DIARS

Detection of invasive plant species and assessment of their impact on ecosystem properties through remote sensing

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BACKGROUND

- **biological invasions**
  - Need for warning and rapid response systems
  - Included in biodiversity conservation policy of the European Commission
- **Field-based approaches**
  - time consuming
  - potentially subject to observation bias.
- **Remote sensing** provides systematic, objective, and synoptic view on Earth cover
  - largely underexplored and underused by invasion biologists

DIARS in a nutshell

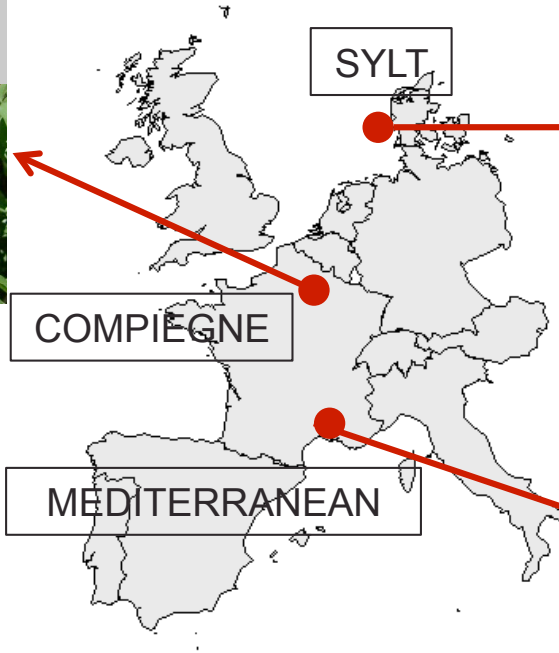
- Duration: three-year project (2014-2016)
- Budget: 784 kEUR
- objectives
  - Assess impact of invasive plant species on ecosystem, combining field and remotely sensed data.
  - Support management measures to mitigate invasive species by:
    - Monitoring
    - Prediction of spread
    - Risk assessment

STUDY AREAS AND SELECTED SPECIES

» **different plant life forms** - a bryophyte, an herbaceous species and a tree species - and **three different ecoregions**

Prunus serotina

(Black cherry)

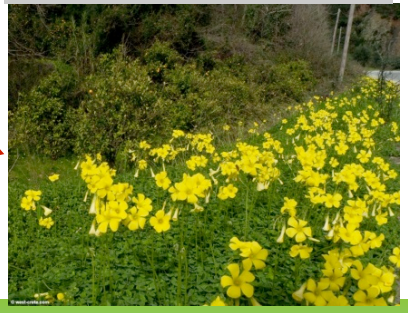


Campylopus introflexus

(Heath star moss)

Oxalis pes-caprae

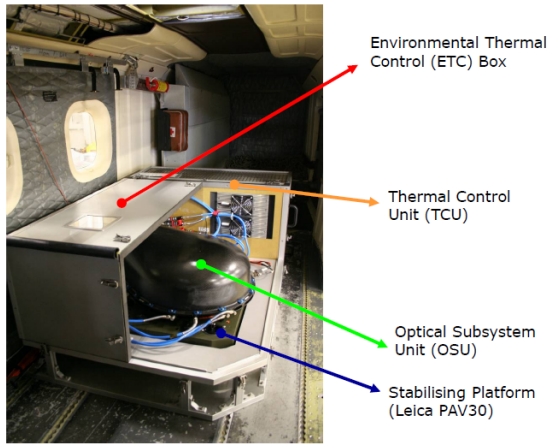
(Bermuda buttercup)

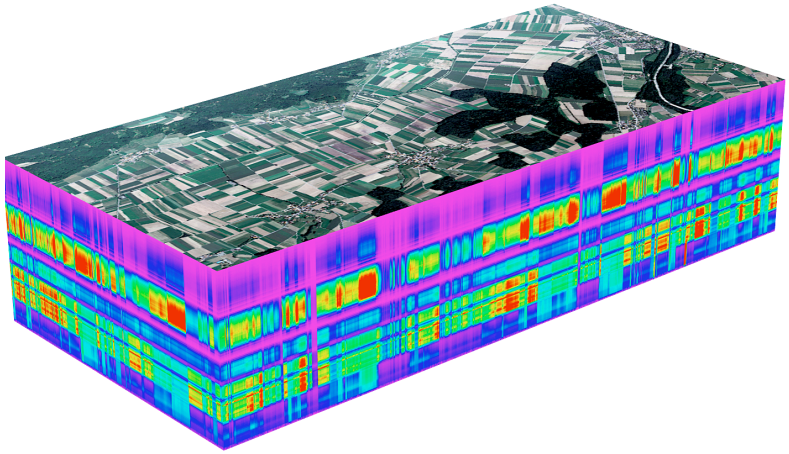


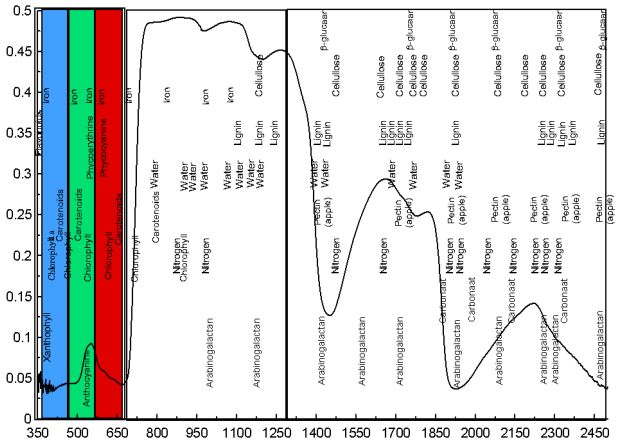
DATA: REMOTE SENSING DATA

- **high spectral similarity** of different co-occurring plant species poses difficulties to map individual plant species
- Fusion of **hyperspectral imaging** and **light detection and ranging (LiDAR)** – offers crucial advantages

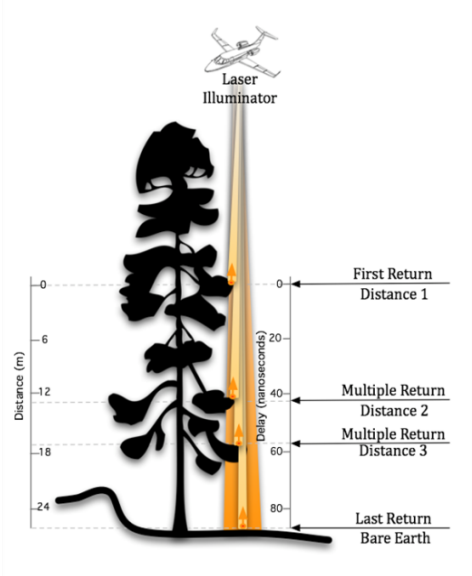
- **Airborne hyperspectral data from APEX**
  - Over 200 spectral bands from 350-2500 nm
  - Spatial resolution 2-3 m
  - Typical use:
    - retrieving bio-chemical parameters of vegetation
    - Discriminating subtle differences between species

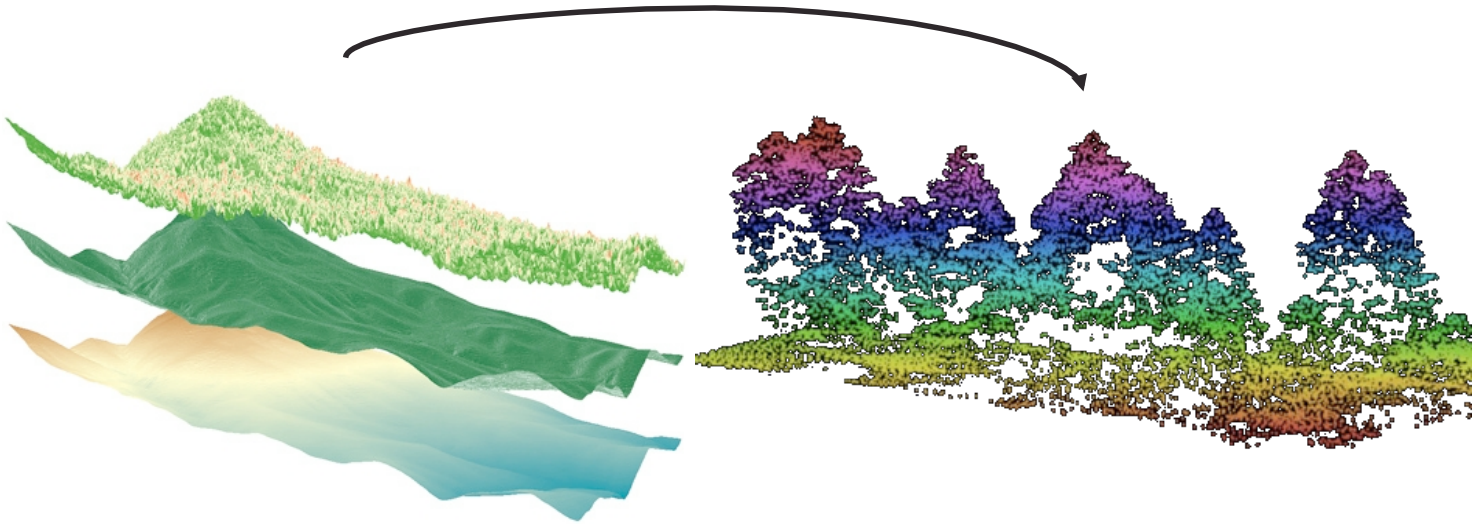






- High-density **LiDAR** provides information on
  - Terrain model (topography)
  - 3-D canopy structure





DATA: FIELD DATA

- Species cover
- Above ground biomass
- Leaf chemistry (N,P,C,chlorophyll, lignin, tannin, phenol, specific water content)
- Soil nutrient analysis
- In situ ASD (spectral) measurements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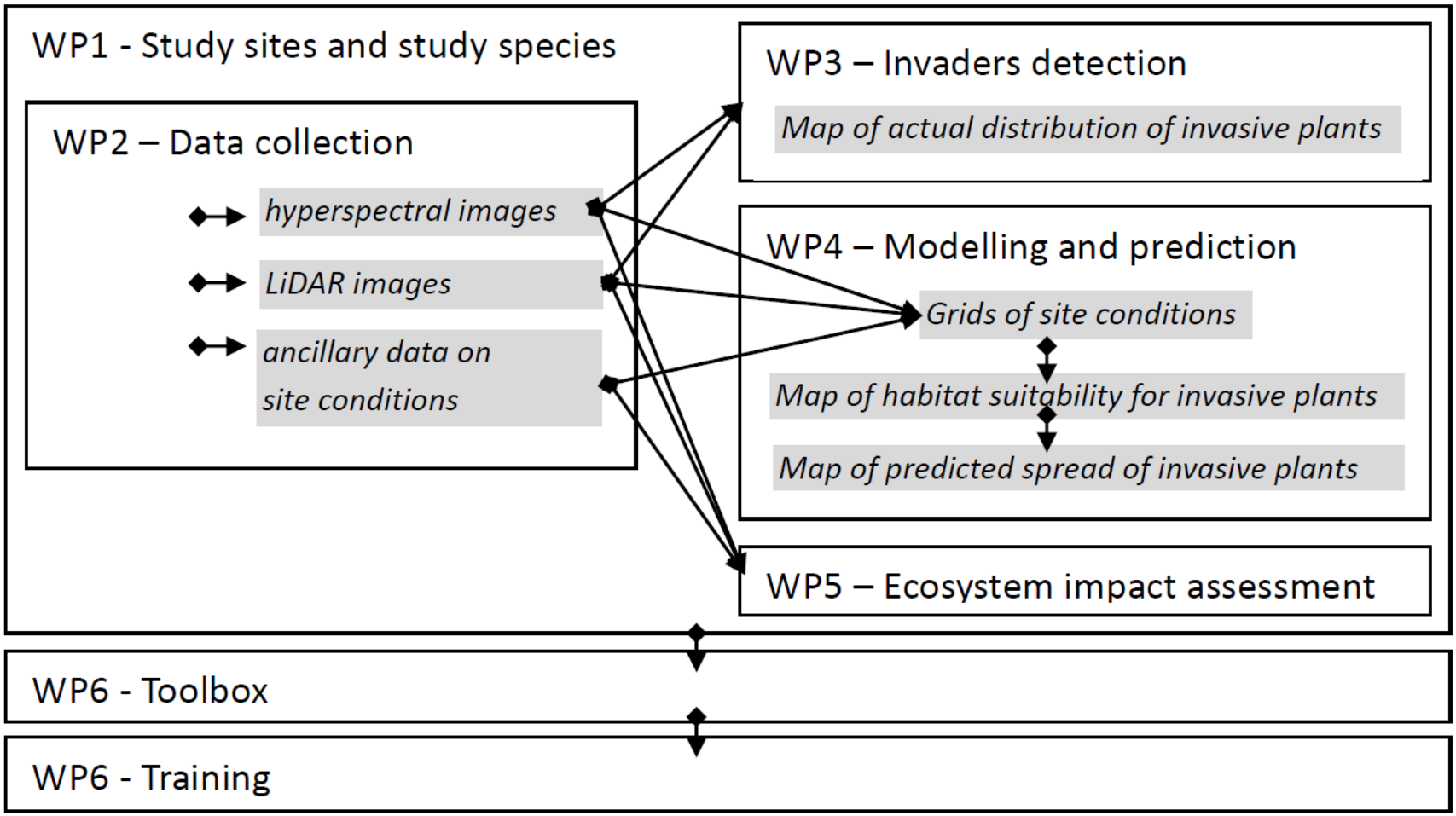

WP1 - Study sites and study species
WP2 – Data collection
hyperspectral images
LiDAR images
ancillary data on site conditions
WP3 – Invaders detection
Map of actual distribution of invasive plants
WP4 – Modelling and prediction
Grids of site conditions
Map of habitat suitability for invasive plants
Map of predicted spread of invasive plants
WP5 – Ecosystem impact assessment
WP6 - Toolbox
WP6 - Training

INTERACTION WITH END USERS

- Yearly steering committee meetings with
  - Policy makers at national, regional & local level
  - Relevant scientific research community
  - Professional land managers and nature conservationists

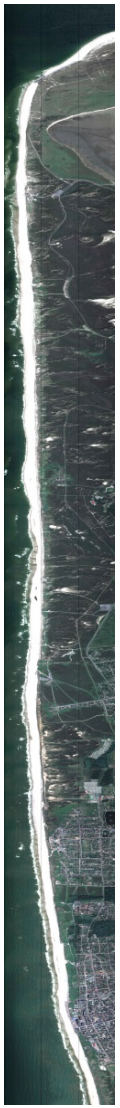
- Educating stakeholders
  - Training session
  - Workshop

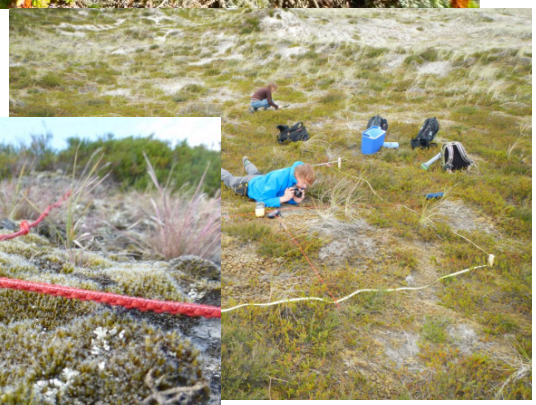
PROGRESS

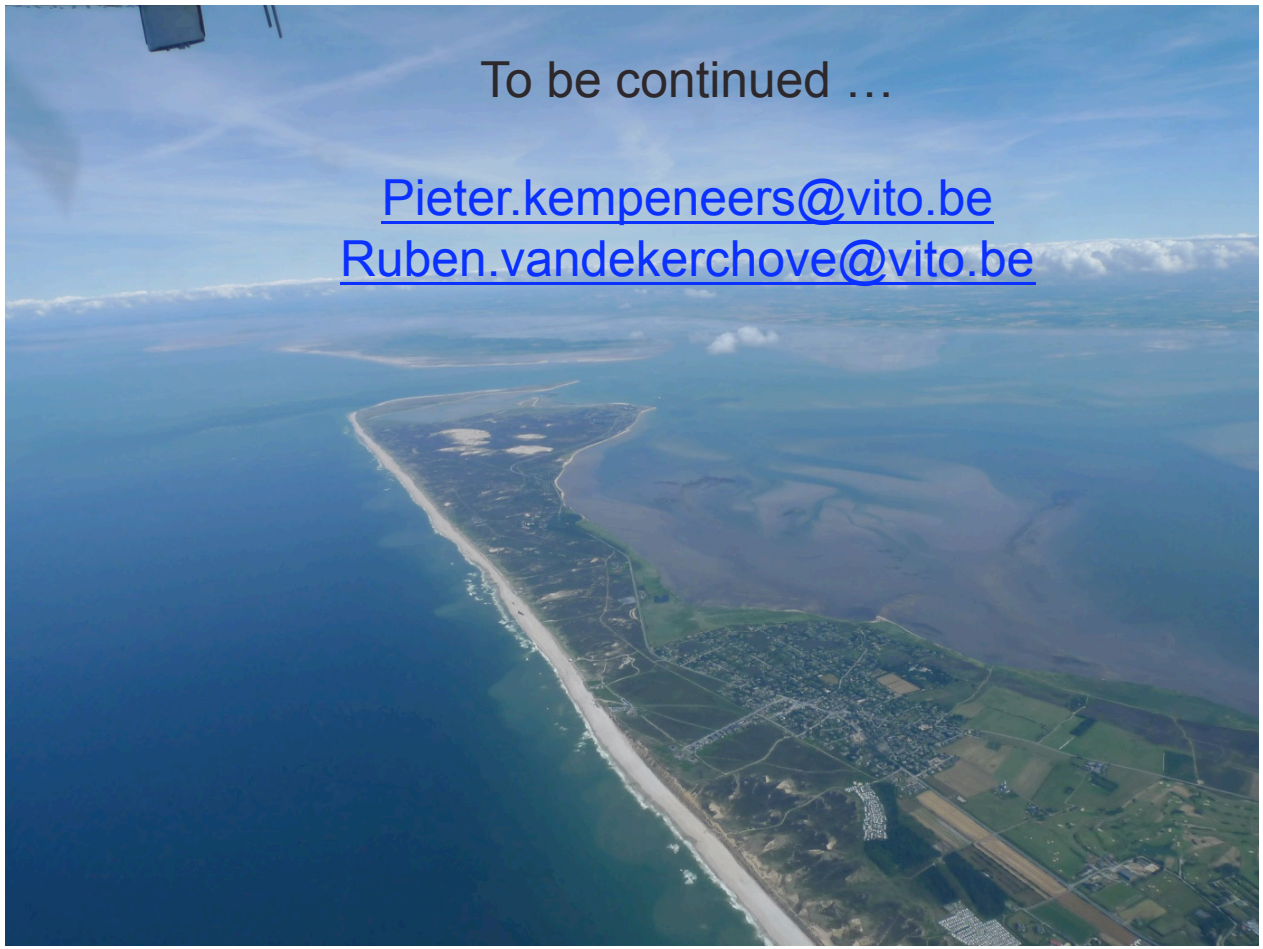
» Focus on 2 sites: **Compiègne** (Prunus) & **Sylt** (Campylopus)

	SYLT ***(Campylopus introflexus)***	**COMPIEGNE** ***(Prunus serotina)***	***(Oxalis pes-caprae)***
APEX	✓	✓	-
LiDAR	✓	✓	-
FIELDWORK	✓	✓	-

DATA, DATA, DATA …..







To be continued …

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