BELGIAN EARTH OBSERVATION

URBANEARS Urban Ecosystem Analysis supported by Remote sensing

Support To Exploitation and Research in Earth Observation

STEREO III programme | Support To Exploitation and Research in Earth Observation

Context and objectives

Current policy support tools such as environmental models are not well adapted to the high level of heterogeneity of urban landscapes and would greatly benefit from detailed, multi-temporal, spatially distributed input data provided by remote sensing. This project therefore aims at exploring the potential of the combined use of recent multi- and hyperspectral sensors in combination with structural information derived from LiDAR, for detailed, spatially explicit characterization of morphological and (bio)physical properties of the urban environment. Remote sensing derived information on the characteristics of green and built-up areas will be used to improve the parameterisation of urban biophysical models.

Project outcome

Results

- A hybrid spectral endmember library pruning approach was developed allowing more efficient unmixing.

- Synergistic Use of LiDAR and APEX Hyperspectral Data for High-Resolution Urban Land Cover Mapping through pixel-based and spectral unmixing based approaches.

- Synthetic mixing of library spectra as an alternative for producing land cover fraction training data for regression modelling, i.e. library-based training has been proposed.

- A method to monitor urban tree health based on the synergetic use of hyperspectral imagery and LiDAR data was developed.

- Location and time specific hydrological simulations with multi-resolution remote sensing data in urban areas. The combined use of hyperspectral high spatial resolution data (APEX, June 2015, 2m) and the multispectral high temporal resolution data (ProbaV, 5-day composites, 100m) enabled the creation of detailed seasonal leaf area index maps as an input for our hydrological model.

- A metric approach to evaluate the hydrological response of highly urbanized areas and apply it to the city of Brussels / A remote sensing based Local Climate Zone (LCZ) classification methodology was developed.

Products and services

- Spectral database for urban surface materials / Tools for spectral unmixing / A method to quantify urban vegetation type and state.

- A LCZ mapping system based on Landsat, simulated Enmap and Sentinel-2 data .

- Characteristic profiles of relevant urban climatic parameters for all LCZ at multiple spatial scale levels, assisting local policy makers in their interpretation of LCZ maps.

- Distributed ecosystem service indicator maps regarding 'urban water regulation' for Brussels.

- A simulation tool for modelling impacts of alternative urban growth and spatial planning scenarios on the (bio)physical characteristics of the urban environment.

- Indicator maps characterizing environmental conditions for different urban growth scenarios in relation to urban climate and water fluxes.

- A detailed brochure was compiled given and overview of products and services.

Potential users

- Bruxelles Environnement – Leefmilieu Brussel

- SBGE/BMWB – Société Bruxelloise de la Gestion de l'Eau / Brusselse Maatschappij voor Water-Beheer

- VIVAQUA – drinking water company Brussels & management of communal sewer infrastructure

- IRM/KMI – Institut Royal Météorologique / Koninklijk Meteorologisch Instituut

- Urban Development Agency (ADT-ATO) of the Brussels-Capital Region

- Departement Leefmilieu, Natuur en Energie van de Vlaamse overheid (LNE)

- Région wallonne, Département Aménagement du territoire et Urbanisme

- Région wallonne, Département de l'énergie et du bâtiment durable.
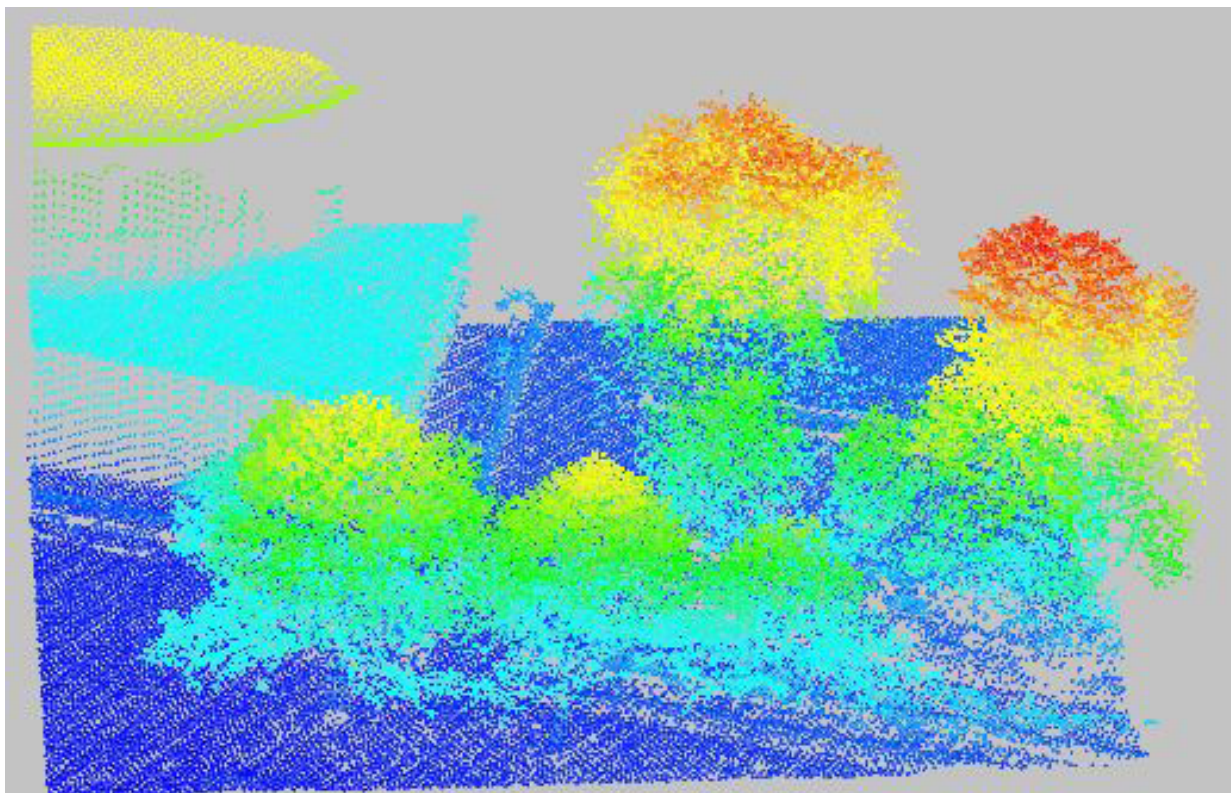
Project leader(s)

HERMY Martin | KULeuven - Department of Earth and Environmental Sciences (EES)
Martin.Hermy@ees.kuleuven.be
SOMERS Ben | KULeuven - Department of Earth and Environmental Sciences (EES)
ben.somers@kuleuven.be

Belgian partner(s)

BAUWENS Willy | VUB - Department of Hydrology and Hydraulic Engineering (HYDR)
wbauwens@vub.ac.be
CANTERS Frank | VUB - Cartography and GIS
fcanters@vub.ac.be
VERBEIREN Boud | VUB - Department of Hydrology and Hydraulic Engineering (HYDR)
Boud.Verbeiren@vub.ac.be
DE WULF Robert | UGent - Laboratory of Forest Management and Spatial Information Techniques (FORSIT)
Robert.DeWulf@UGent.be
VAN COILLIE Frieke | UGent - Laboratory of Forest Management and Spatial Information Techniques (FORSIT)
Frieke.VanCoillie@UGent.be

Location

Brussels metropolitan area - Cities of Berlin and Santa Barbara

Website

http://ees.kuleuven.be/urbanears