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To cite this version:
Anne Puissant, Arnaud Le Bris, Vincent Thierion, Thomas Corpetti, Thibault Catry, et al.. Innovative Methods and Products of the "Urbanization and Artificialization" Scientific Expertise Centre. Living Planet Symposium 2019, May 2019, Milan, Italy. 2019. hal-02135846

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

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Innovative Methods and Products of the "Urbanization and Artificialization" Scientific Expertise Centre

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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, CIFRAD, CNES, IGN, INRA, CNRS, IRD, INRAE, 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 component 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)

Urban footprint at medium scale (10m)

Mapping urban footprint with machine learning algorithm based on object-oriented approach and times series S2

Urban vegetation at large scale (50 cm)

Mapping “low" and “high" vegetation at large scale with Pliades imagery combined with LiDAR data and using deep convolutional neural networks or machine learning algorithms

Several research developments …
* Integration of S1 & S2 times series in the processing chain for mapping:
  - Urban footprint 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