Monitoring the expansion of alien species along roads with remote sensing

LIFE LINES
Linear Infrastructure Networks with Ecological Solutions

Life

LIFE-LINES (LIFE14 NAT/PT/001081)
Linear Infrastructure Networks with Ecological Solutions
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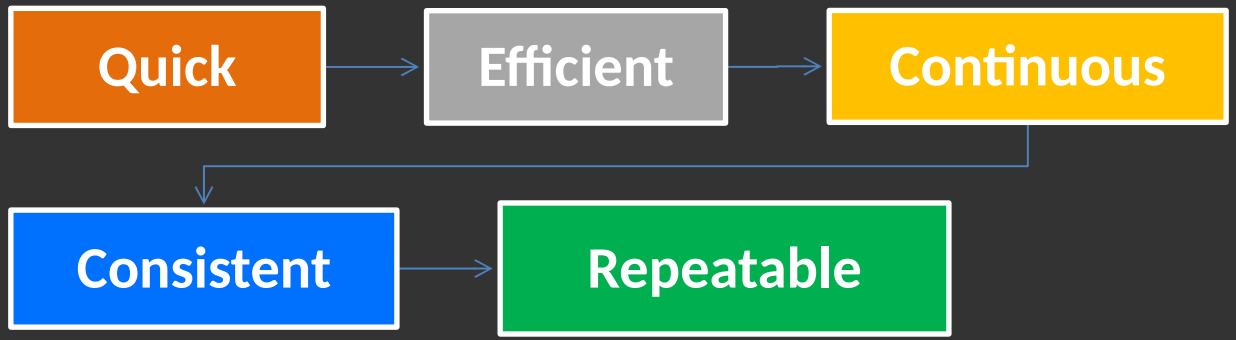
- **Invasive species: one of the most important threats to biodiversity and ecosystems**
- **Monitoring invasion status: necessary for the implementation of mitigation measures and conserving biodiversity**

Ornamental

Shade

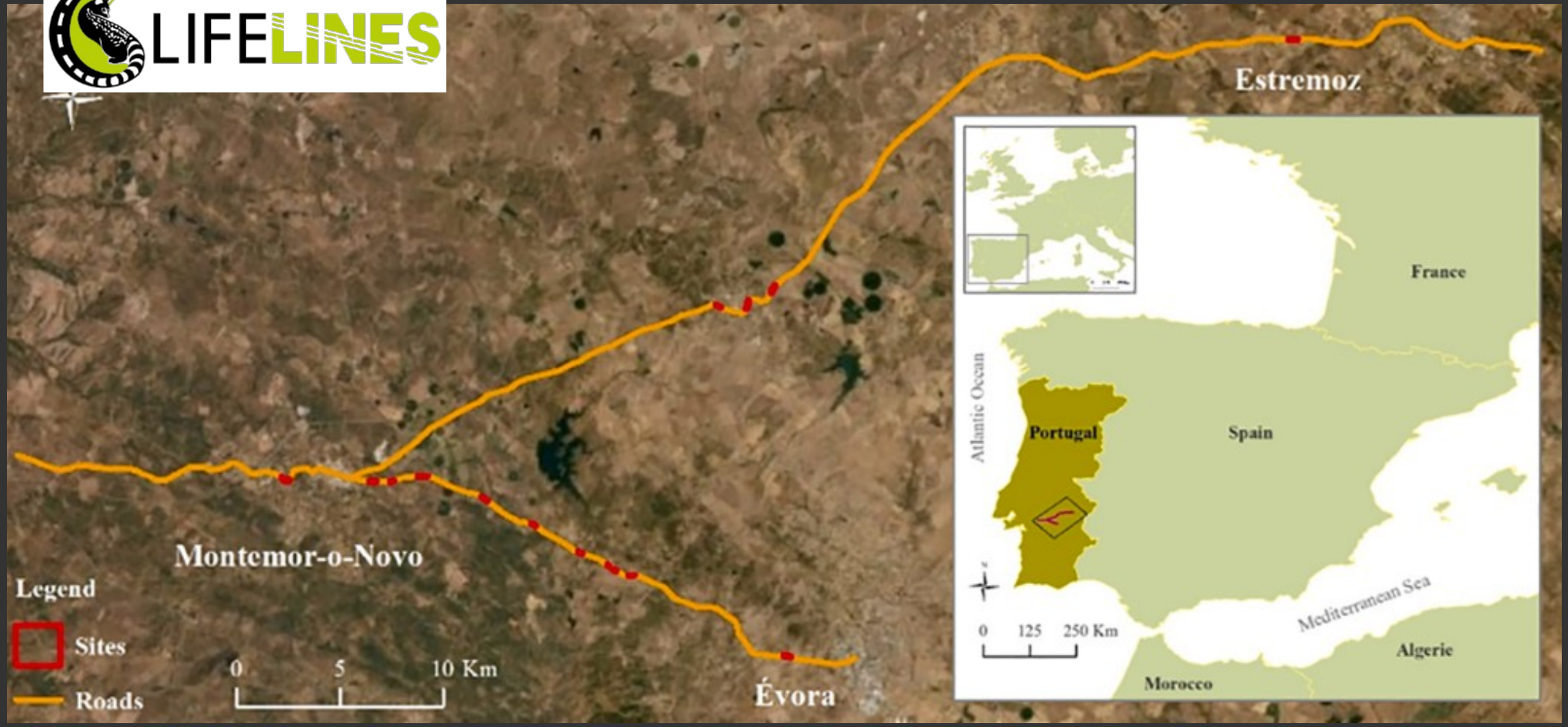
Soil stabilization

- Best Earth Observation tool for monitoring biodiversity
- Data at several spatial resolutions
- Data at several temporal resolutions
- Data with several spectral resolutions



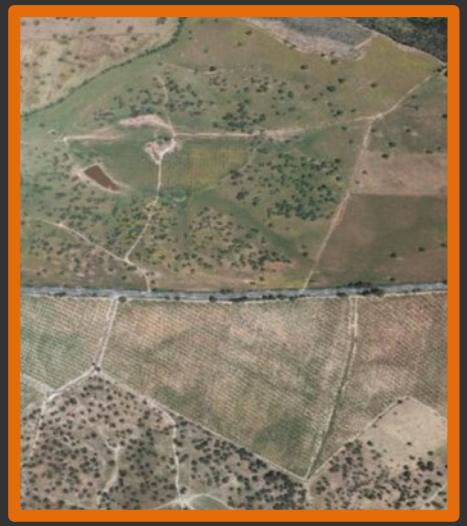
OVER LARGE AREAS AROUND THE WORLD

- To monitor the expansion along roadsides of five invasive plant species
- To determine whether roadsides are the main path of expansion for invasive plant species in Mediterranean landscapes
- To determine whether expansion is human mediated because of strong agricultural management along roads


LIFELINES
Estremoz
Montemor-o-Novo
Évora
Legend
Sites
Roads
0 5 10 Km
France
Atlantic Ocean
Portugal
Spain
Mediterranean Sea
Algerie
Morocco
0 125 250 Km

2016

- Resolution 0.10 m
- RGB and IR bands

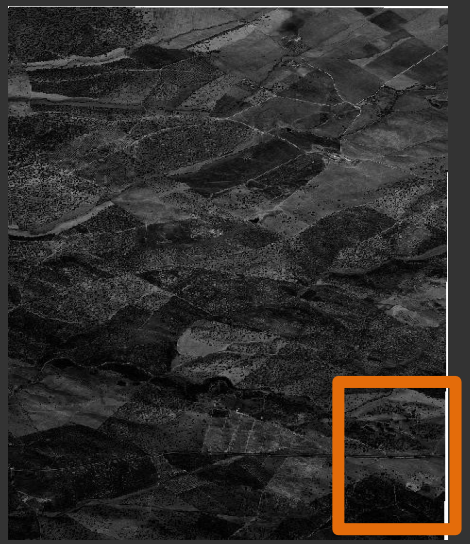


2010

- Resolution 0.50 m
- RGB bands

1995

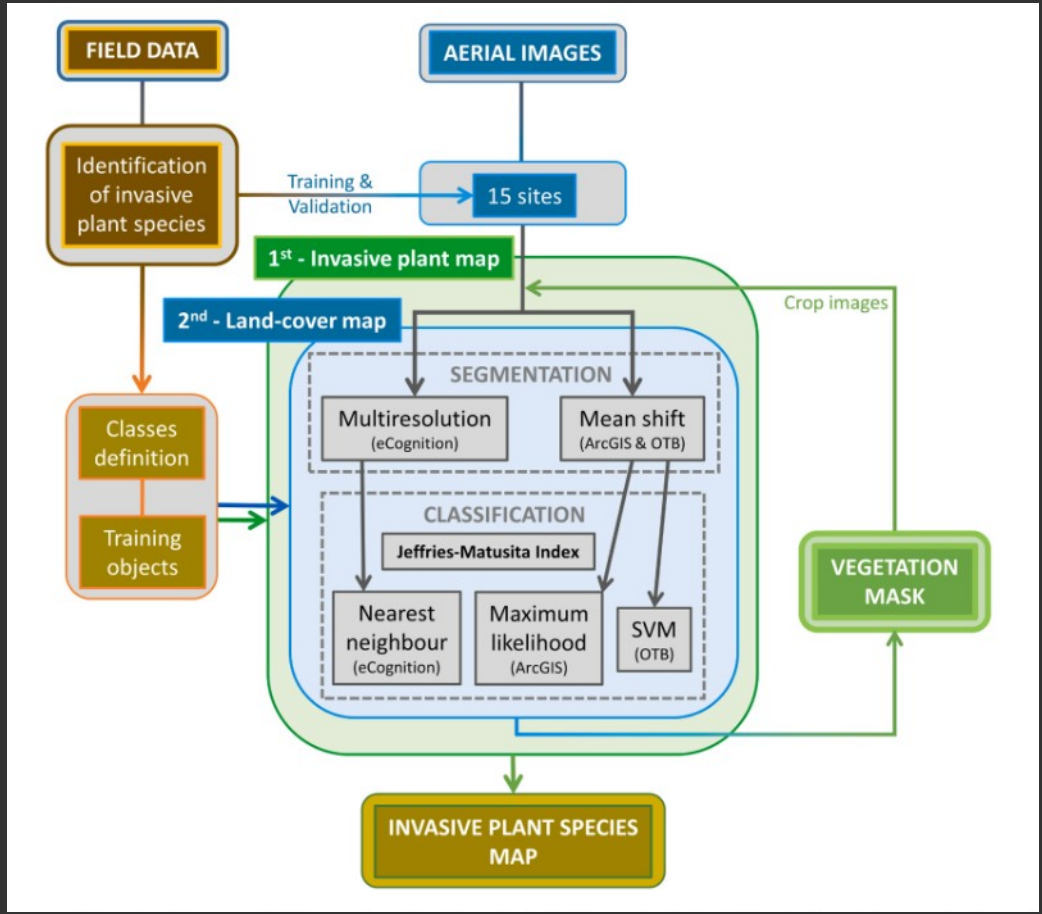
- Resolution 1 m
- RGB bands



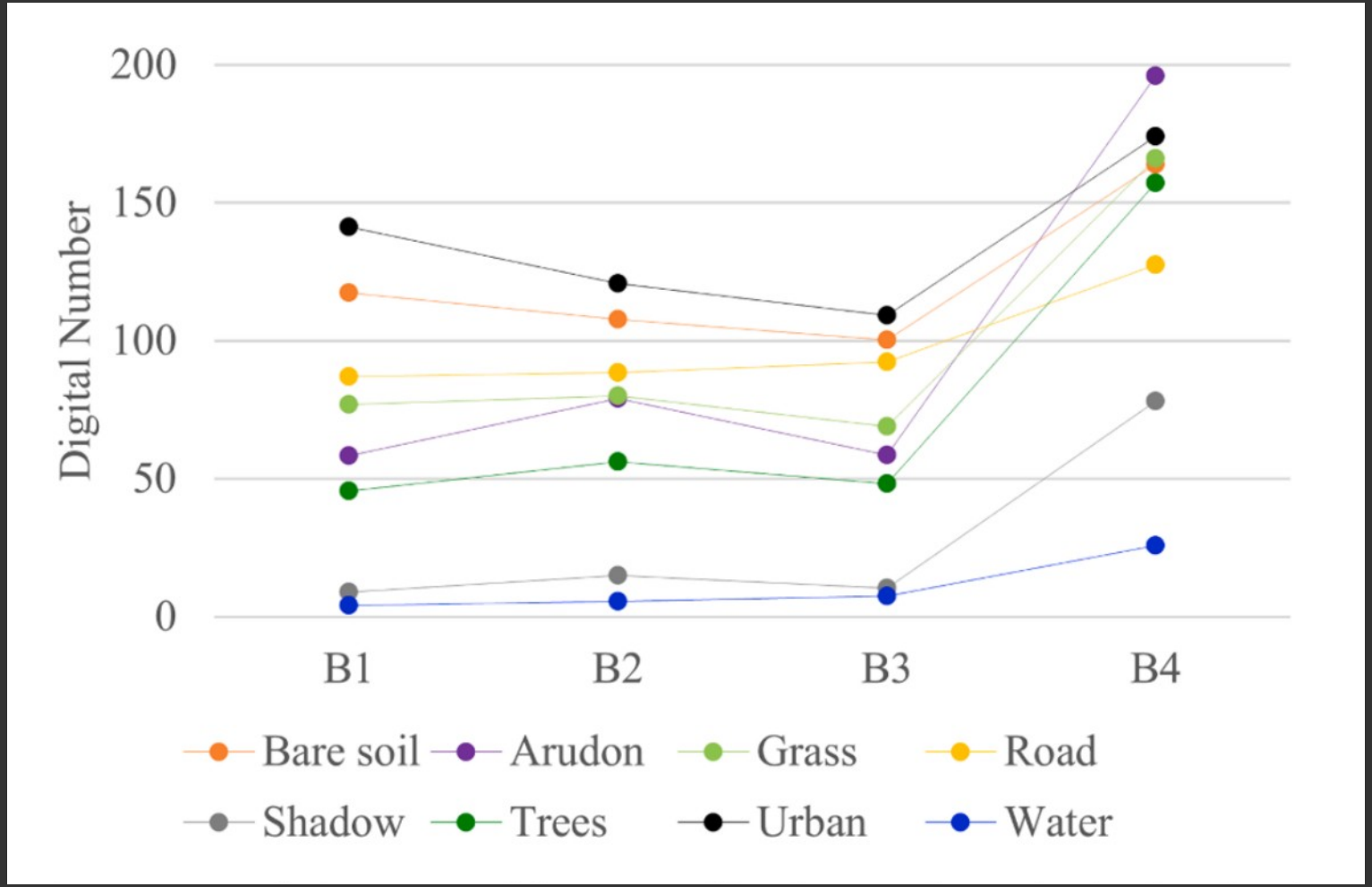
10/14

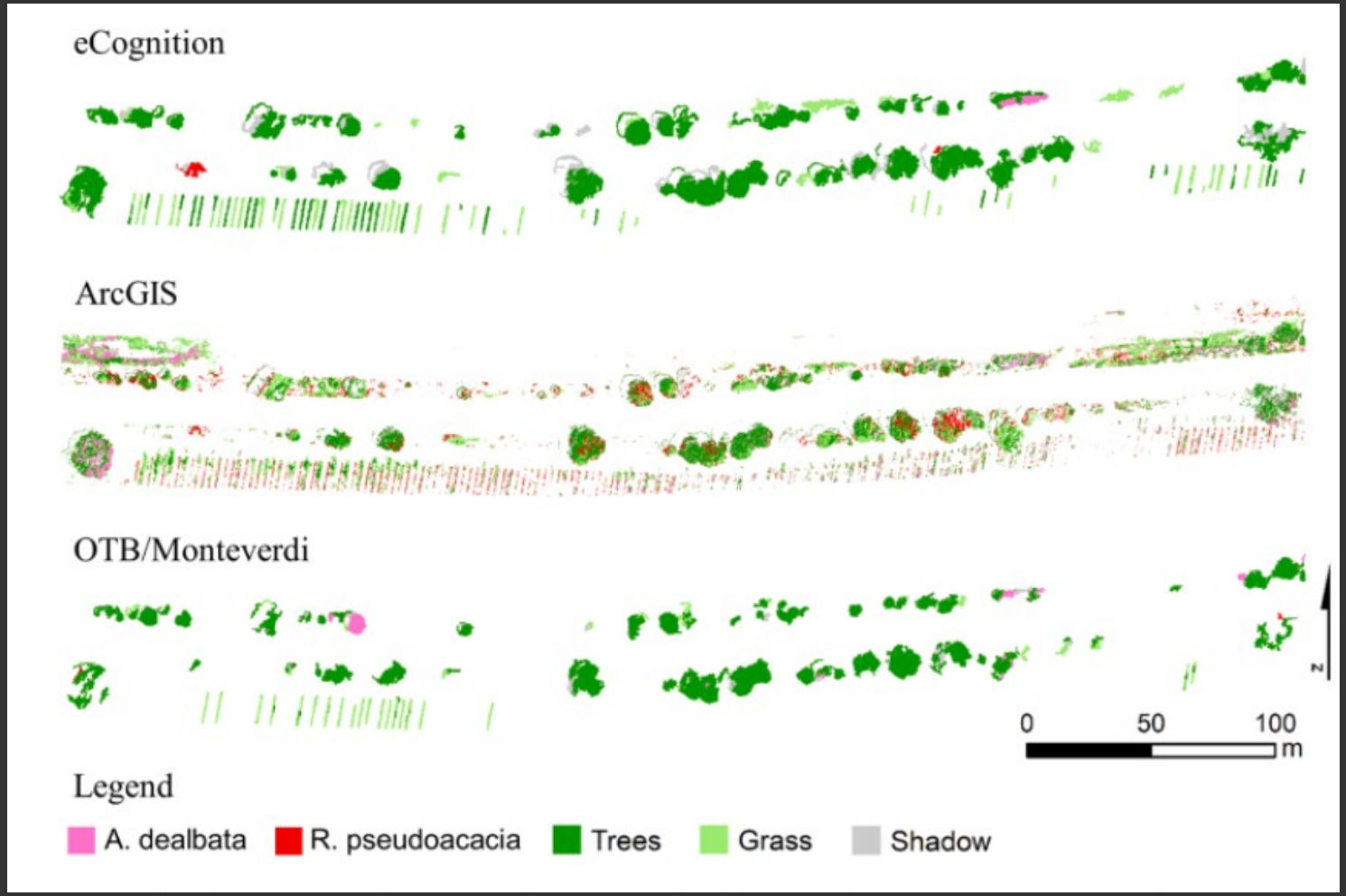
Real-time kinematic GPS
Centimetre accuracy

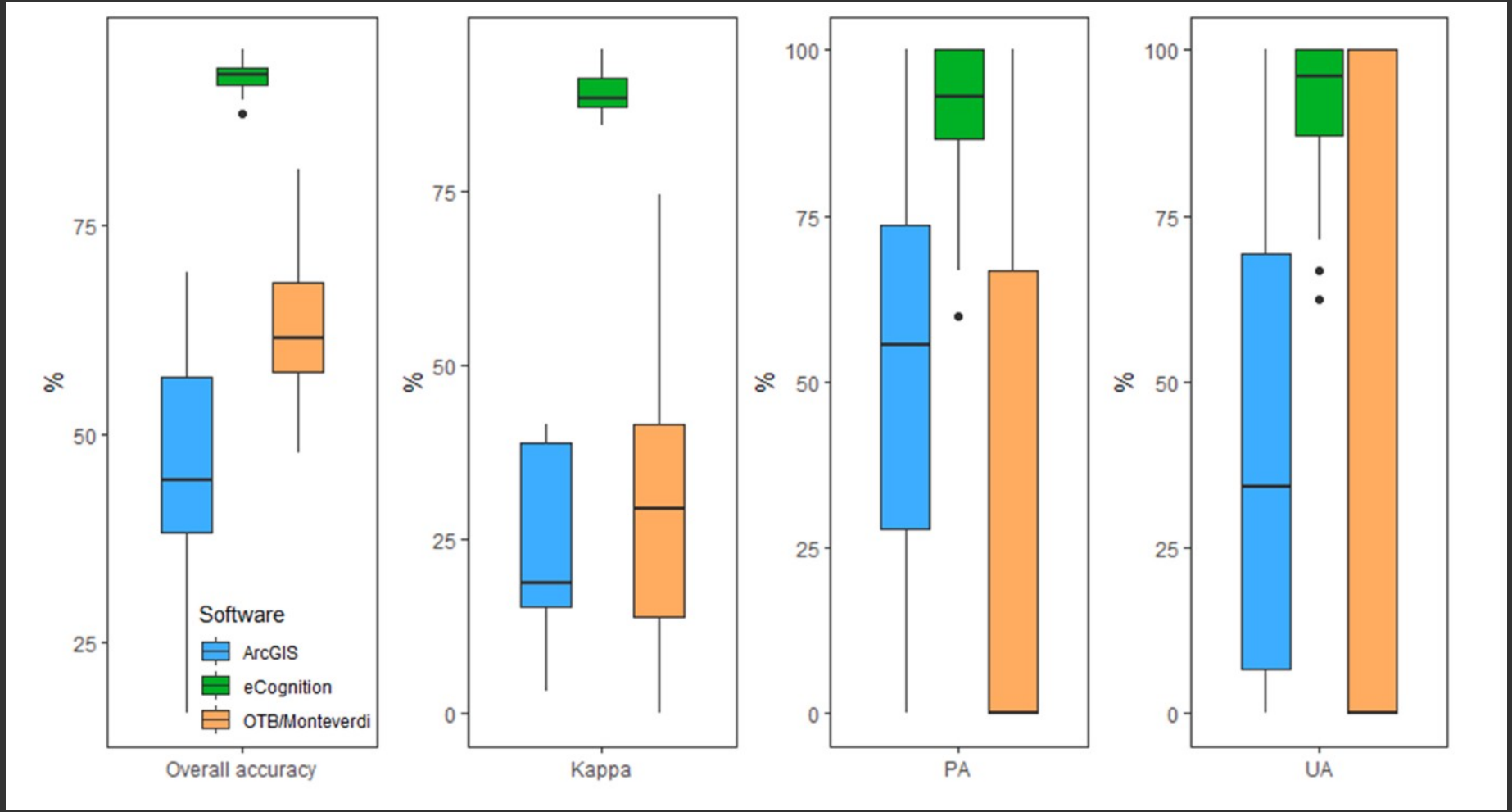
- Sequential process with two steps
- First step excluding non-vegetation
- Second step for five invasive species
- eCognition + ArcGIS + OTB
- Segmentation with multi-resolution algorithm
- Object-oriented classification: Nearest Neighbour classifier

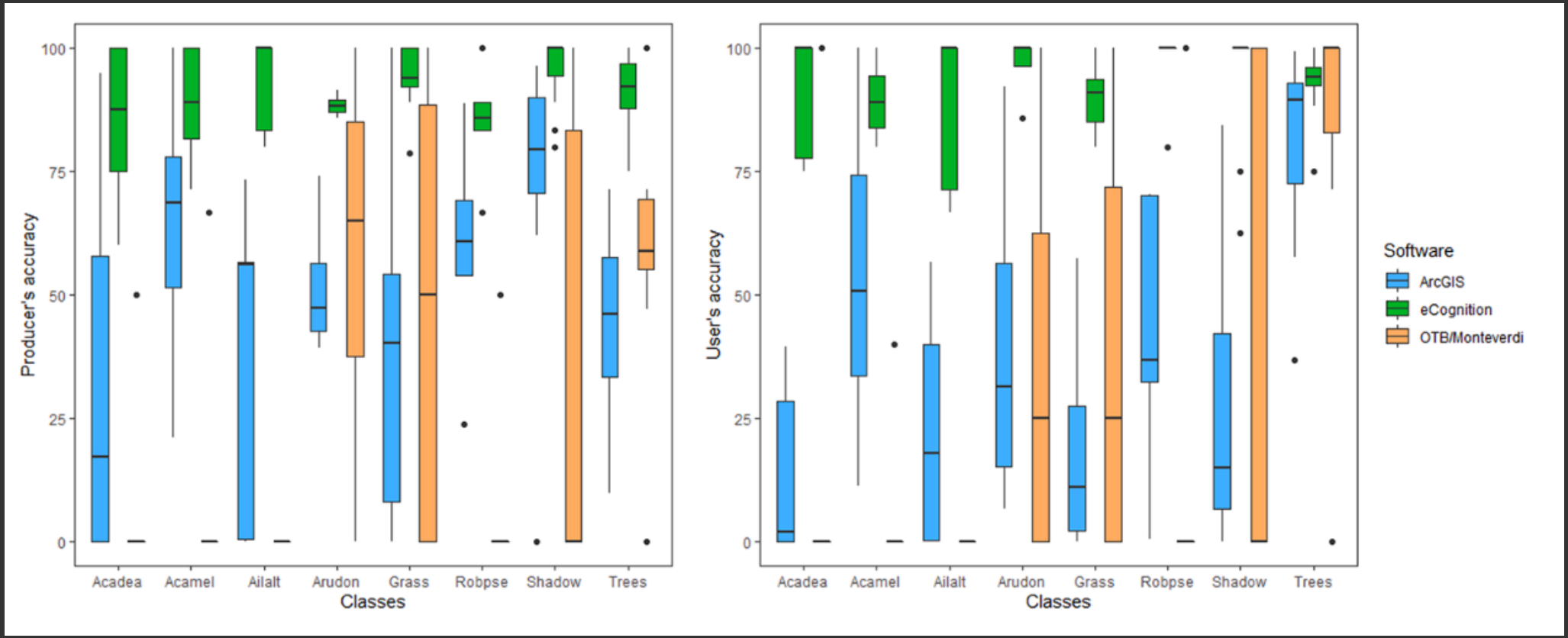


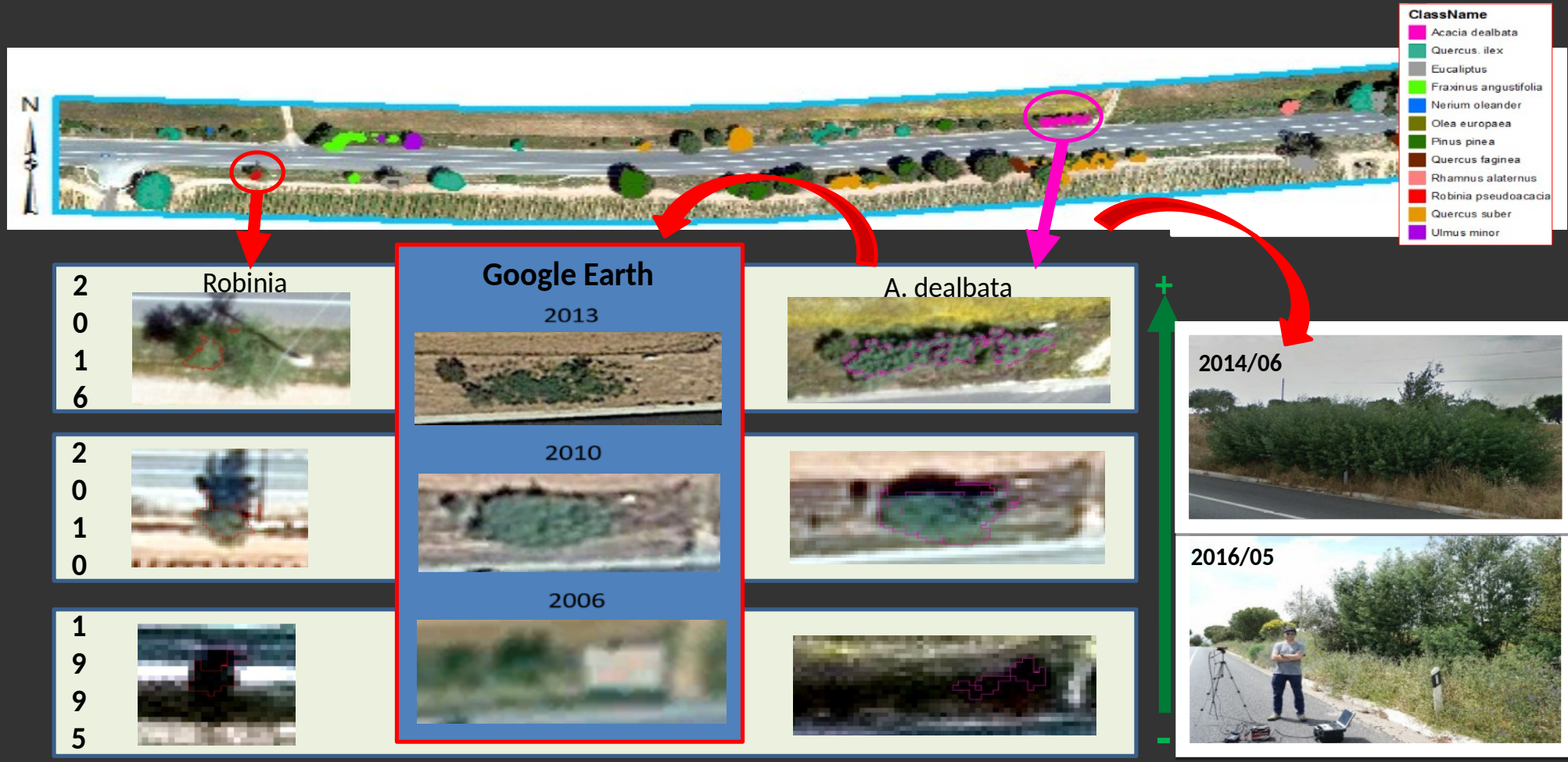

S1
Ailanthus altissima
S9
Arundo donax
S11
Ailanthus altissima
S14
Acacia dealbata

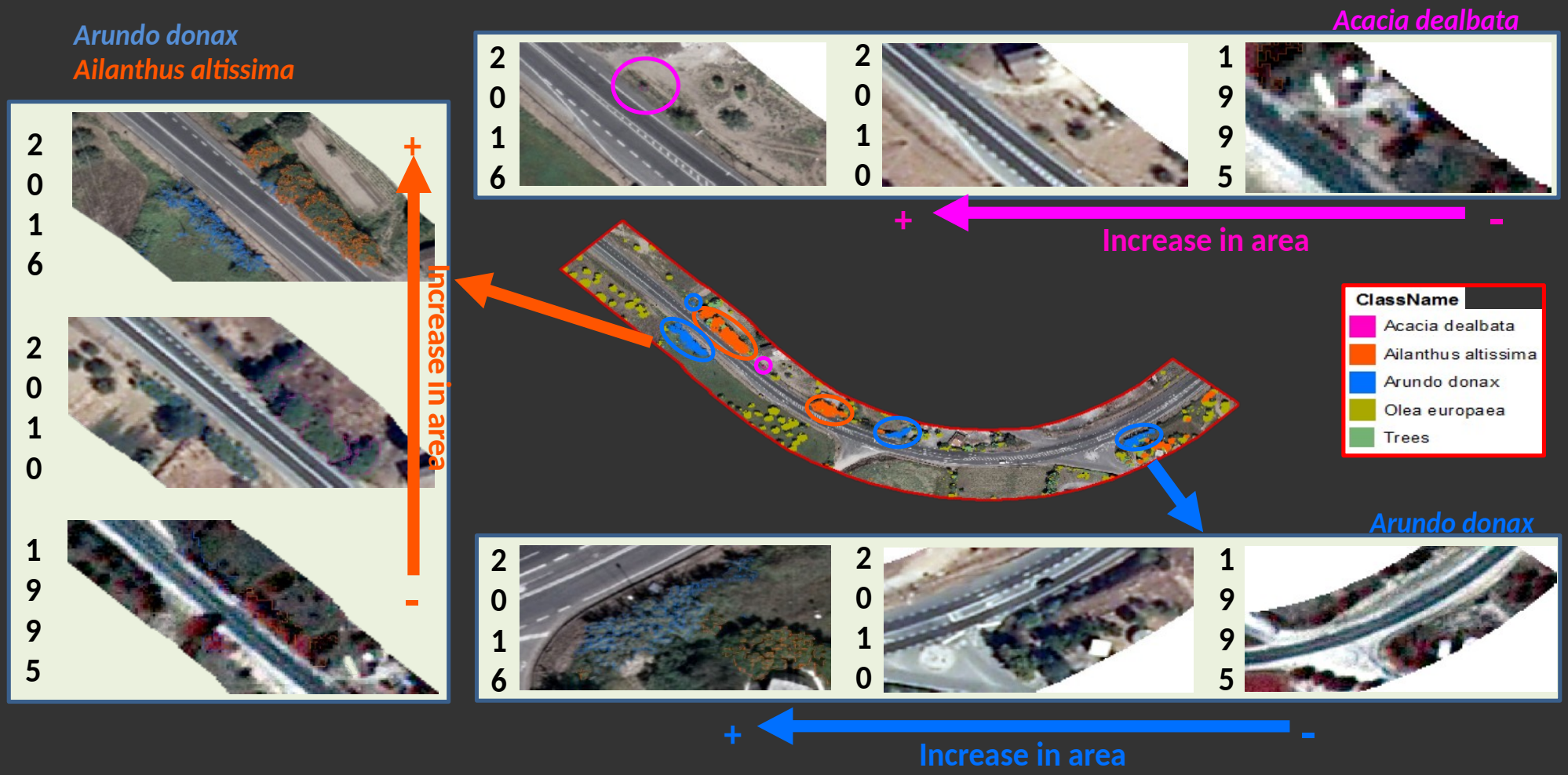

200
150
100
50
0
Digital Number
B1
B2
B3
B4
Bare soil
Arudon
Grass
Road
Shadow
Trees
Urban
Water


eCognition
ArcGIS
OTB/Monteverdi
N
0
50
100
m
Legend
A. dealbata
R. pseudoacacia
Trees
Grass
Shadow


%
75
50
25
Software
ArcGIS
eCognition
OTB/Monteverdi
Overall accuracy
%
75
50
25
0
Kappa
%
100
75
50
25
0
PA
%
100
75
50
25
0
UA


Producer's accuracy
User's accuracy
100
75
50
25
0
Acadea
Acamel
Ailalt
Arudon
Grass
Robpse
Shadow
Trees
Classes
Software
ArcGIS
eCognition
OTB/Monteverdi


ClassName
Acacia dealbata
Quercus. ilex
Eucaliptus
Fraxinus angustifolia
Nerium oleander
Olea europaea
Pinus pinea
Quercus faginea
Rhamnus alaternus
Robinia pseudoacacia
Quercus suber
Ulmus minor
N
Robinia
A. dealbata
Google Earth
2013
2010
2006
2016
2010
1995
2014/06
2016/05


Arundo donax
Ailanthus altissima
2016
2010
1995
+
-
Increase in area
Acacia dealbata
2016
2010
1995
+
-
Increase in area
ClassName
Acacia dealbata
Ailanthus altissima
Arundo donax
Olea europaea
Trees
Arundo donax
2016
2010
1995
+
-
Increase in area

- Invasive species expanded in the study area between 1995-2016 along the roads
- Expansion mainly close to anthropogenic areas
- *Arundo donax* expanded more than the other invasive species
- Invaded area duplicated between 1995 and 2016
- Human management hampered expansion by cutting down individuals
- Segmentation + 2-step classification provided better results
- Remote Sensing efficient tool to measure expansion of invasive species

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Assessing the performance of different OBIA software approaches for mapping invasive alien plants along roads with remote sensing data

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Obrigado!

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