Innovative Methods and Products of the "Urbanization and Artificialization" Scientific Expertise Centre
Anne Puissant, Arnaud Le Bris, Vincent Thierion, Thomas Corpetti, Thibault Catry, Sébastien Gadal, Xavier Briottet, Rémy Cression, Nicolas Baghdadi, Arnaud Sellé

To cite this version:

HAL Id: hal-02135846
https://hal-amu.archives-ouvertes.fr/hal-02135846
Submitted on 21 May 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Innovative Methods and Products of the "Urbanization and Artificialization" Scientific Expertise Centre

Anne Puissant1, Arnaud Le Bris2, Vincent Thierion3, Thomas Corpetti4, Thibault Catry5, Sébastien Gadal6, Xavier Briottet7, Rémi Cression8, Nicolas Baghdadi8, Arnaud Sellé8,9

1. Live, CNRS/univ. Strasbourg, Strasbourg, France.
2. Laboris, CNRS/univ. Poitiers, Poitiers, France.
3. Irstea, CNRS/univ. Lyon, Lyon, France.
5. Espace Dev / IRD, Montpellier, France.
7. Onera, Toulouse, France.
8. Tetis, CNRS-INRE, Montpellier, France.
9. Pôle THEIA, INRIA, TETIS, Montpellier, France.

1. Background and Objectives of THEIA

The THEIA data and services centre (www.theia-land.fr) is a consortium of 12 French public institutions involved in Earth observation and environmental sciences (CEA, CEREMA, CIRAD, CNES, IGN, INRA, CNRS, IRD, Istea, Météo France, AgroParisTech, and ONERA). THEIA initiated in 2012 with the objective of increasing the use of space data by the scientific community and the public actors. The first years allowed structuring the national science and user communities, to pool resources to facilitate access to data and processing capacities, to federate various previously unrelated initiatives, and to disseminate the French achievements nationally and internationally.

THEIA is structuring the science community through 1) Scientific Expertise Centres (SEC) to provide the community with tools and treatment methods adapted to different thematic fields; 2) Regional Animation Networks (RAN) to federate users (scientists and public/private actors); 3) the setup of a mutualized Service and Data Infrastructure (SDI) distributed between several centers, allowing access to a variety of products (Figure 1).

The THEIA centre is one of the components of the “Earth System” Research Infrastructure with ODATIS (Data and Service for the Ocean), Form@Ter (Data and Service for the Solid Earth) and AERIS (Data and Service for the Atmosphere).

2. Activities of the ‘Urban’ Scientific Expertise Centres (SEC)

Fig. 1. THEIA’s structure and governance scheme

Urban Vegetation
At large scale (50 cm)
Mapping “low” and “high” vegetation at large scale with Pléiades imagery combined with LiDAR data and using deep convolutional neural networks or machine learning algorithms

(http://www.kermap.com/montpellier/)

Urban footprint
at medium scale (10m)
Mapping urban footprint with machine learning algorithm based on object-oriented approach and times series S2

(http://a2splatform.unistra.fr)

Urban footprint
at large scale (1-2m)
Mapping urban buildings with semantic segmentation of Spot 6/7 images using deep convolutional neural networks

Integration of S1 & S2 times series in the processing chain for mapping :
- Urban foot print at medium scale
- Urban Fabrics

Fusion of Sentinel 2 & SPOT6/7 imagery *

Development of a chain to detect changes (bi-date / imCLASS) and to produce automatically Digital Surface Model by using stereoscopic imagery (DSM-OPT).

Adaptation to the South *
Countries with others thematic classes

* Deep learning ...

Several research developments ....

Relationships between Urban SEC and RANs
to disseminate the outputs to the user community and to aggregate user needs... towards a portfolio of complementary urban products,

Links with the SEC for land cover (OSO SEC)

Urban fabric classes

Example of result from Iota2 land cover map on Strasbourg with urban atlas as samples to improve the classification

(http://a2splatform.unistra.fr/osa2/)

The “Urban” SEC brings together teams from several research laboratories in France that carry out research and develop innovative data processing methods for urban remote sensing using optical and SAR sensors. They are working on validation of the urban products provided by the THEIA SDI, and try to demonstrate user-oriented applications.