

URBA-OPT-S2 : towards a processing chain based on Sentinel-2A to extract artificialized areas

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CONTEXT

Urban footprint extraction is a key task that is often required in numerous applications (urban planning and management, risk analysis, human health or biodiversity, etc). Some binary products (urban/no urban) are now available on several coverages (global, European or national) and with different spatial or temporal resolution. Only the frequency of updates is often limited due to the temporal frequency of the used images. The recent launch of Sentinel 1&2 satellites makes possible to obtain a massive 'stream' of satellites images with a high spatial resolution around 10 to 20m depending on the spectral bands. In this context, the A2S platform is being created in order to propose a processing system for the rapid exploitation of satellite data streams on HPC platforms (Fig. 1)

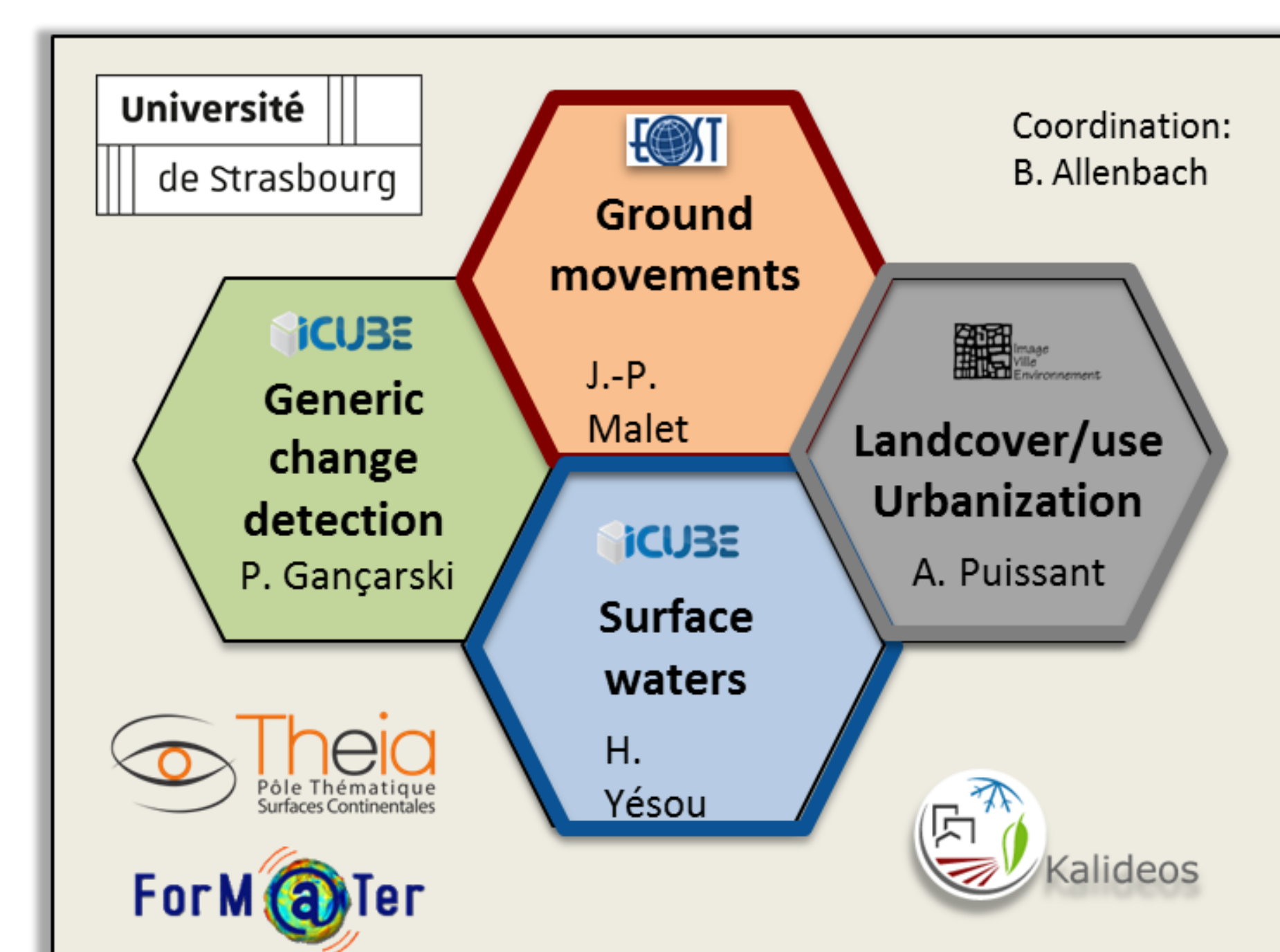


Figure 1: The A2S structure

PROCESSING CHAIN FOR



URBA-OPT-S2 has been initially developed for mapping artificialized areas for analysis SPOT historical archives (SWH) and further extended to the analysis of time series of Sentinel 2A imagery for the Theia Land center. The prototype has been calibrated first on six urban areas (Fig. 2) before to be deployed (a) to the whole french territory (a) on mono-date images without clouds and (b) on times series of one year (first test on 2017).

The processing workflow is described in Figure 2. It is based on a supervised and object-oriented method using two chains of pre-treatment allowing to co-registered and calculated attributes on times series. The processing chain consists in three steps, comprising (Fig. 3):

- (1) A production of stacking image file with three multispectral bands (G, R, NIR), the NDVI feature;
- (2) A construction of a training datasets of artificialized/non-artificialized areas based on the transformation of the High Resolution Layer (HRL) 'Imperviousness' from the Copernicus Land Monitoring Services;
- (3) A segmentation and classification step based on OTB using Meanshift and Random Forest algorithms
- (4) A validation based on the process developed in IOTA2 to product the confidence map for each time;
- (5) A fusion at the decision-level for each result of classification (calculated for each novel image without clouds)

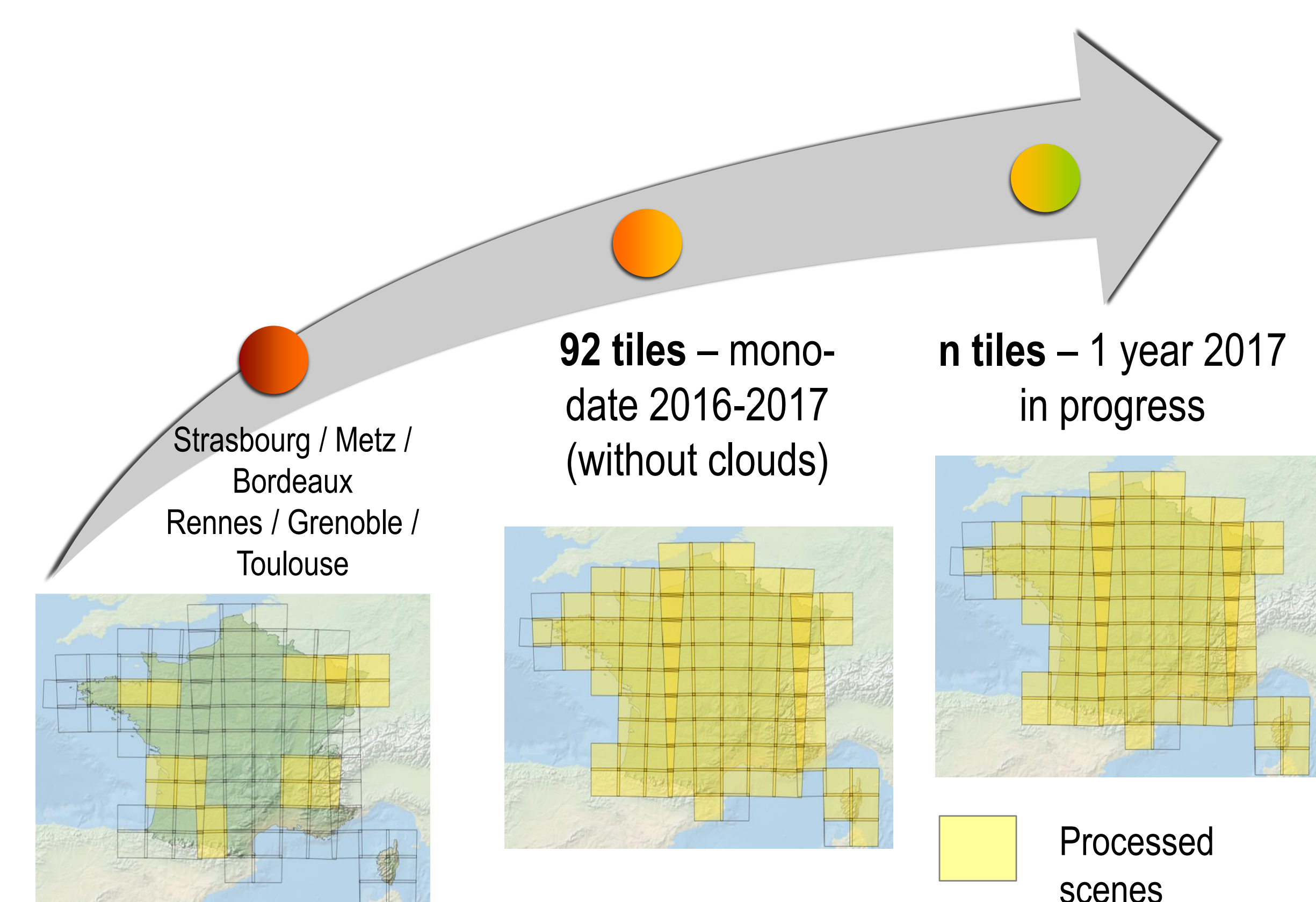
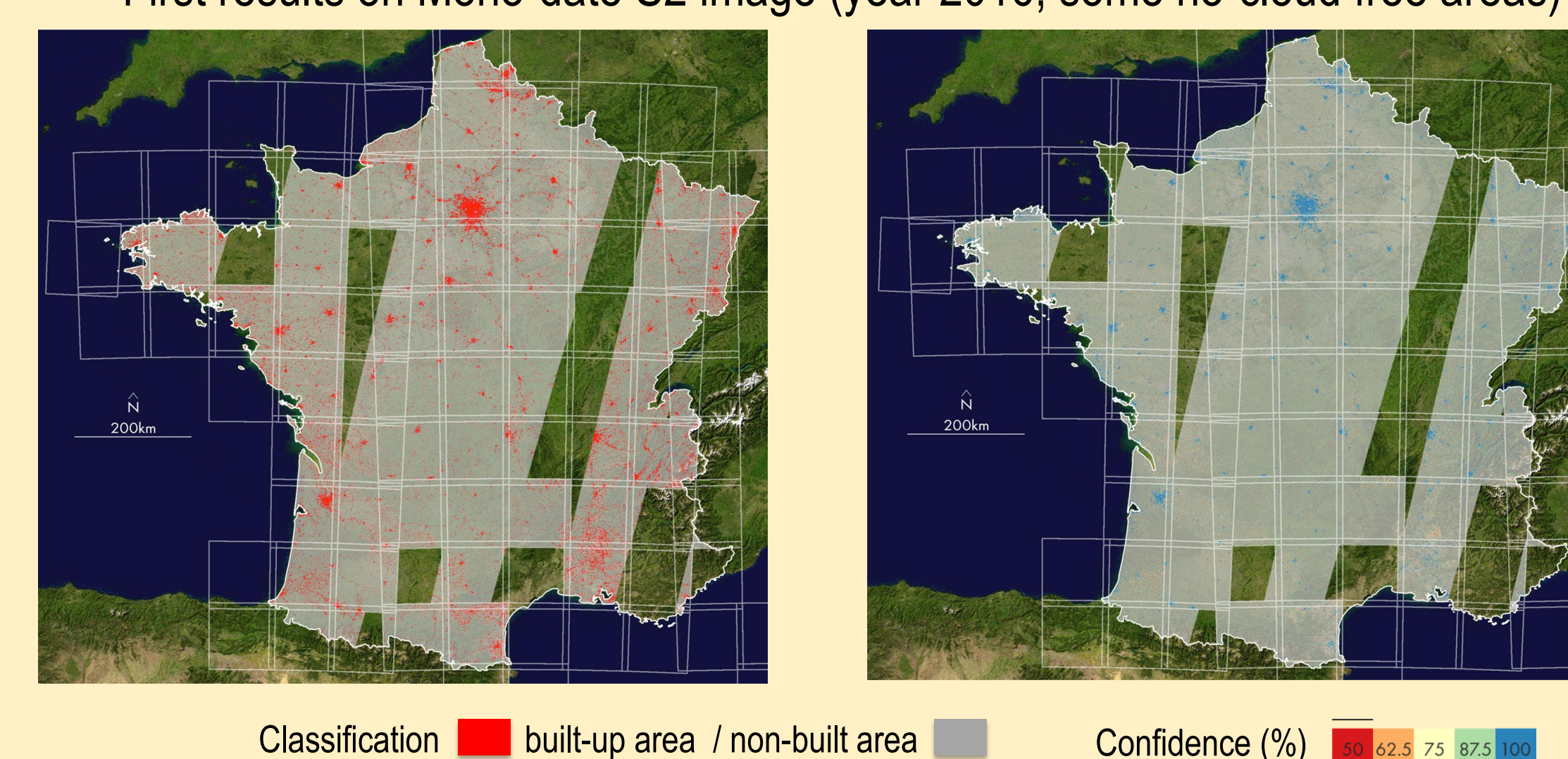


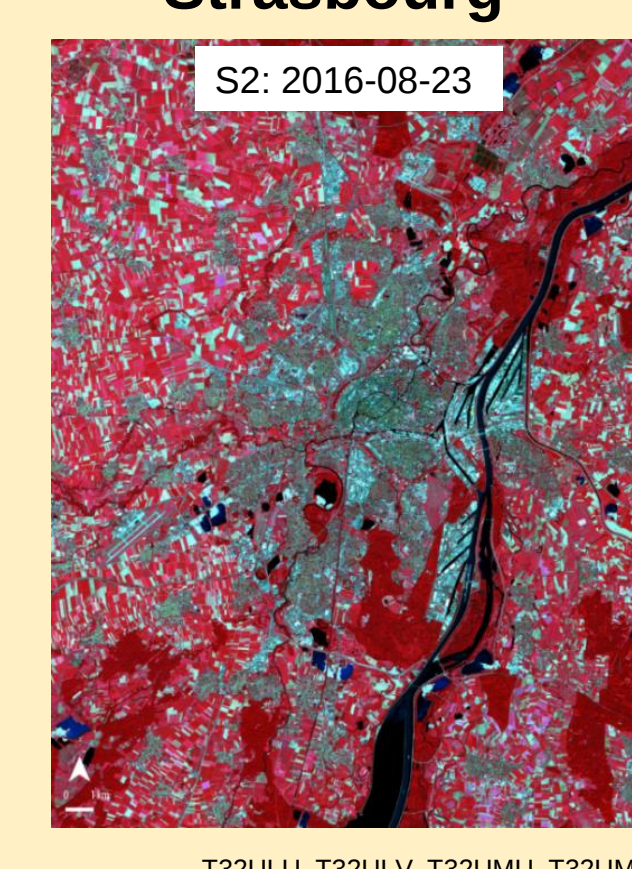
Figure 2: From prototype to deployment of the urban processing chain for the S2A tiles on French territory (in progress 2018)

RESULTS

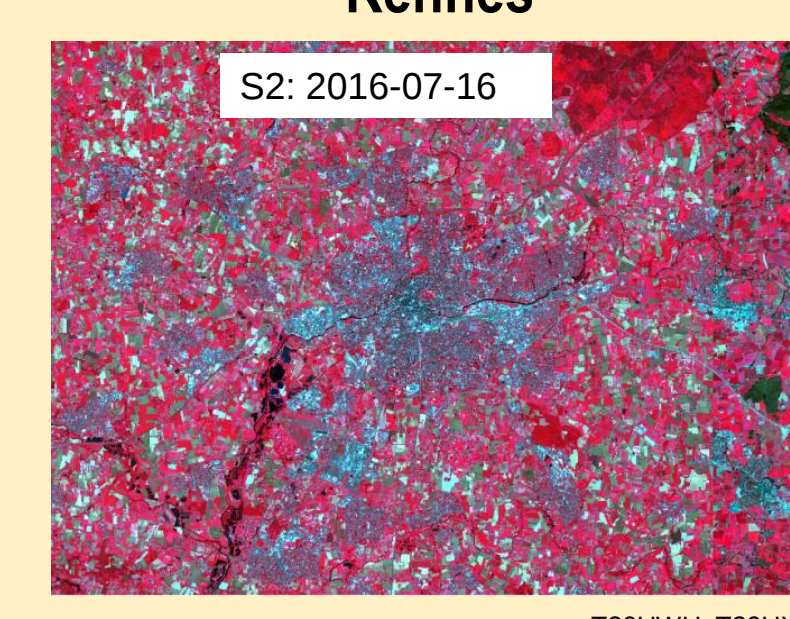
First results on Mono-date S2 image (year 2016; some no-cloud free areas)



Strasbourg



Rennes



Binary result

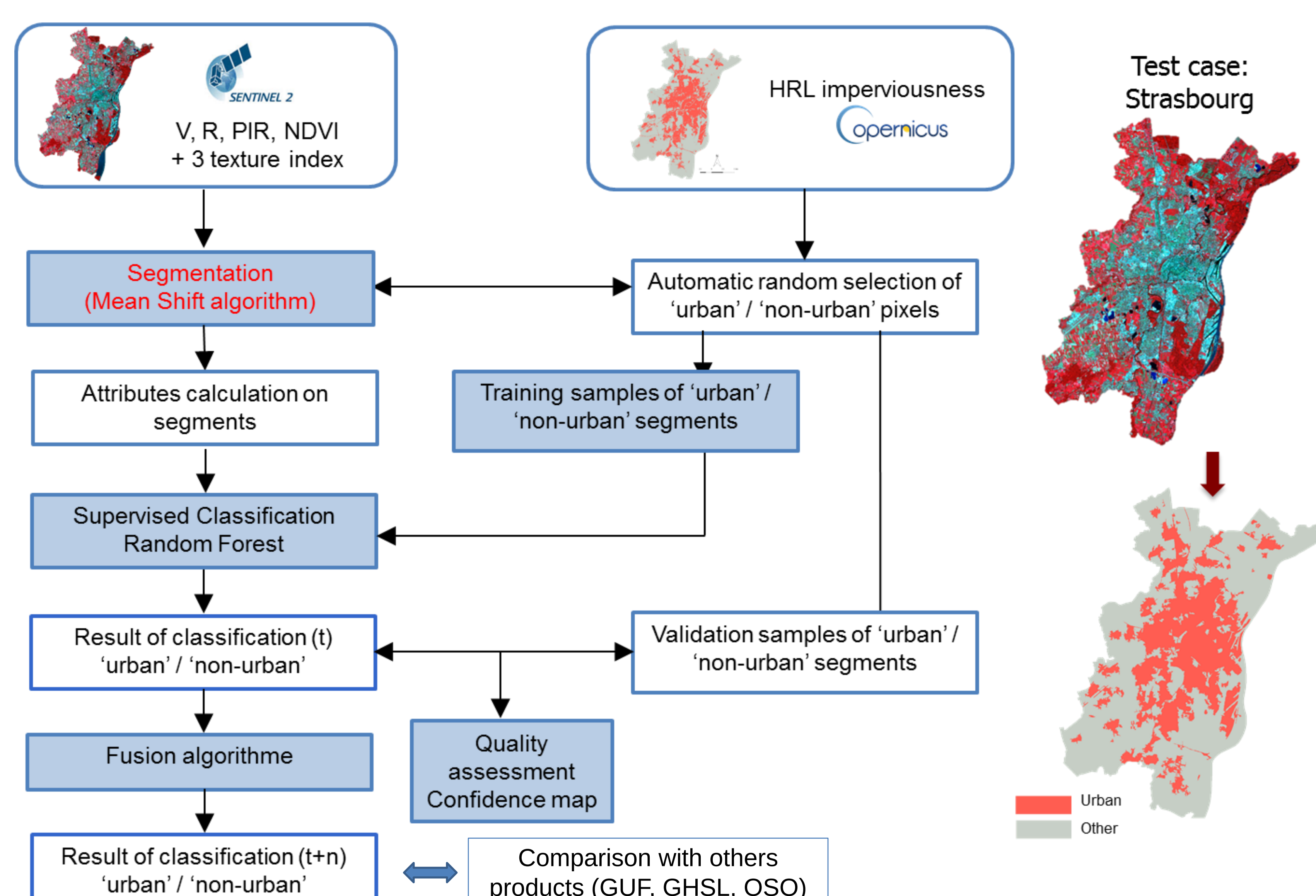
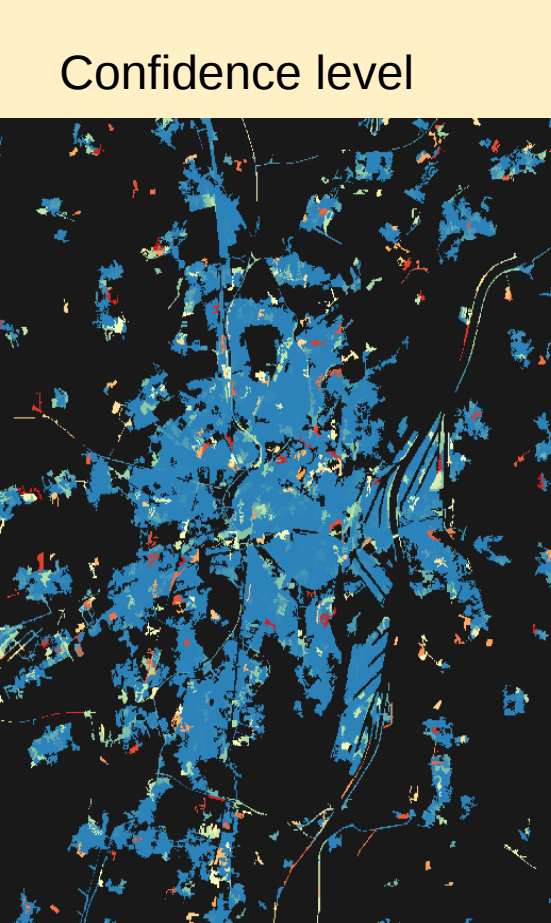


Figure 3: Flowchart of the methodology