

Combining remote sensing and hydrological information for improving hydrological characterization of dehesas in Mediterranean mountain areas: a study case in Cardena-Montoro Natural Park (Spain)

April, 30, 2021

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Introduction

- Mediterranean Mountain areas are especially vulnerable to changes
- Climatic trends points out to an increasing number of extreme events (e.g. number of heat waves and droughts) and consequently, a direct alteration of the hydrological states of their associated ecosystems

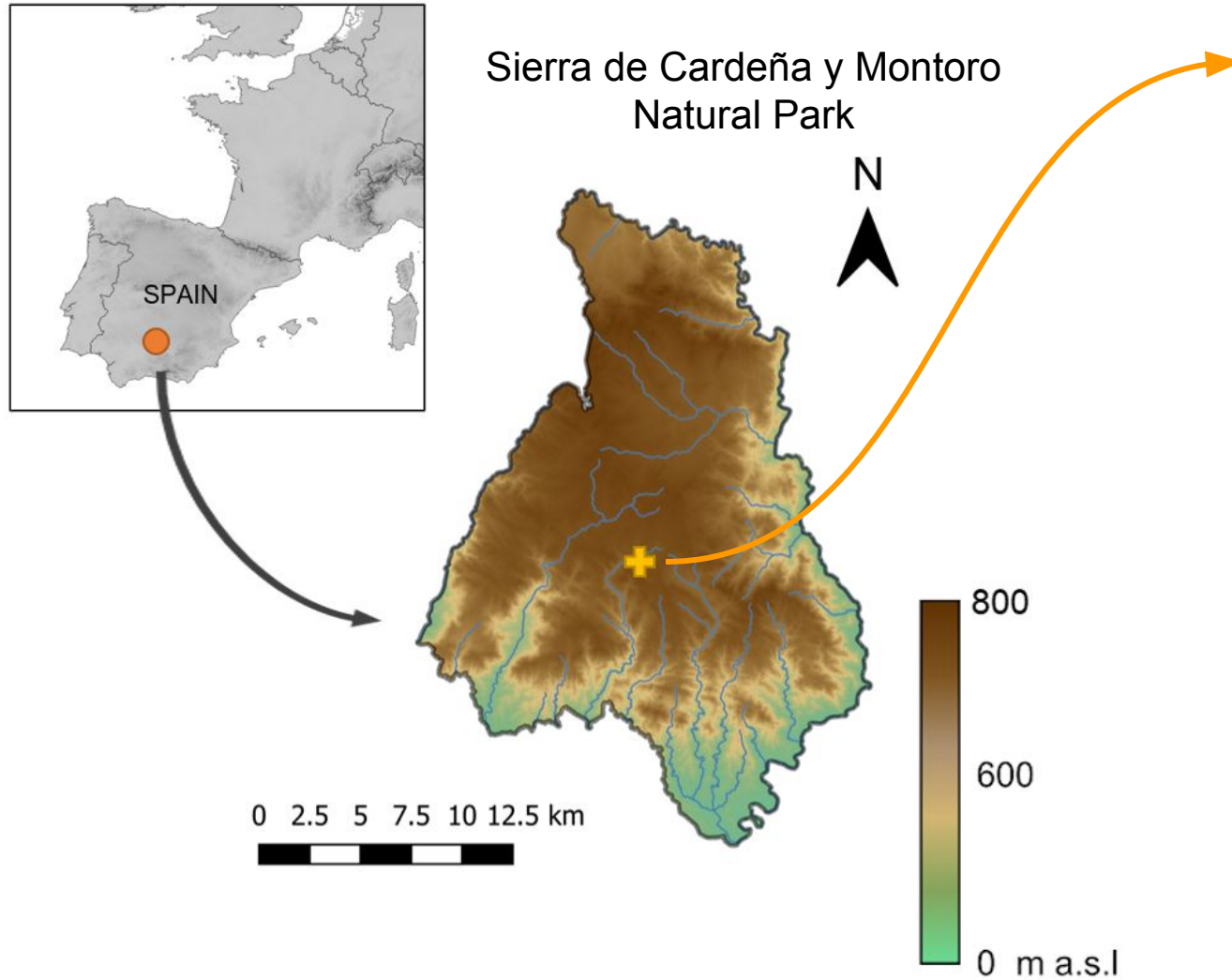
Dehesa

- co-evolution of indigenous ecosystems and human settlement in a sustainable balance
- Complex vegetation structure
 - Holm oak, cork oak and oak
 - Mediterranean shrubs
 - Pastures

This study proposes the combined use of satellite information, terrestrial imagery and hydrometeorological information as data sources for improving hydrological characterization of *dehesa* systems



Study Site



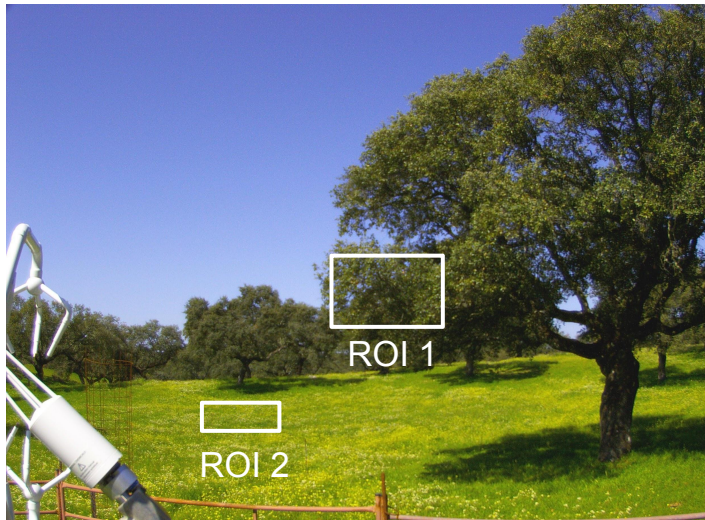
Santa Clotilde experimental site:

- Terrestrial camera
- Meteorological station



Methods and Data

1. TERRESTRIAL PHOTOGRAPHY



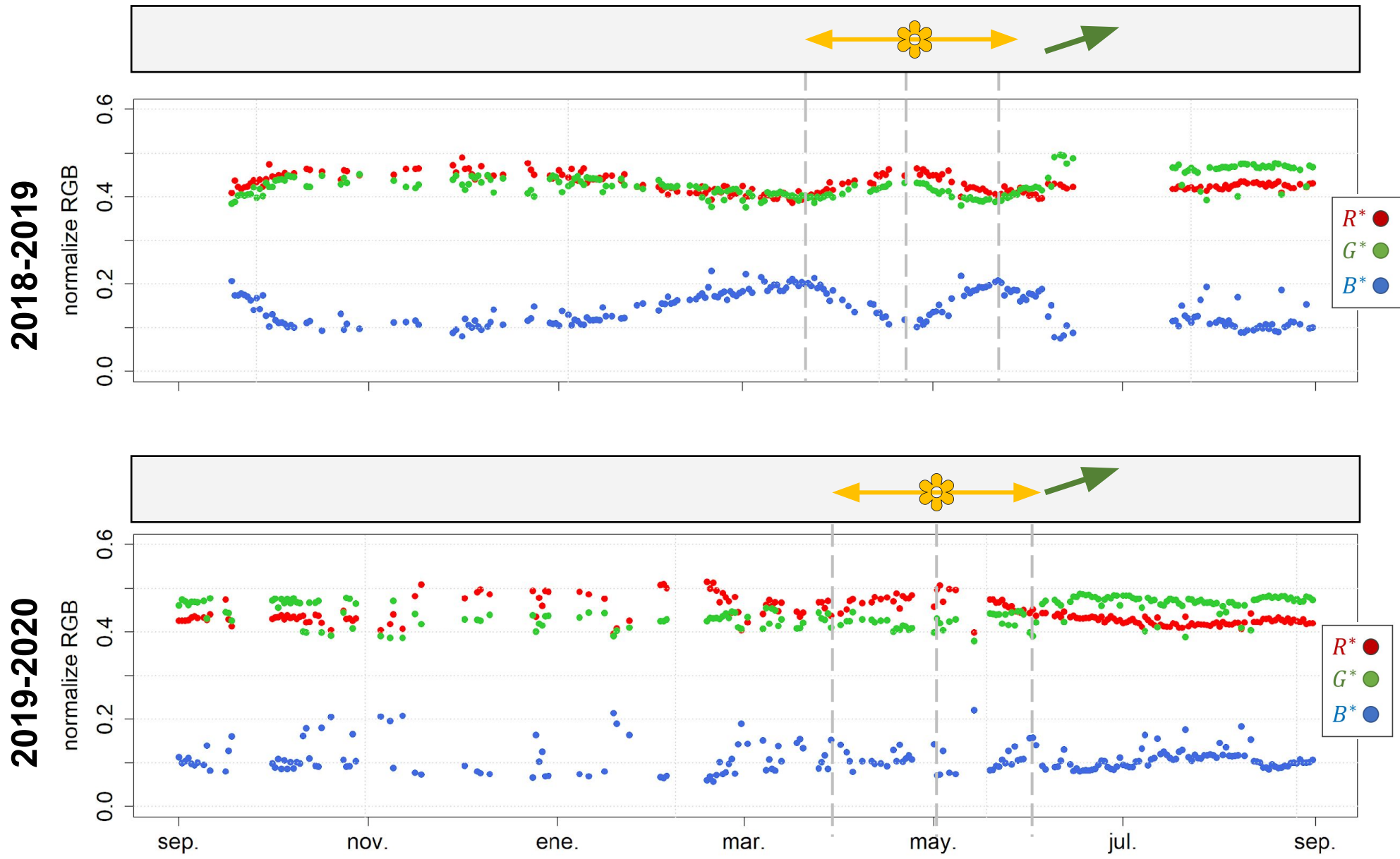
- Study Period: 2 hydrological years 2018-2019 and 2019-2020
- One image selected per day (457 images analyzed)
- Two targeted vegetation type:
ROI 1 - Holm Oak
ROI 2 - Pasture
- **Normalized values in each channel**

$$R^* = \frac{R}{R + G + B} \quad G^* = \frac{G}{R + G + B} \quad B^* = \frac{B}{R + G + B}$$

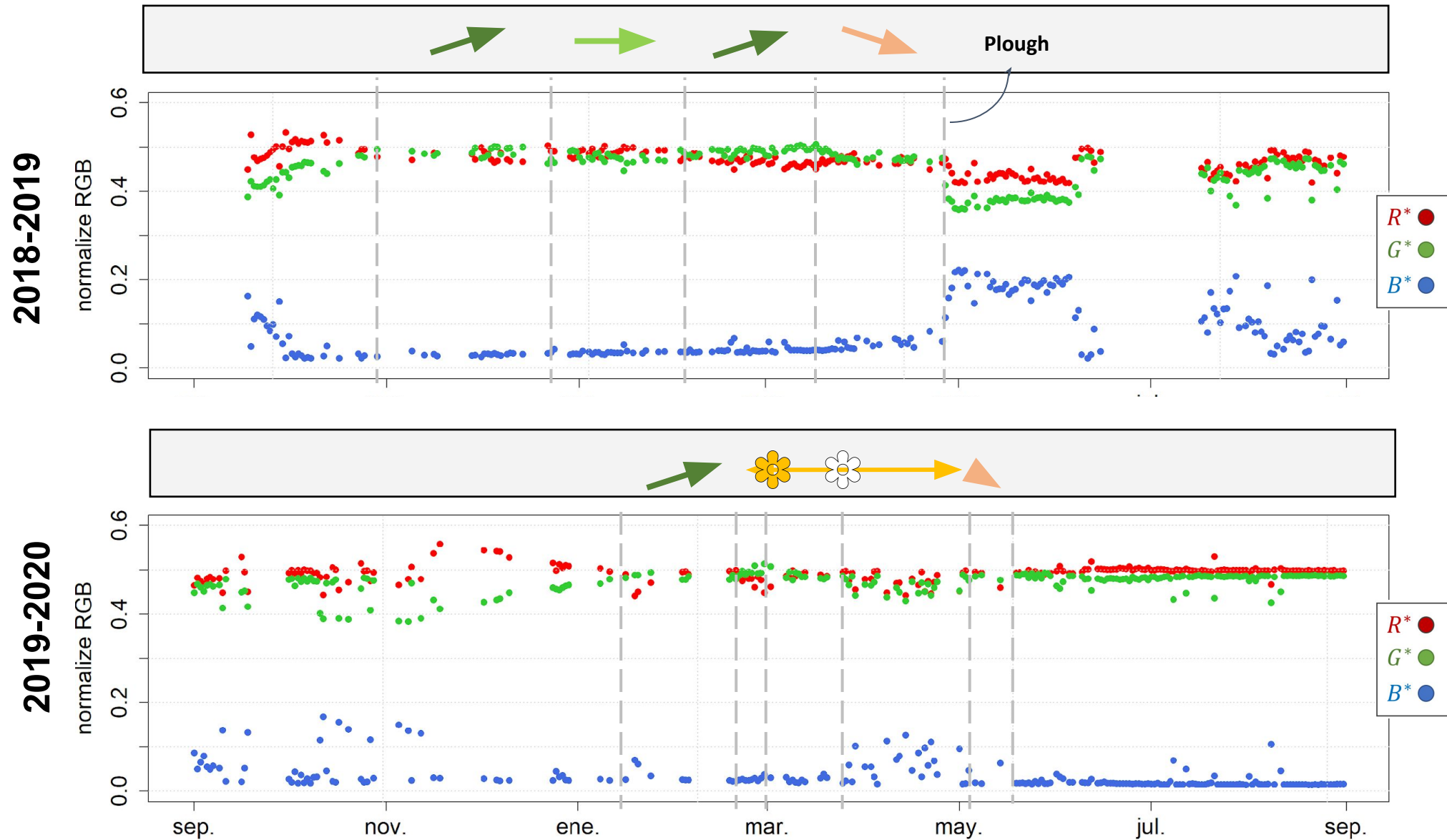
2. REMOTE SENSING

- Sentinel 2 - Level 2A (BOA)
- Study Period: 2 hydrological years 2018-2019 and 2019-2020
- One image selected per day (140 images analyzed)
- **2 pixel** analysed, corresponding with the area of terrestrial image
- **NDVI**

Results: Terrestrial Photography - Holm Oak

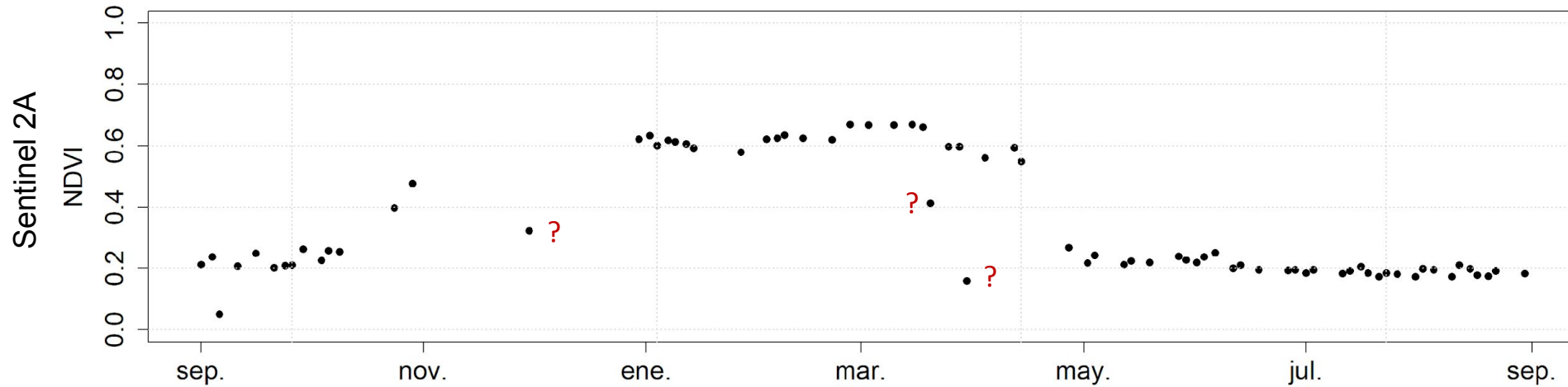


Results: Terrestrial Photography - Pasture



Results: Remote Sensing

2018-2019



Pasture

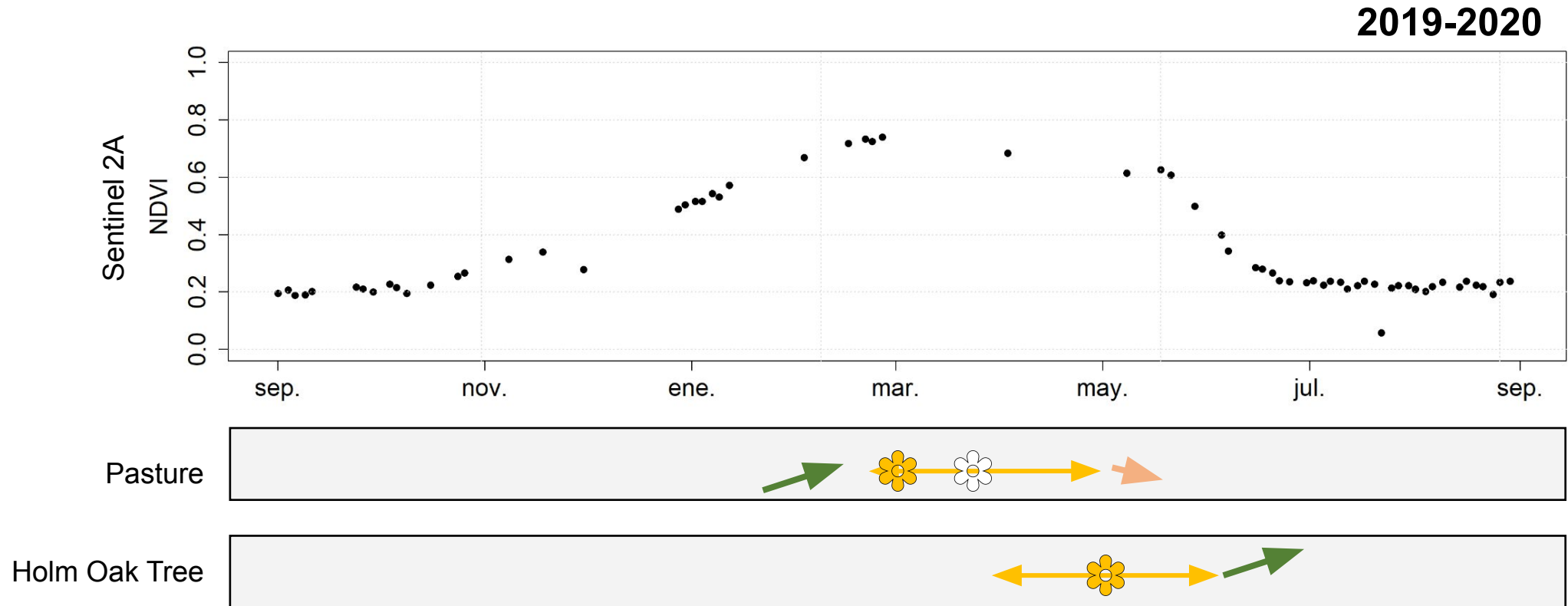


Holm Oak Tree



- In general NDVI dynamics are linked to the pasture evolution
- However, autumn' NDVI increase (nov) not directly linked to any change in the pasture but rather a modification in holm tree greenness due to precipitation during this month.
- Holm oak flowering seems not impact NDVI

Results: Remote Sensing



- Autumn' NDVI increase seems again not to be directly linked to any change in the pasture but rather a modification in holm tree greenness due to precipitation during this month.
- Not enough information to assess the impact of the flowering in the pasture during this year.

Conclusions

- Terrestrial photography complements the information provided by traditional satellite remote sensing
 - Improving spatiotemporal resolution
 - Improving subpixel scale information understanding (e.g. the contributions of different vegetation types to the whole pixel value)
- Terrestrial photography allows to capture not only vegetation dynamics but also phenological states of the vegetation as the flowering and linked them to hydrological changes



This work has been funded by project SIERRA Seguimiento hídrológico de la vEgetación en montaña mediteRránea mediante fusión de sensores Remotos en Andalucía), with the economic collaboration of the European Funding for Rural Development (FEDER) and the Office for Economy, Knowledge, Enterprises and University of the Andalusian Regional Government. Rafael Pimentel acknowledges funding by the the Juan de la Cierva Incorporación program of the Ministry of Science and Innovation (IJC2018-038093-I)

Thank you!

