HARMONIOUS

UAS Techniques for Environmental Monitoring

Salvatore Manfreda – Valencia 15 February 2018

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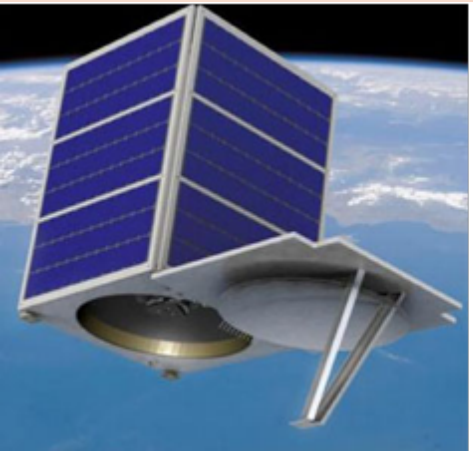
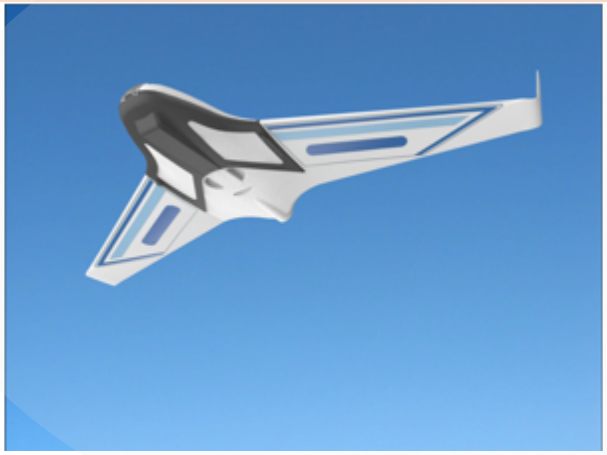
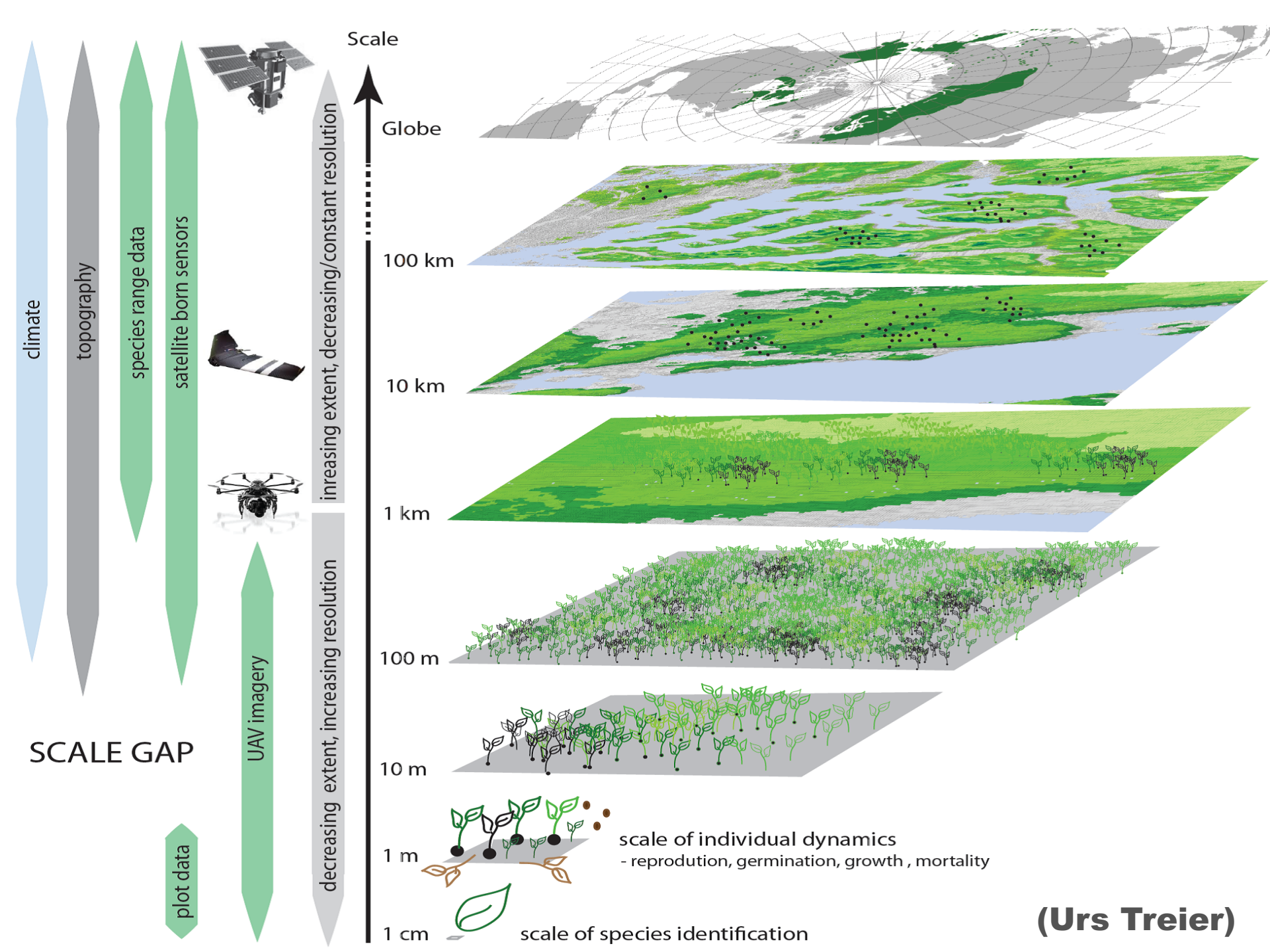
cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

Funded by the Horizon 2020 Framework Programme
of the European Union

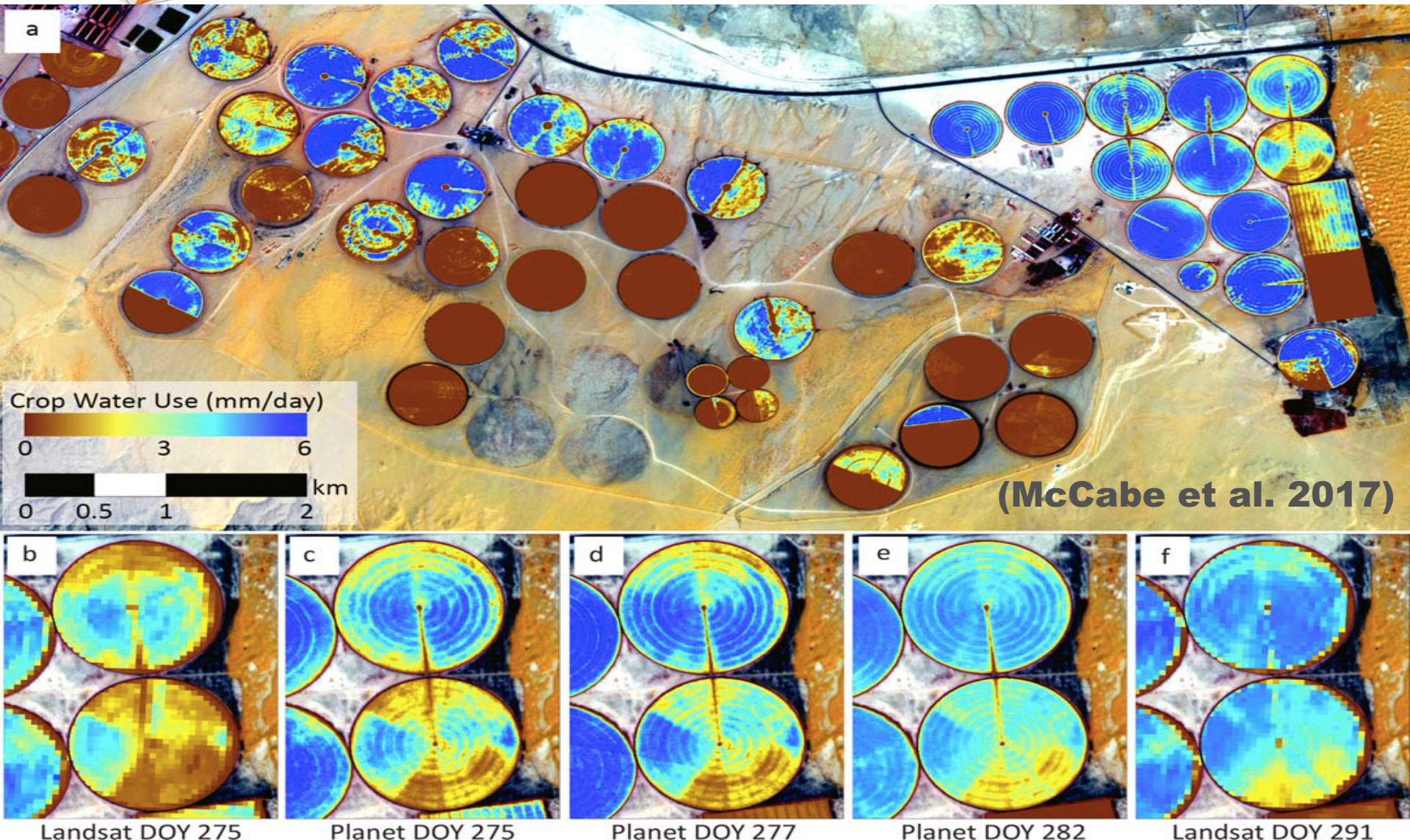
Environmental Monitoring

Global	Few hectars	Few m^2
		
Up to 30cm	Up to 1cm	Up to 1cm

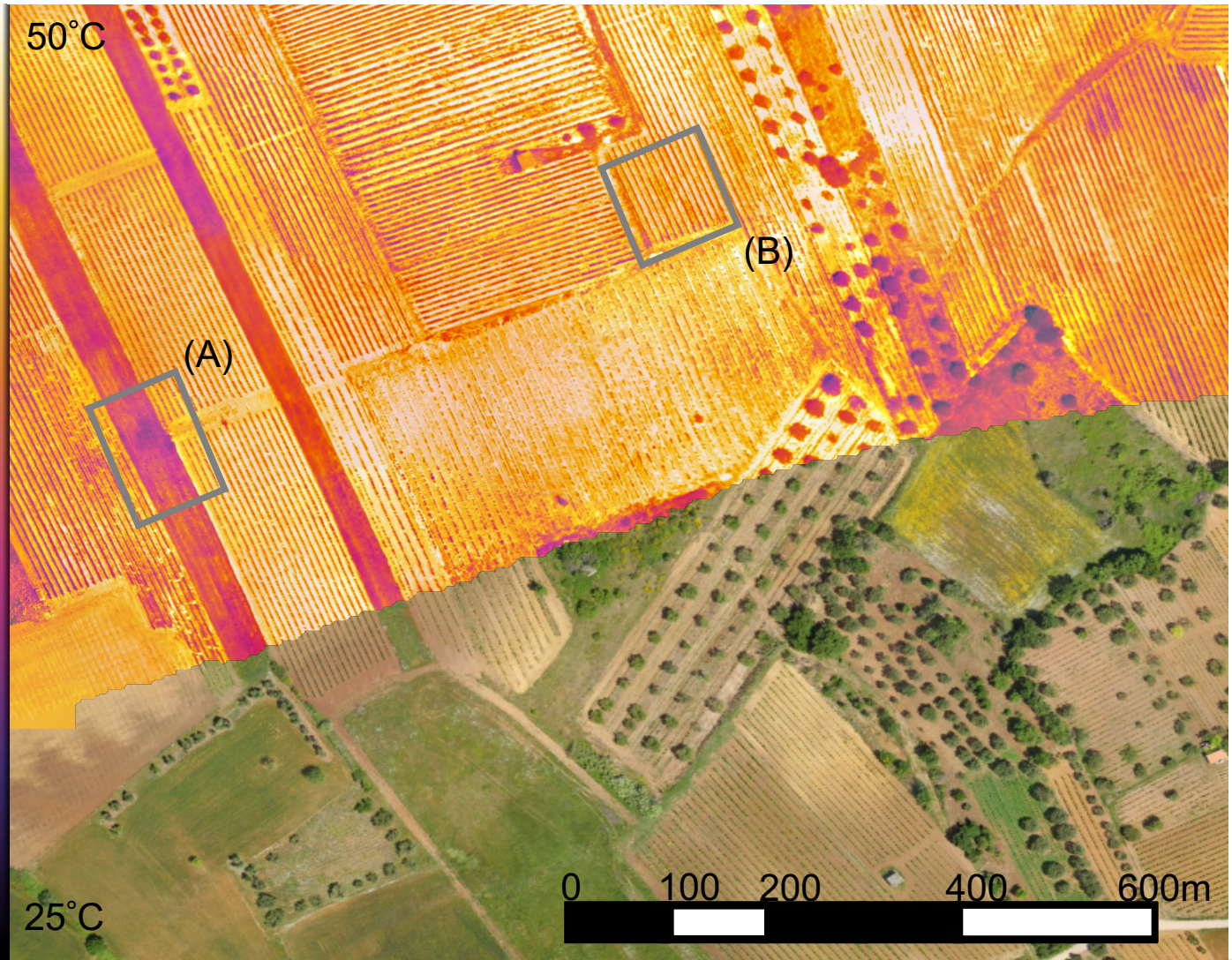
Comparable Scales


Scale
climate
topography
species range data
satellite born sensors
UAV imagery
plot data
inreasing extent, decreasing/constant resolution
decreasing extent, increasing resolution
SCALE GAP
Globe
100 km
10 km
1 km
100 m
10 m
1 m
1 cm
scale of individual dynamics
- reprodution, germination, growth , mortality
scale of species identification
(Urs Treier)

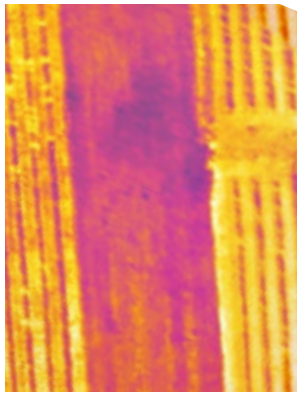
CubeSat-LAI


a
Crop Water Use (mm/day)
0
3
6
km
0
0.5
1
2
(McCabe et al. 2017)
b
c
d
e
f
Landsat DOY 275
Planet DOY 275
Planet DOY 277
Planet DOY 282
Landsat DOY 291

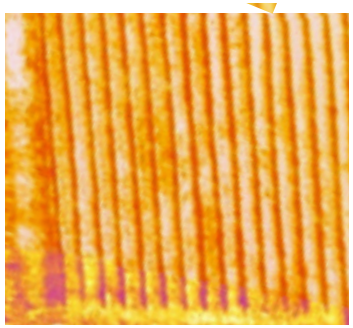
UAS thermal survey over an Aglianico vineyard in the Basilicata region (southern Italy)



(A)

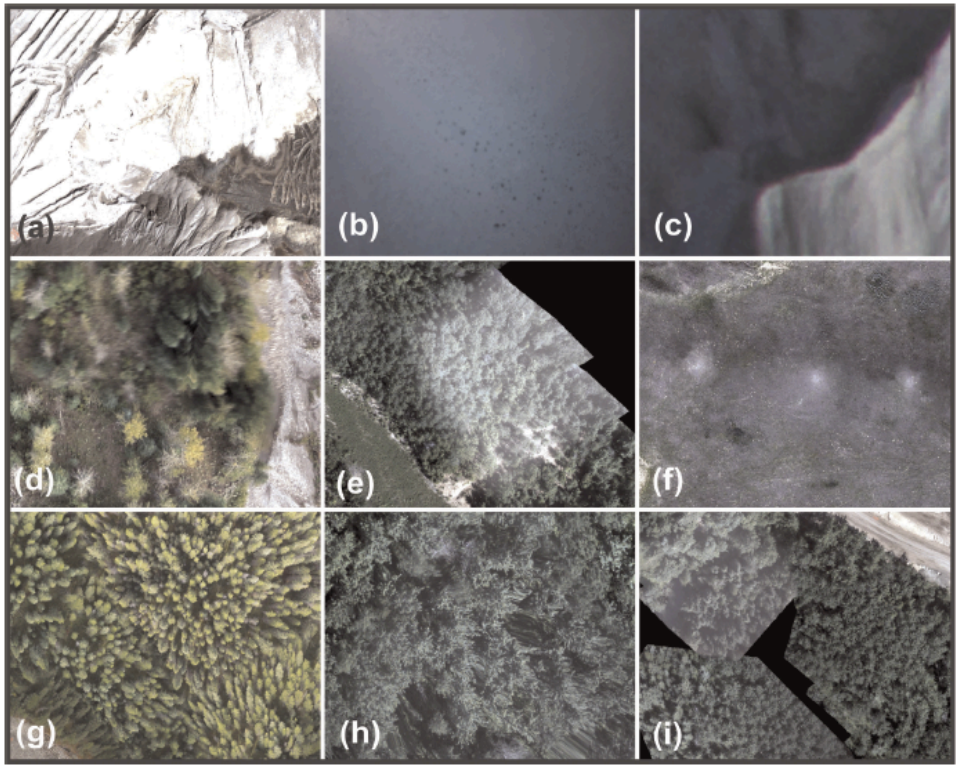


(B)



0 40 80 120m

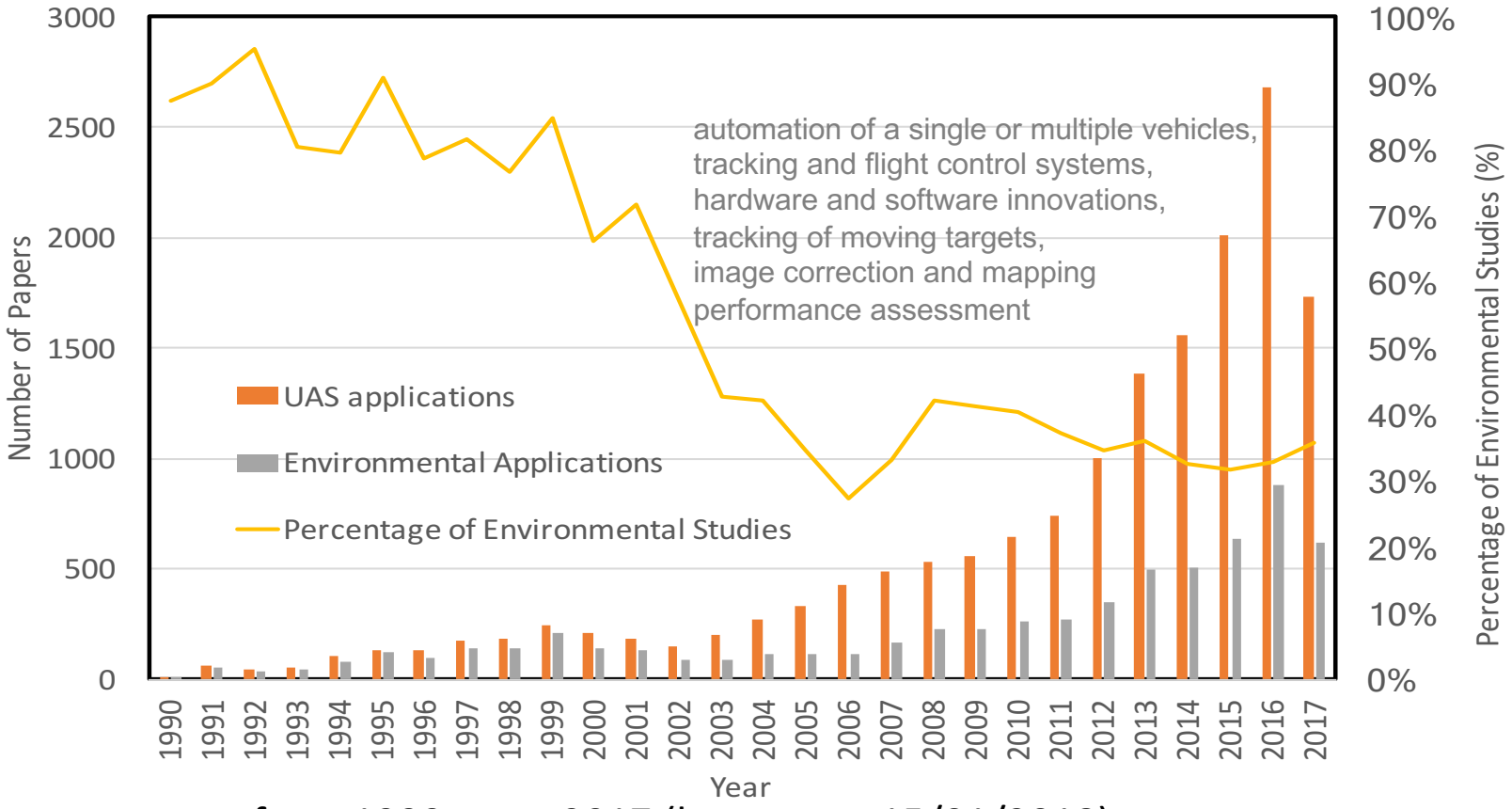
Examples of Common image artifacts



(Whitehead and Hugenholtz, 2014)

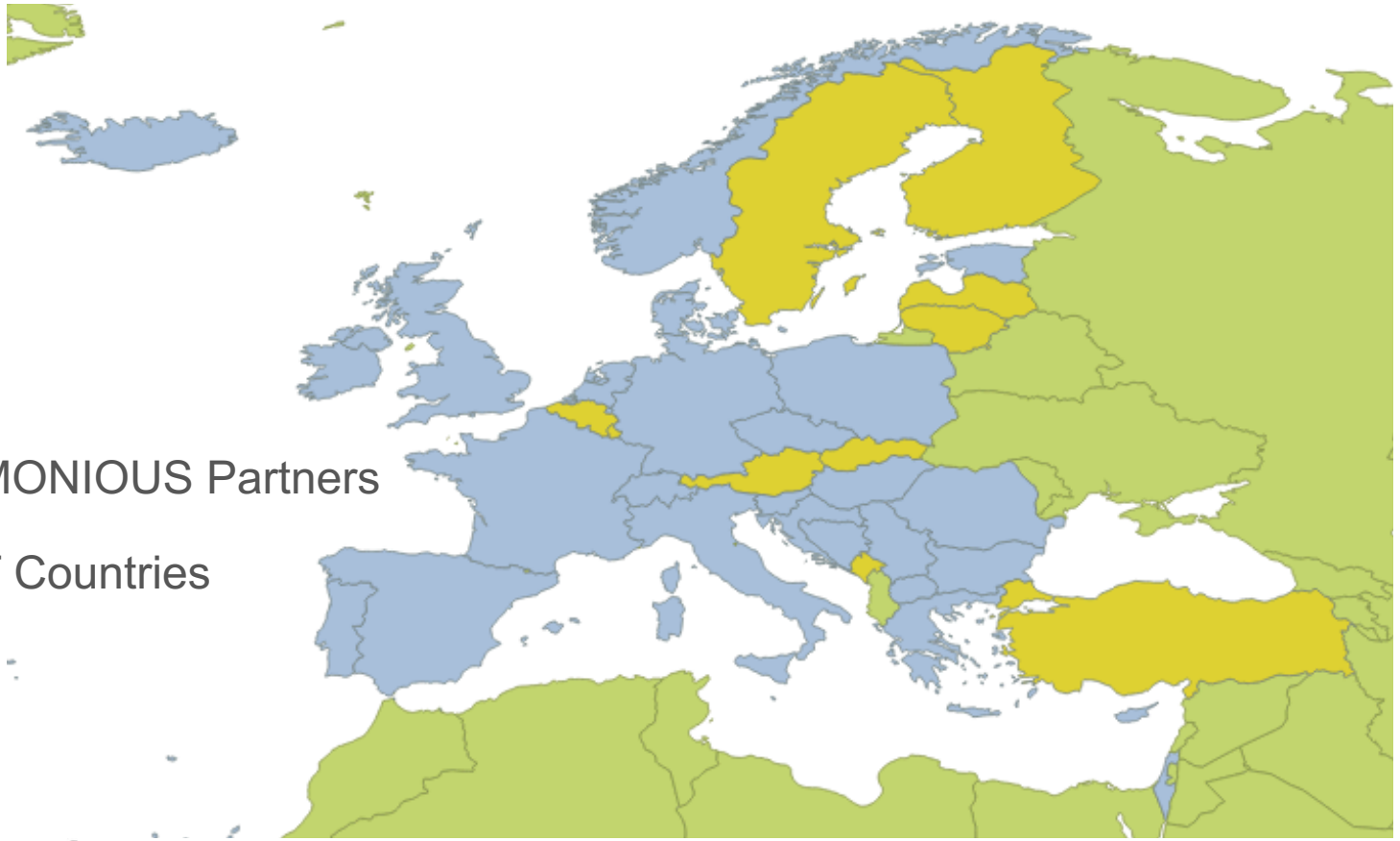
a) saturated image;
b) vignetting;
c) chromatic aberration;
d) mosaic blurring in overlap area;
e) incorrect colour balancing;
f) hotspots on mosaic due to bidirectional reflectance effects;
g) relief displacement (tree lean) effects in final image mosaic;
h) Image distortion due to DSM errors;
i) mosaic gaps caused by incorrect orthorectification or missing images.

Number of articles extracted from the database ISI web of knowledge



from 1990 up to 2017 (last access 15/01/2018)

HARMONIOUS Network



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31 Partners

Action Chair Salvatore Manfreda
Vice Chair Brigitta Toth
Science Communications Manager: Guiomar Ruiz Perez
STSM coordinator: Isabel De Lima
Training School Coordinator: Giuseppe Ciraolo

WG1: UAS data processing

Leader Pauline Miller
Vice leader Victor Pajuelo Madrigal

WG2 Vegetation Status

Leader Antonino Maltese
Vice leader Felix Frances

WG3 Soil Moisture Content

Leader Zhongbo Su
Vice leader David Helman

WG4

Leader Matthew Perks
Vice leader Marko Kohv

River morphology

Stream flow

Geometric Correction and image calibration

Contrast Enhancement

WG5: Harmonization of methods and results

Leader Eyal Ben Dor
Vice leader Flavia Tauro

Harmonization different procedures and algorithms in different environments

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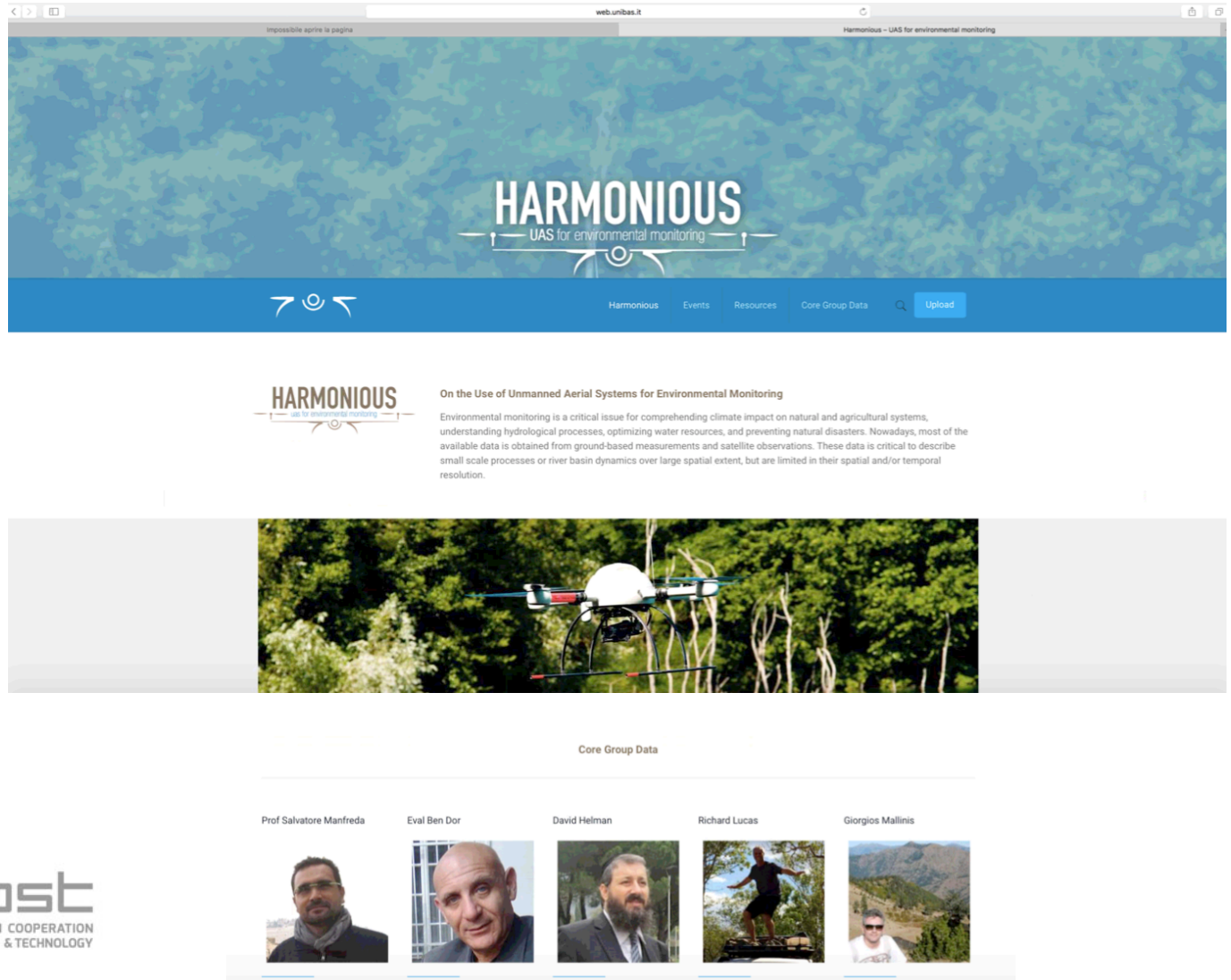
uas for environmental monitoring

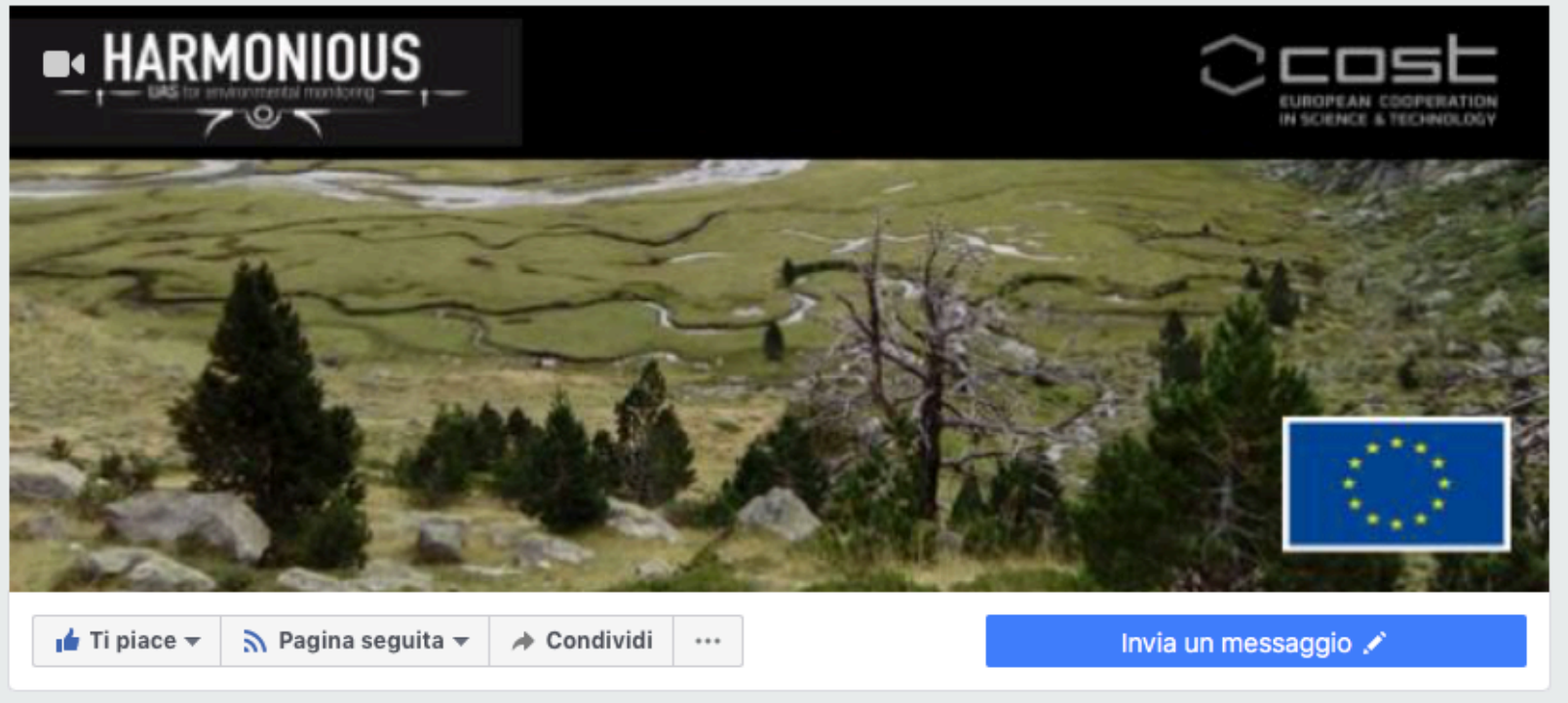
The Home Page



Twitter on February 14

https://twitter.com/COST_HARMONIOUS

Facebook Harmonious-European-COST-Action



70 followers on facebook

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https://www.facebook.com/Harmonious-European-COST-Action-485412205186817/

Activities Summary

- N. 1 Workshop - two days (50 participants)
- N. 1 MC within the Workshop
- N. 1 Training Course (20 participants)
- N. 2 Core group meetings (10 participants)
- N. 5 WG meeting (8 participants)
- N. 3 STSM of 2 weeks
- N. 12 STSM of 1 week

Session 1

8:45-10:30 – Session 1 - UAS for Environmental Monitoring [Convener Pauline Miller]

[8:45-9:00] ***HARMONIOUS COST Action: challenges and opportunities*** **- Salvatore Manfreda** (Chair)**, Brigitta Toth** (Vice Chair)

[9:00-9:15] ***UAV-based monitoring of grasslands: Experiences using accessible technology and techniques*** **- Joel Forsmoo** (University of Exeter, UK) - Invited

[9:15-9:30] ***Development of European and Spanish regulations for RPAS. Progress and future perspectives***. **Israel Quintanilla**, (Universitat Politecnica de Valencia, Spain)

[9:30-9:45] ***State of the art of the Wageningen University and Research-Unmanned Aerial Remote Sensing Facility and its applications and challenges in agriculture and nature*** **- Sander Mucher** (Wageningen Environmental Research, Netherlands)

[9:45-10:00] ***GRONE Project : a cross-border cluster for UAV-based services*** **- Thomas Beco (**University of Liege, Belgium)

[10:00-10:15] ***The importance of altimetry in the UAV missions design*** **- Miguel A. Manso** (Universidad Politecnica de Madrid, Spain)

[10:15-10:30] **Soil spectral library for quantitative mapping of the soil surface - Eyal Ben Dor** (Tel Aviv University, Israel)

Session 2

11:00-13:30 – Session 2-UAS for Vegetation Monitoring [Convener Antonino Maltese]

[11:00-11:15] ***New UAVs opportunities for ecology and agriculture*** **- Xurxo Gago** (University of Balearic Islands, Spain) – Invited

[11:15-11:30] ***Detection of forest windthrow areas by unmanned aircraft system with RTK*** **- Martin Mokroš** (Technical University in Zvolen, Slovakia)

[11:30-11:45] ***Assessing the ability of hybrid poplar for in-situ phytoextraction of cadmium by using UAV–photogrammetry and 3D flow simulator*** **- Nunzio Romano** (University of Naples"Federico II", Italy)

11:45-12:00] ***Vegetation monitoring in Iceland using UAV´s*** **- Victor Madrigal**, Bryndís Marteinsdóttir [(Svarmi-The Soil Conservation Service of Iceland, Iceland)

[12:00-12:15] ***Combining measurements for drought by UAS thermal platform*** **- Jesper Svensgaard** (University of Copenhagen, Denmark)

[12:15-12:30] ***From below to aboveground: Using and up scaling the bioindicator potential*** **- Maria Tsiafouli** (Aristotle University of Thessaloniki, Greece)

[12:30-12:45] ***Remote-sensing assessment of selected urban forest parks in Karlovo region-*** S. Dimitrov, V. Chepisheva, M. Zhiyanski**, Ivaylo Tsvetkov** (Sofia University, Bulgaria)

[12:45]-13:00] ***Unmanned aircraft for alien plant species detection and monitoring*** **- Petr Dvořák (**Brno University of Technology, Czech Republic)

[13:00-13:30] Discussion

Session 3

15:00-17:30 –Session 3 – UAS for Hydrological Monitoring [Convener Bob Su]

[15:00-15:15] ***Obtaining soil hydraulic parameters to enhance soil moisture prediction with UAS*** **– Brigitta Toth** (Hungarian Academy of Science, Hungary)

[15:15-15:30] ***Using infrared thermography towards optimizing water use in irrigated agriculture*** **- Isabel Pedroso De Lima** (University of Coimbra, Portugal)

[15:30-15:45] ***On the use of remote sensed soil moisture data in spatio-temporal model calibration for a Mediterranean catchment***, **Carlos Echeverria**, Félix Francés (Universidad Politécnica de Valencia, Spain)

[15:45-16.00] ***Calibration and Validation methodologies for SMOS/SMAP*** **- Bob Su** (University of Twente, Netherlands)

[16:00-16.15] ***Surface soil water content mapping using thermal images: limits and advantages*** **- Antonino Maltese,** Giuseppe Ciraolo (University of Palermo, Italy)

[16:15-16:30] ***Field experiences on stream flow monitoring by UAS*** **- Flavia Tauro** (University of Tuscia, Italy)

[16:30-16:45] ***Exploring the optimal experimental setup for surface flow velocity measurements using PTV*** **- Salvatore Manfreda** (University of Basilicata, Italy)

[16:45-17:30] Discussion and Closure