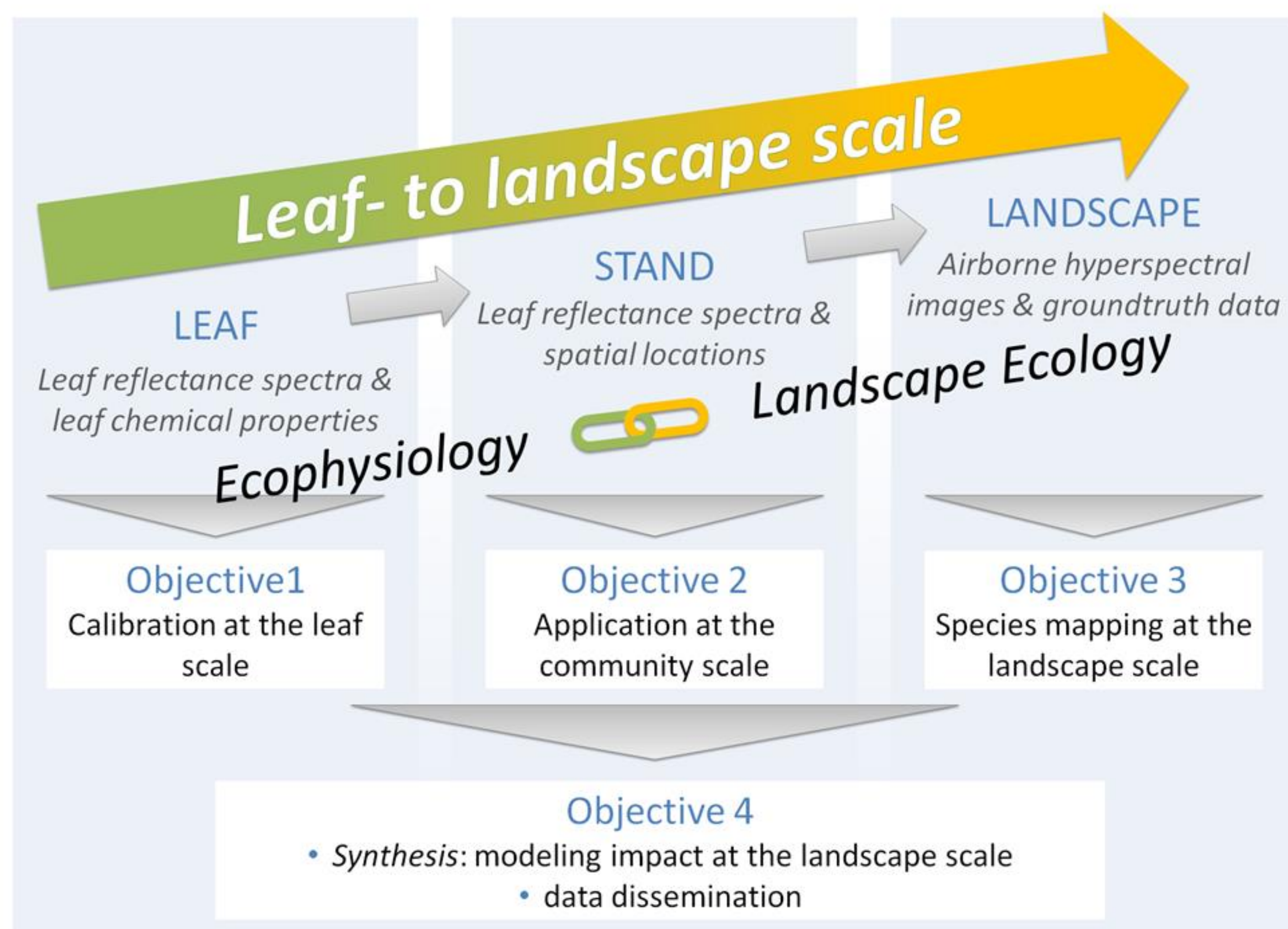


Quantifying the spatial impact of exotic plant invasion on ecosystem functioning- from the leaf to landscape level

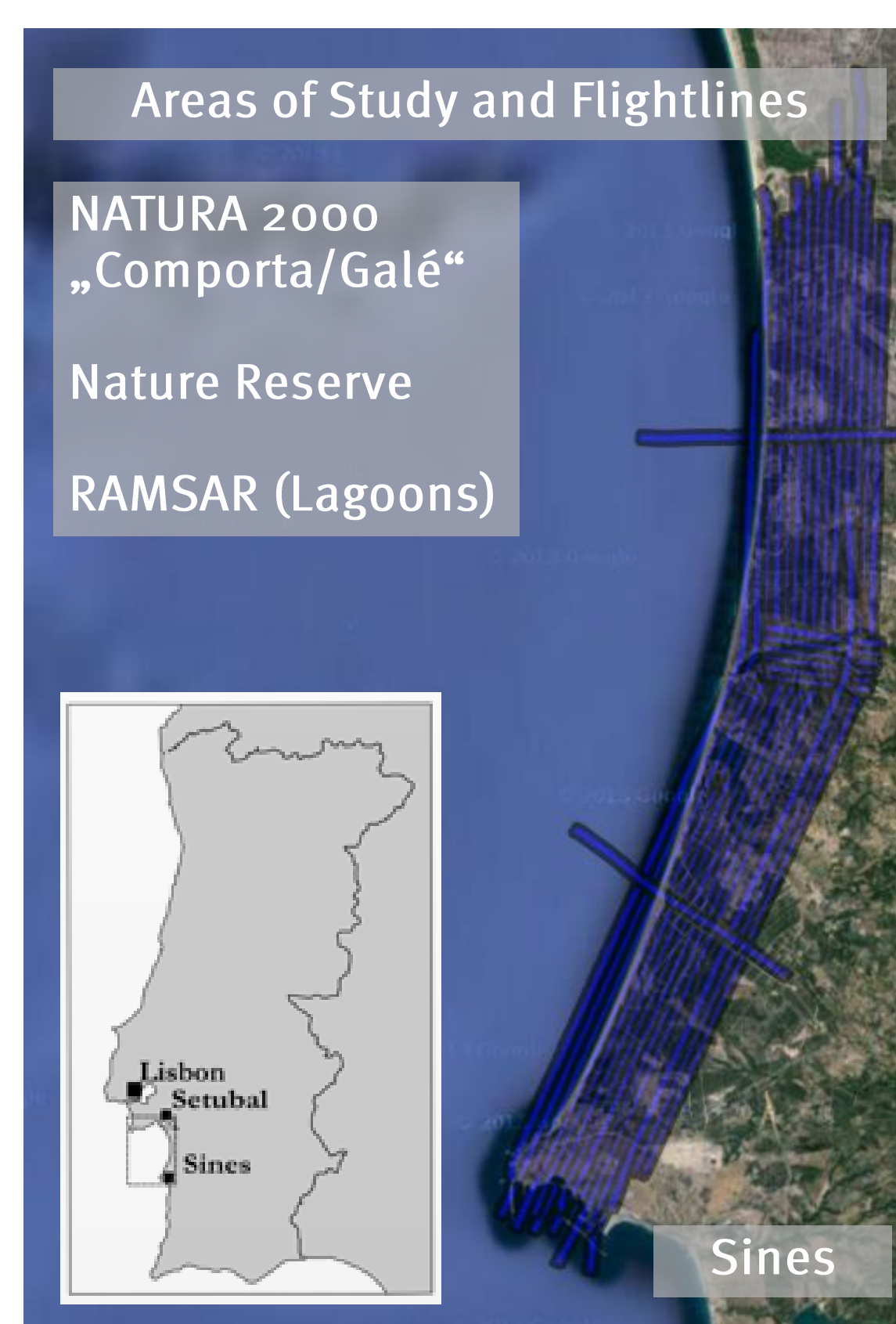
Große-Stoltenberg A¹, Hellmann C², Oldeland J³, Thiele J¹ and Werner C²

Aim of the Project

Tracing the ecosystem impact of the invasive shrub *Acacia longifolia* in a protected Mediterranean dune ecosystem in Southwest Portugal at different scales.



Area of Study & Data



Flight Data

- Hyperspectral Eagle/Hawk (NERC), 1/1.5m
- LiDAR 4 returns, 4.5 points/m²
- Aerial Images RGB, 0.5m

Field Data

Leaf and Canopy Spectro-Chemistry

- 280 samples, 6 transects around *A. longifolia*
- Leaf and Canopy Spectral Data
 - Biomass samples (C, N, $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, Lignin, Cellulose, Hemicellulose)

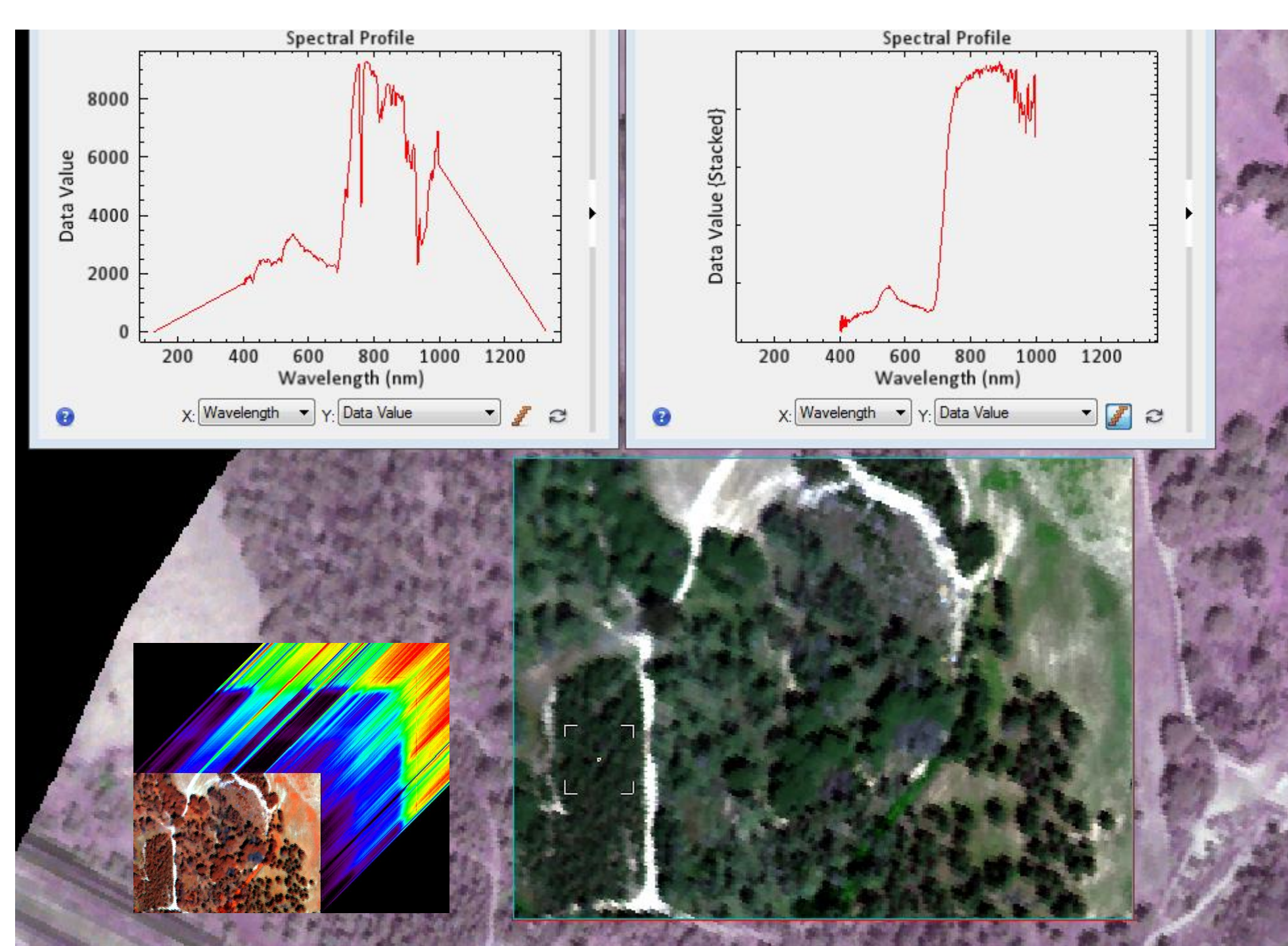
Species Composition & Vegetation Structure

- 1800 dGPS locations for ground truth
- 464 Hemispherical Photos (LAI, Gap Fraction)

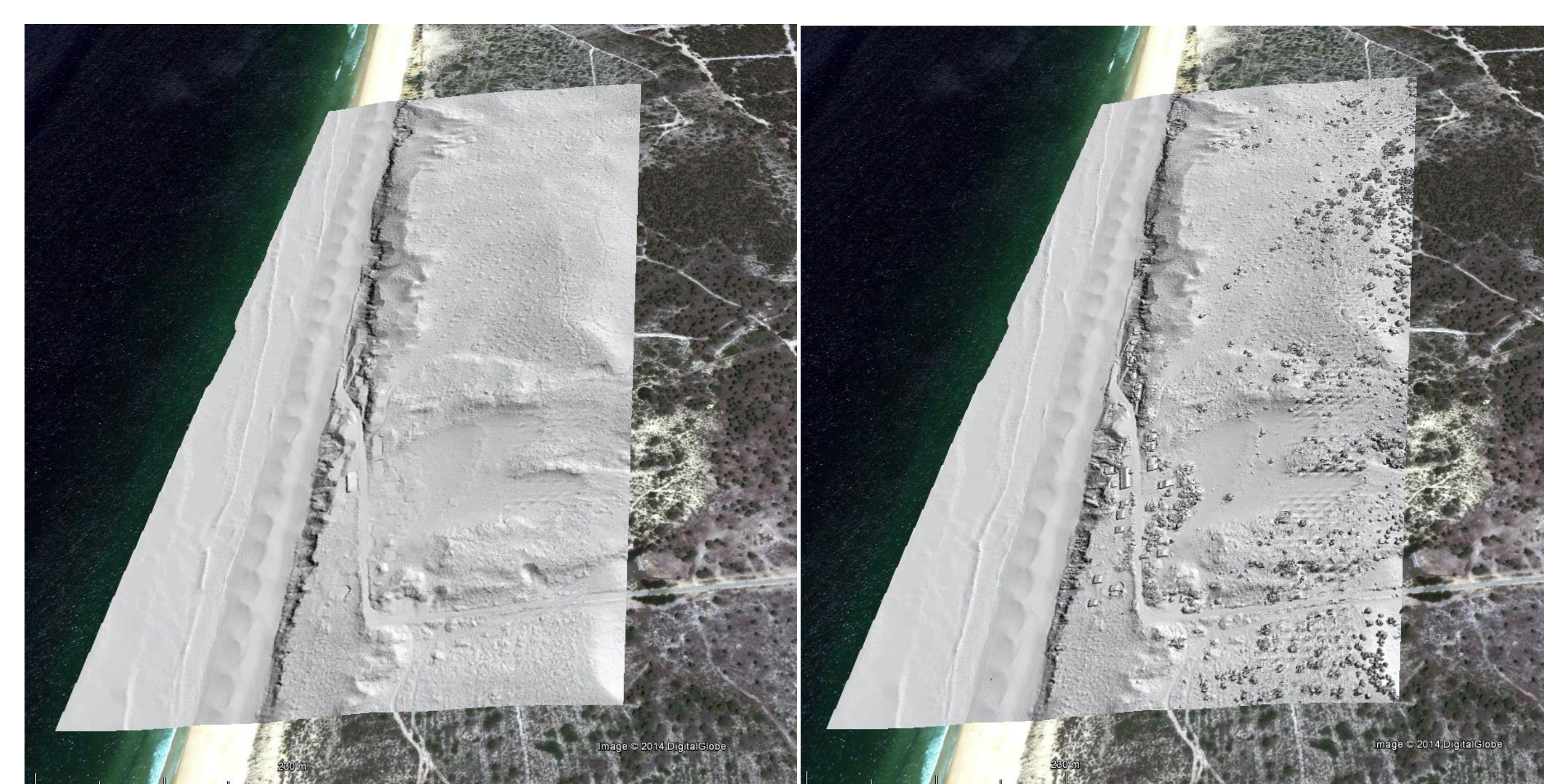


Work Flow & First Results

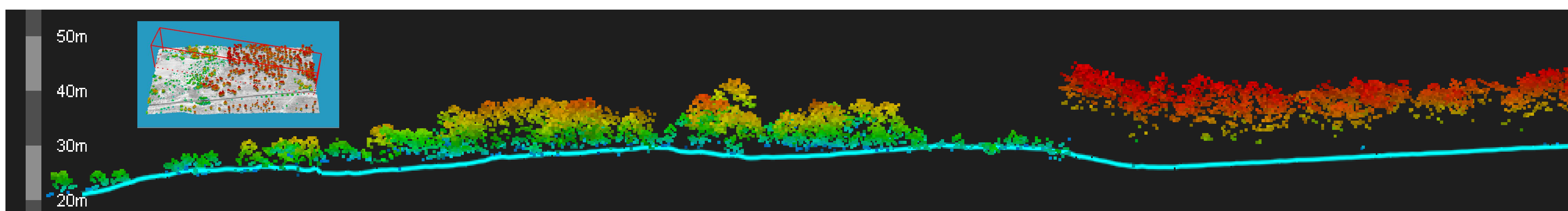
- 1) Field Campaigns August 2013 and April/May 2014
- 2) Processing LiDAR Data
- 3) Processing Hyperspectral Data
- 4) Building Spectral Libraries (Leaf, Canopy, Airborne)
- 5) Calculation of LiDAR Derivatives (DTM, DSM, CHM, Forestry Metrics)
- 6) Classification of Hyperspectral Data including LiDAR Derivatives
- 7) Modelling Impact of the invasive Species at Landscape Scale



Atmospherical correction of Eagle sensor using Empirical Line Correction using ENVI 5.1



Digital Terrain and Digital Surface Model using Lastools (areal image: Googleearth)



Cross section of height filtered airborne LiDAR data from open dunes to dune forest using ENVI 5.1 LiDAR Viewer

Basic Project Information

Funding German Science Foundation DFG (2013-2016)

Partners

University of Münster, University of Bayreuth, University of Hamburg
Associated: University of Lisbon (PT), University of Leicester (GB)

Further Funding

European Facility for Airborne Research (EUFAR), German Academic Exchange Service (DAAD)

Associated Projects

INSPECTED.NET Invasive Species Evaluation, ConTrol & Education.NETwork

Marie Curie IRSES, EC, FP7 2012-2016, U Münster (DE), U Bayreuth (DE), U Lisbon (PT), UF Viçosa (BR)



Publications

Hellmann C, Große-Stoltenberg A, Lauströer V, Oldeland J, Werner C (in review). Predicting $\delta^{15}\text{N}$ Isotopic Signature from Fresh Leaf Reflectance Spectra: First Evidence for a Physical Basis.

Lehmann JK, Große-Stoltenberg A, Römer M, Oldeland J (in review). Optical measurements of Leaf Tannin Concentration help to discriminate non-native from Mediterranean shrub species in Portuguese Dune Ecosystems.

5th ESA Advanced Training Course on Land Remote Sensing. 8-12 September, University of Valencia, Valencia, Spain.