

Joint Workshop of the GOFC-GOLD SCERIN and MedRIN Networks

CIHEAM conference center, Chania, Greece, July 16 – July 19, 2024

Land Cover Change (LCC) and Extreme Events in the Context of Climate Change

Mediterranean Agronomic Institute of Chania

Region of Crete

Eratosthenes Center of Excellence, Cyprus University of Technology

Aristotle University of Thessaloniki

NASA LCLUC Program

GOFC-GOLD and START, USA



Monitoring of the European mistletoe distribution using airborne remote sensing data

Yuliya Kraslyenko¹, Azim Missarov², Tomáš Cihák³, Olga Brovkina⁴

¹ Department of Biotechnology, Faculty of Science, Palacký University Olomouc, Šlechtitelů , 27, 78371 Olomouc, Czech Republic

² The Silva Tarouca Research Institute, Lidická 25/27, 602 00 Brno, Czech Republic

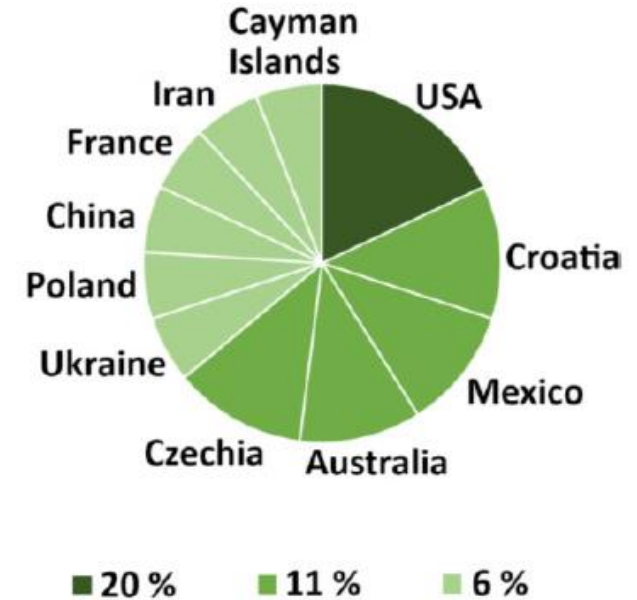
³ Forestry and Game Management Research Institute, Strnady 136, 252 02 Jiloviště, Czech Republic

⁴ Global Change Research Institute CAS, Bělidla 4a, 603 00 Brno, Czech Republic

Mistletoes are a heterogeneous group of obligate aerial **hemiparasitic** angiosperms in the order Santalales (~1600 species) that produce morphologically diverse root-like structures (i.e., haustoria), allowing them to **procure water, dissolved nutrients, and photosynthates** from their host's vascular system



Distribution of mistletoe studies using remote sensing methods published during 2007–2023



Aircraft

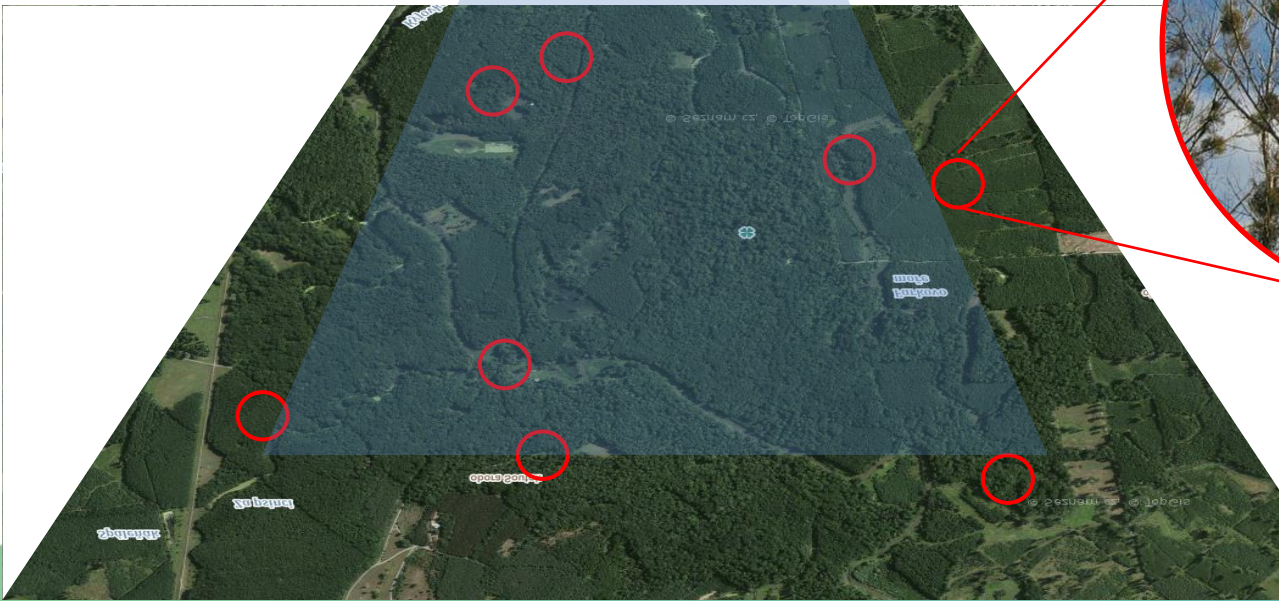


- Forest structure
 - Species composition
 - Tree density
 - Tree height
 - Dead trees
- Mistletoe “hot spots”
- Digital Terrain Model

UA



- Mistletoe type
- Mistletoe structure



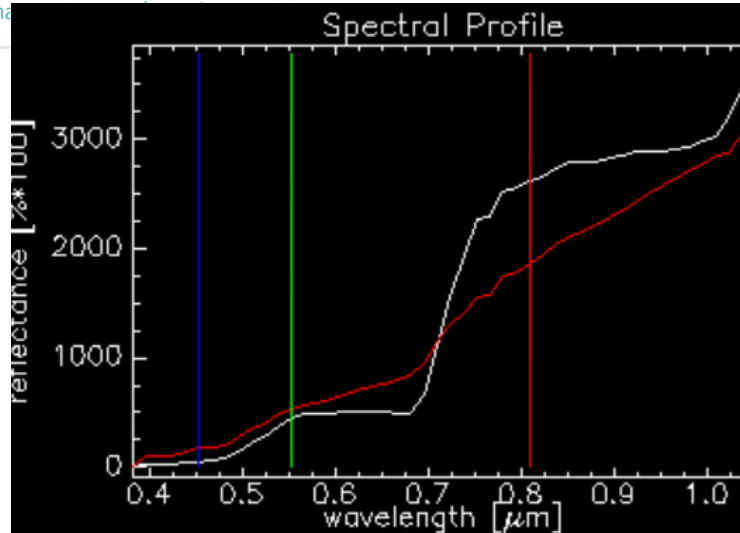
TLS



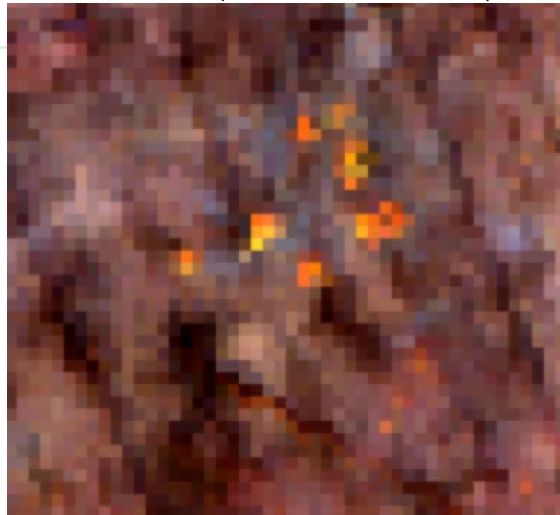
- Tree mechanical stability

March 23d

Spectral Profile



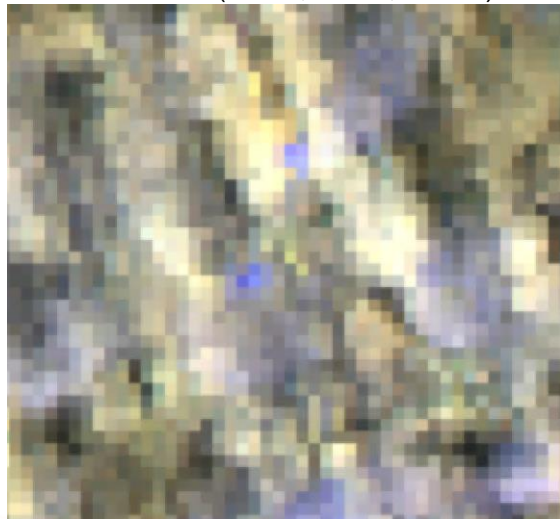
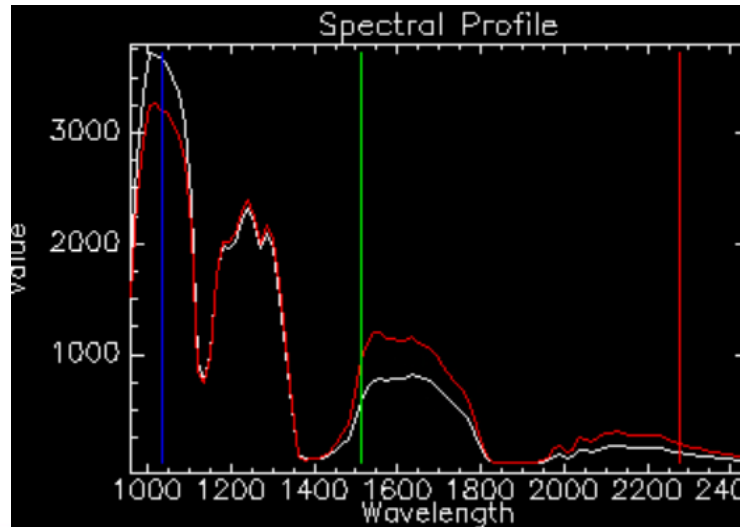
NIR (0.809, 0.553, 0.453)



RGB (0.650, 0.550, 0.453)



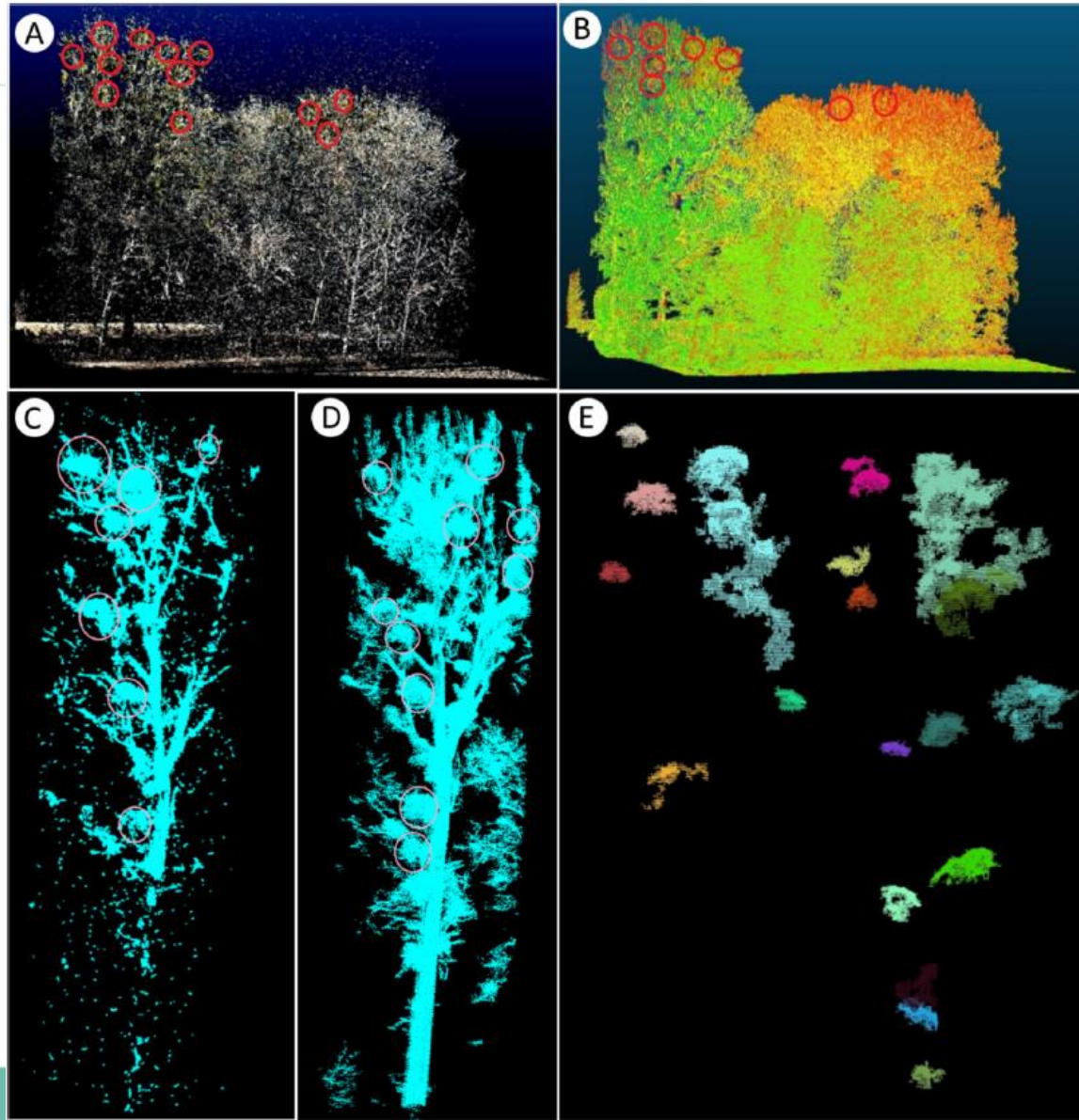
SWIR (2.278, 1.512, 1.032)



**Examples from FLIS
(Flight Laboratory of Imaging Systems)**

European mistletoe (*Viscum album*) infestation on poplars by structure from motion (SfM) versus light detection and ranging (LiDAR) scanning (mistletoes are incorporated into red circles)

- (A) SfM point cloud;
- (B) LiDAR point cloud;
- (C) individual tree in SfM point cloud;
- (D) individual tree in LiDAR point cloud;
- (E) jointed approach resulting in the set of clusters.



The **research** address the following **questions** for improving remote mistletoe detection:

- (i) What image resolution is sufficient to perform the recognition and identification of the phenological phase of mistletoes?
- (ii) Are multi-angular imagery (i.e., taking from different viewing angles) versus top-down (nadir) images crucial for mistletoe remote research?
- (iii) Is the spectral signal consistent throughout the year, which is crucial because some mistletoes are deciduous and are not much visible in wintertime.
- (iv) Do we require big-budget hyperspectral data or is easy-accessible VNIR data (mostly) sufficient?
- (v) Move beyond simple mapping/detection: can we assess the health and growth vigour of the mistletoe with VNIR imagery?

Thank you for your attention!



Horizon Europe projects



AQUARIUS

- Aquatic ecosystems
- Eurofleets
- Trans National Access (TNA)
- 1st Call 11.11.2024
- 100k €



AgroServ

- Agro ecosystems
- Anaee
- Trans National Access (TNA)
- 2nd call 27.6.2024 (open)
- 180k € (65k €)



Danubius

- Aquatic ecosystems
- Danubius ESFRI
- Test-Run activities
- 2nd call 3.6.2024 (open)
- 100k € (100k €)