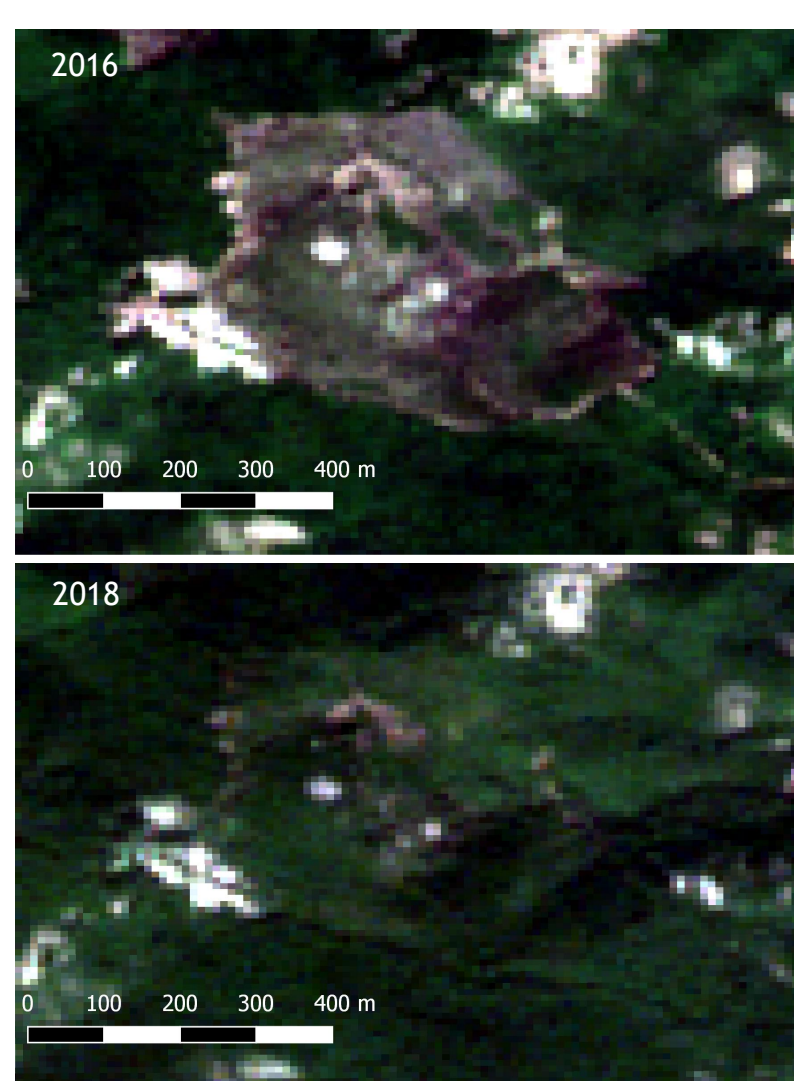
Materials and Methods

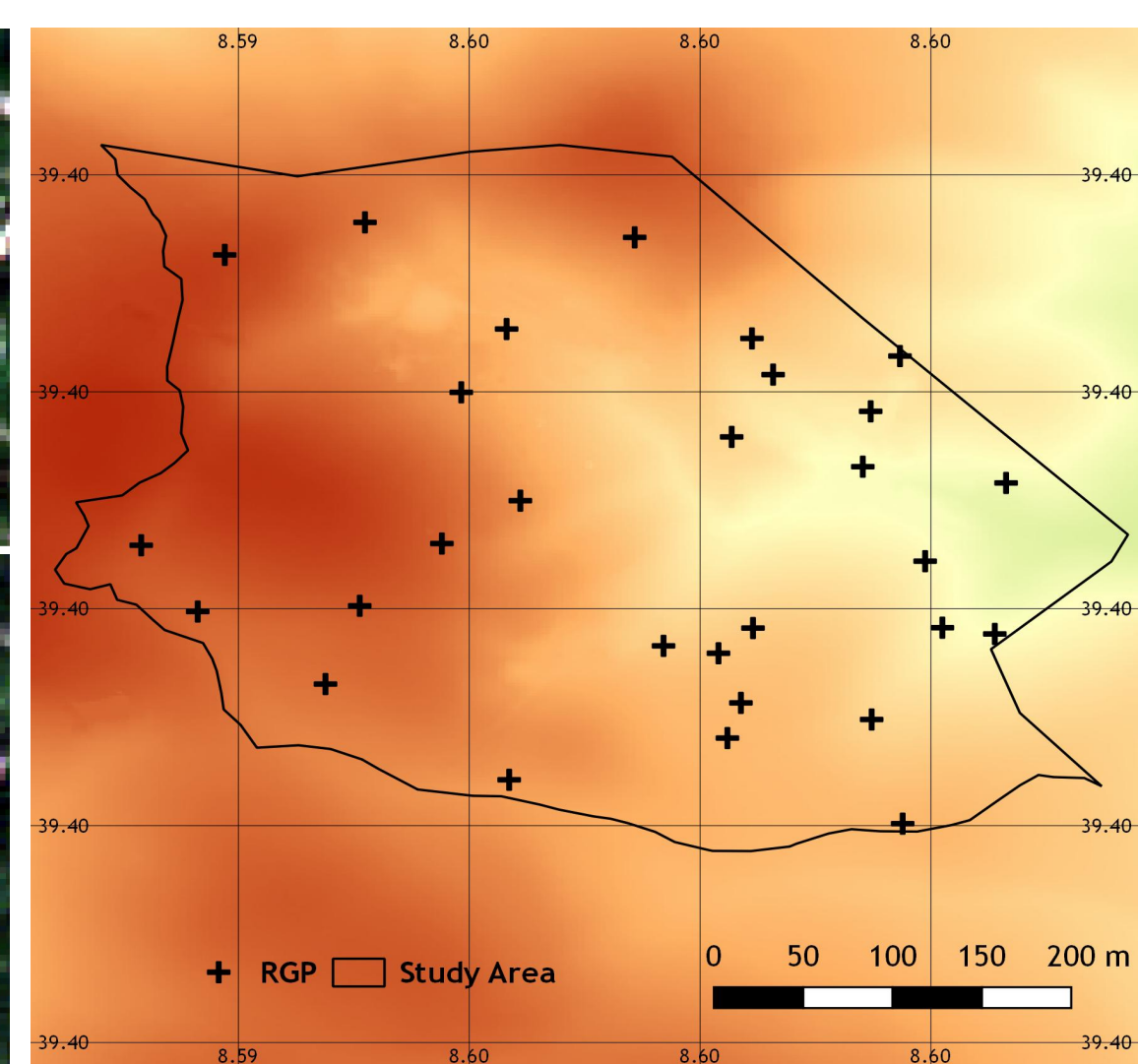Figure 2. 4,3,2 composition of sentinel 2 data

Figure 3. Area study map with RGP

We used Sentinel 2A 1C level products for the evaluation of vegetation indexes during a period between July 2016 and October 2018.
The resolution terrain in all the used bands is of 10 m. We considered the following indexes:
NDVI, Normalized Difference vegetation Index VARI, Visible Atmospheric Resistant Index TGI, Triangular Greeness Index RI, Redness Index .
Starting from a Digital Terrain Model (DTM) derivated from a lidar data(MINAMB,2008), We calculated a series of morphological parameters(Slope, Aspect and Topographic Index, TWI) in order to investigate about a possible relationship between vegetation coverage and the morphological indexes, considering a 30 Random Ground Point set (RGP) .
For every vegetation index we calculated the correspondent values regarding 2016 and 2018 and their related differential. We used the obtained values to realize spacial outputs, representing

Results

The visual analysis of GIS platform graphics outputs, shows that most valuable performances are obtained with VARI(using VARI), whereas Triangular Greeness Index and Redness Index related elaborations resulted in a more evident noise.
Especially the Redness index rshows a less valuable result.
The first exploratory data analysis shows a lower correlation between indexes and morphological parameters calculated in the studied area, respectively slope and aspect, as it is revealed from a first elaborations output, resulting in the following graphics.
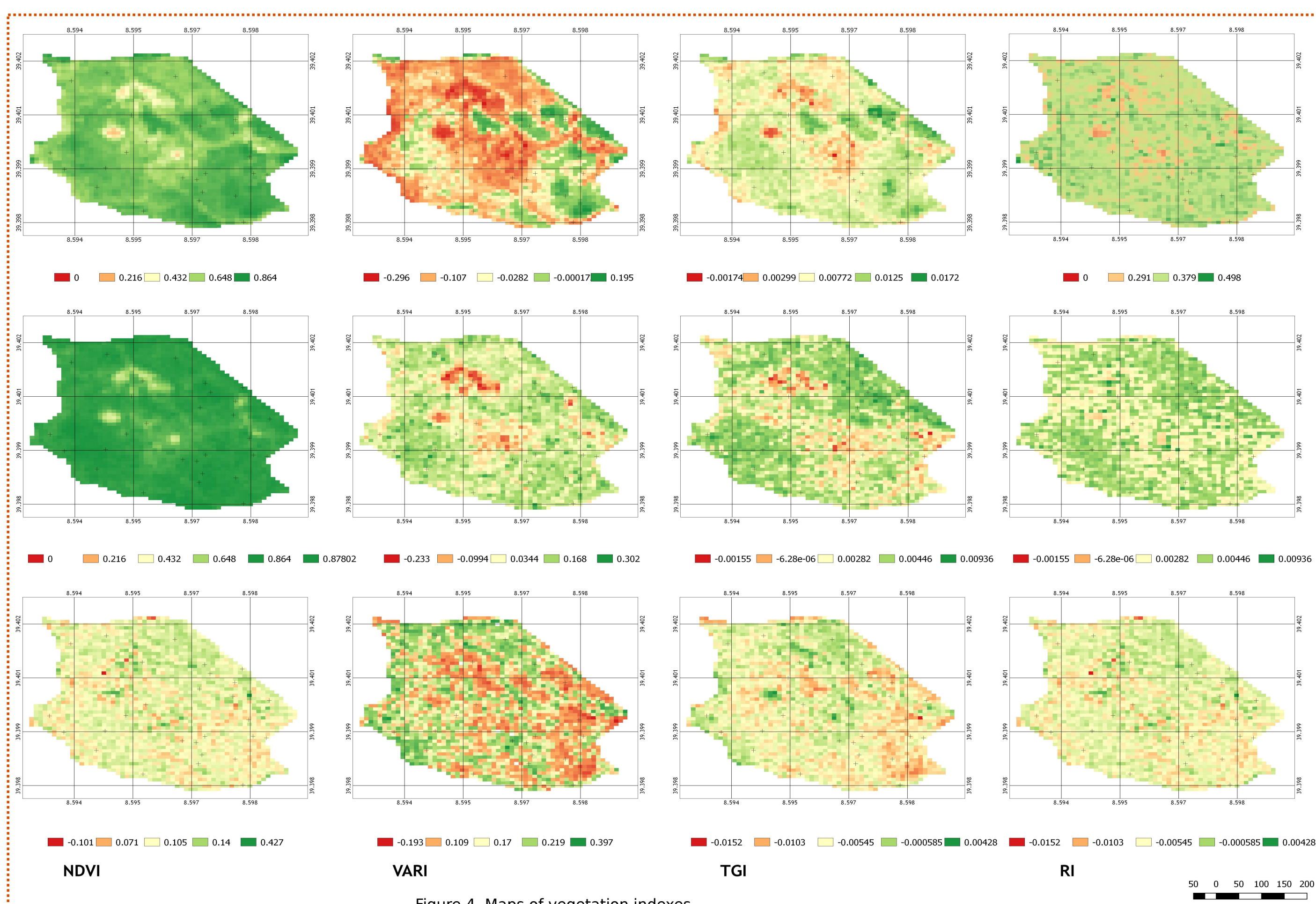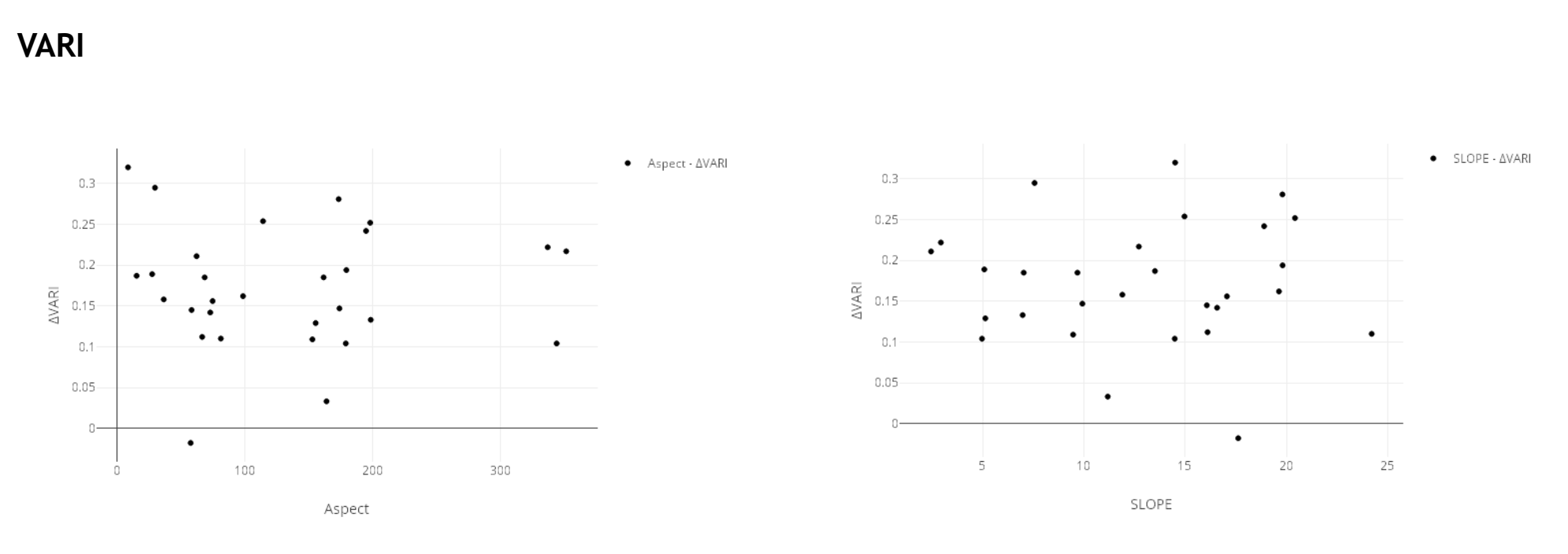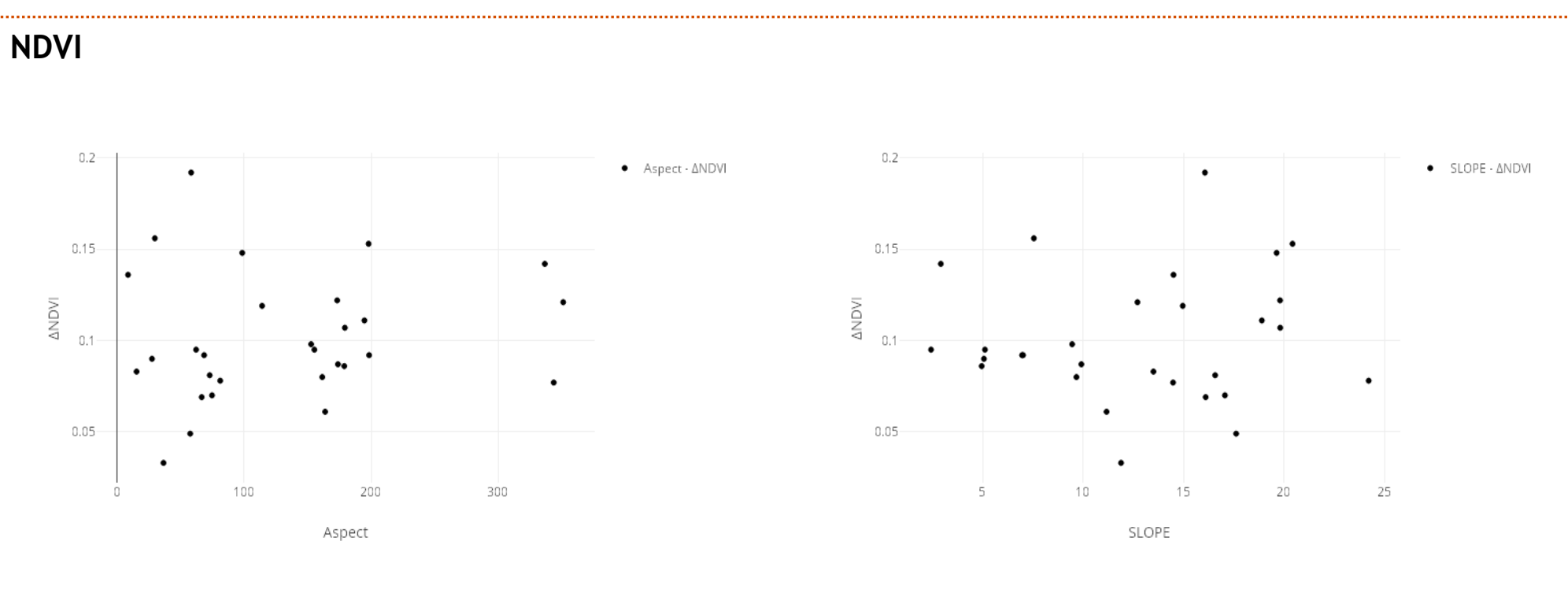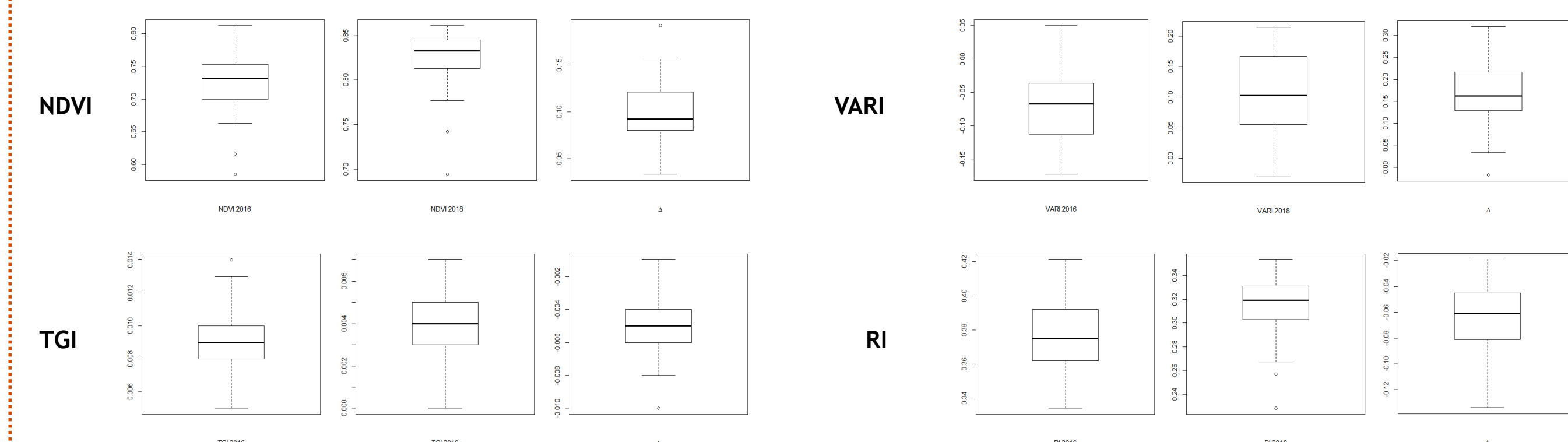
NDVI

VARI

Figure 4. Maps of vegetation indexes

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