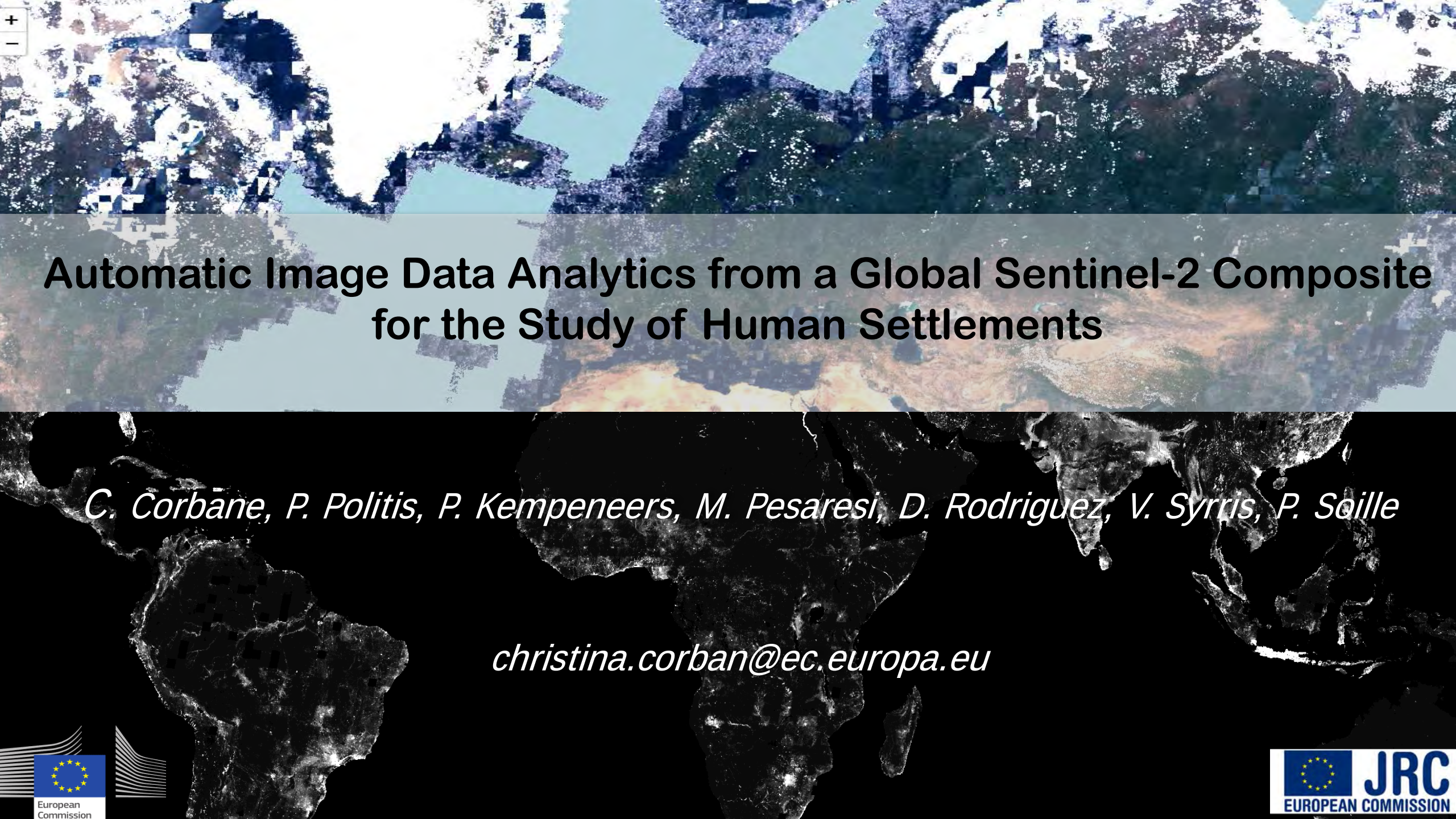


Automatic Image Data Analytics from a Global Sentinel-2 Composite for the Study of Human Settlements

C. Corbane, P. Politis, P. Kempeneers, M. Pesaresi, D. Rodriguez, V. Syrris, P. Soille

christina.corban@ec.europa.eu

European Commission

JRC EUROPEAN COMMISSION

BACKGROUND

Big Data 4 Policy: the Global Human Settlement Layer

Objective of GHSL

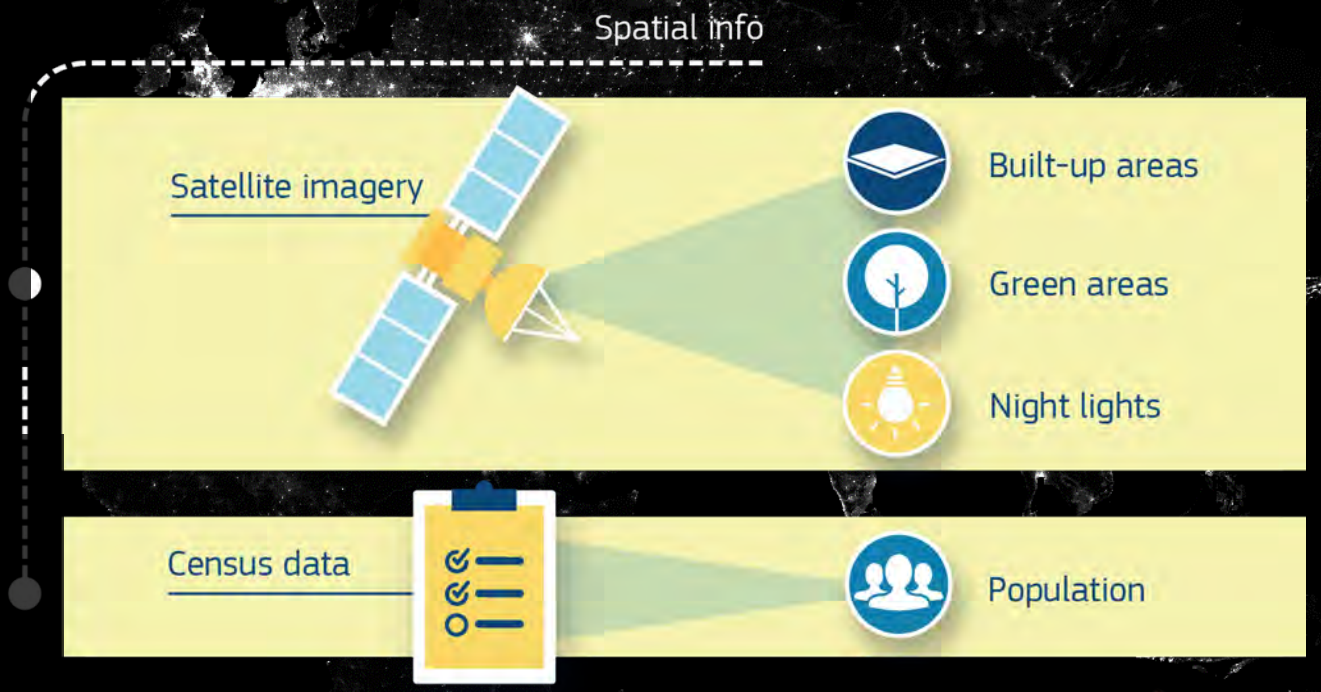
Produce new evidence for decision making:

- 2030 Agenda for Sustainable Development (SDGs)
- Sendai Framework for Disaster Risk Reduction
- New Urban Agenda

Key requirements for policy support

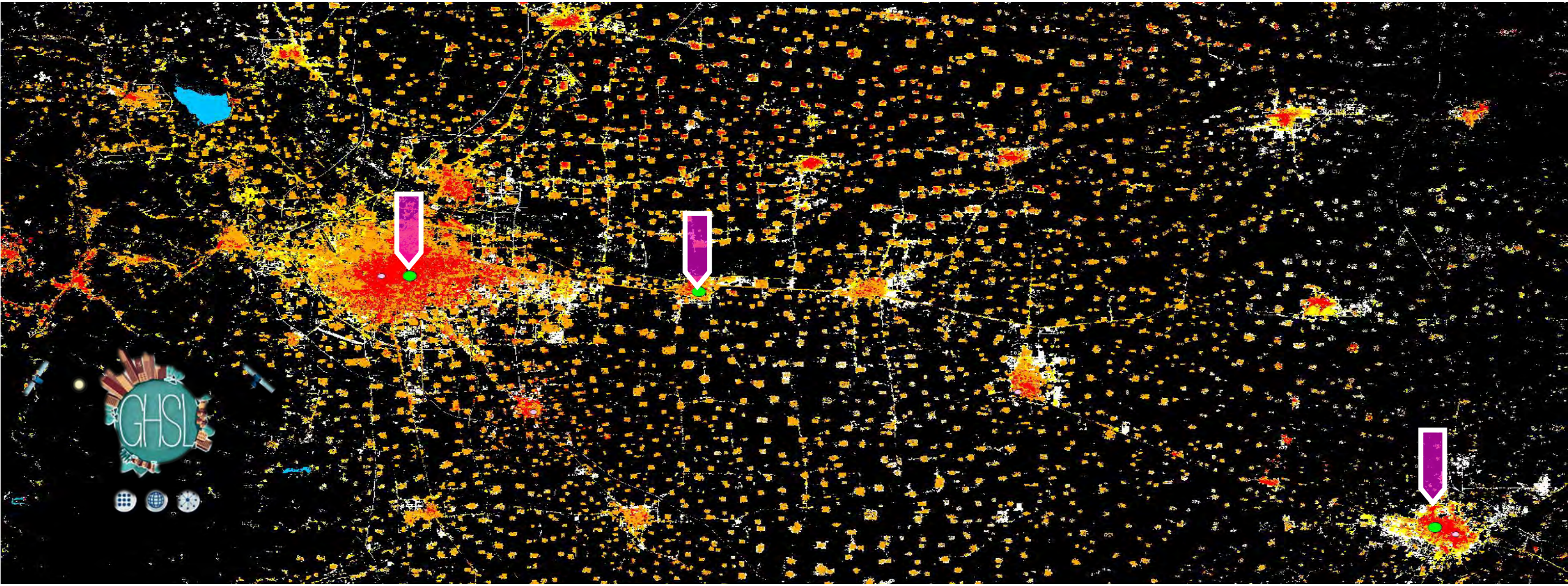
- Reproducible, scientifically sound, synoptic
- Sustainable information production
- Free and open access

➢ Facilitate information sharing and collective knowledge building



http://ghsl.jrc.ec.europa.eu

Discovering new elements in the universe of cities



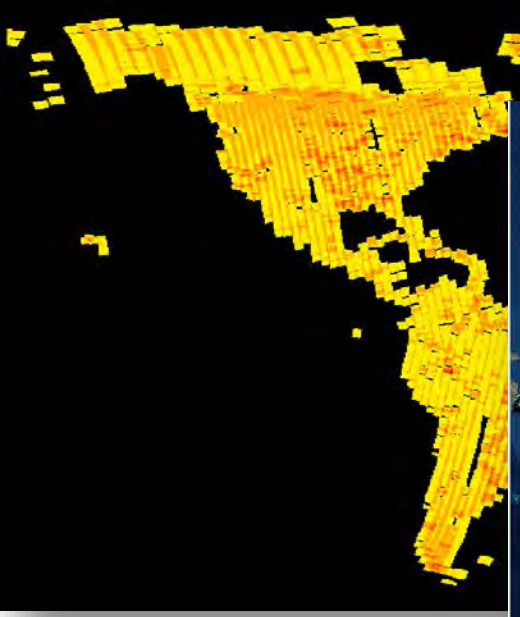
China, EO data vs. Cities accounted in the UN World Urbanization Prospect 2016

GHSL Landsat Multitemporal in 2016

First available multitemporal assessment of built-up areas

GHSL Sentinel-1 in 2017

https://cidportal.jrc.ec.europa.eu/services/webview/jeodpp/databrowser/



Syrris, V., Corbane, C., Pesa
Sentinel-1 Data at Global Sc

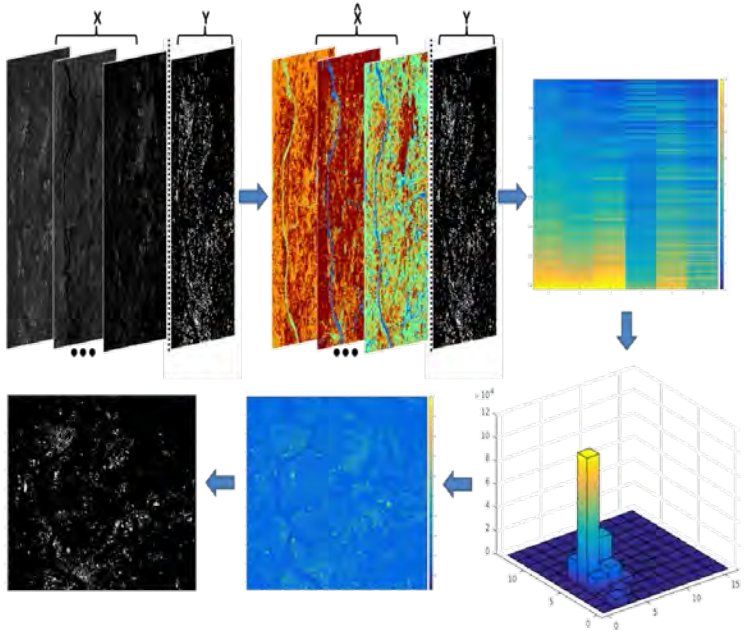
Corbane, C. et al. (2017) Big earth data analytics on Sentinel-1 and Landsat imagery in support to global human settlements mapping, Big Earth Data, 1:1-2, 118-144,

S1A & S1B
>7000 GRD scenes
Dec 2016 – Dec 2017

10 m pixels spacing,
Polarization: VV- VH
Orbit: Desc and Asc
Volume: 10 TB

The building blocks

Symbolic Machine Learning

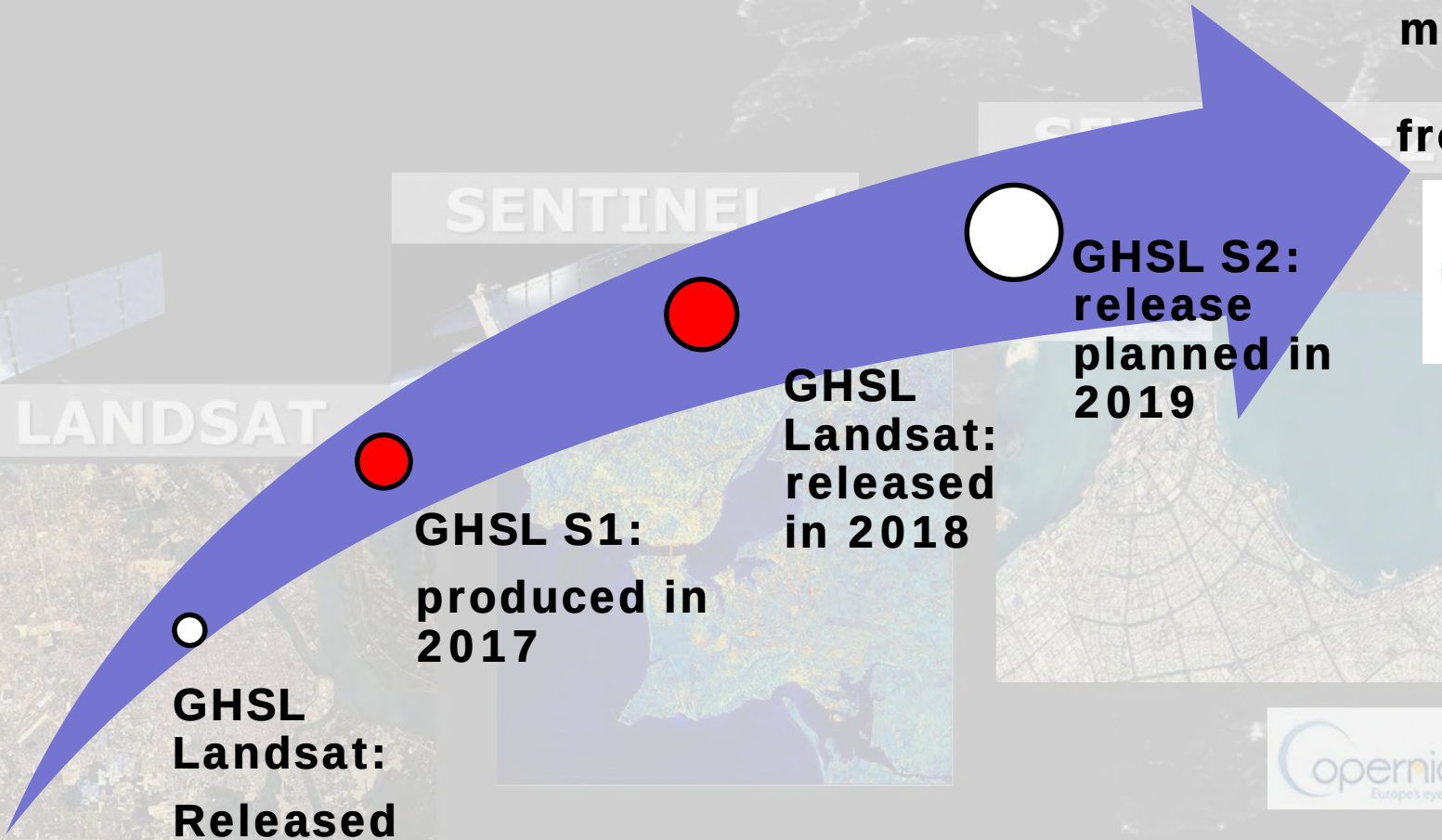


JRC Big Data Platform JEODPP

Incremental Learning & improvements of built-up detection

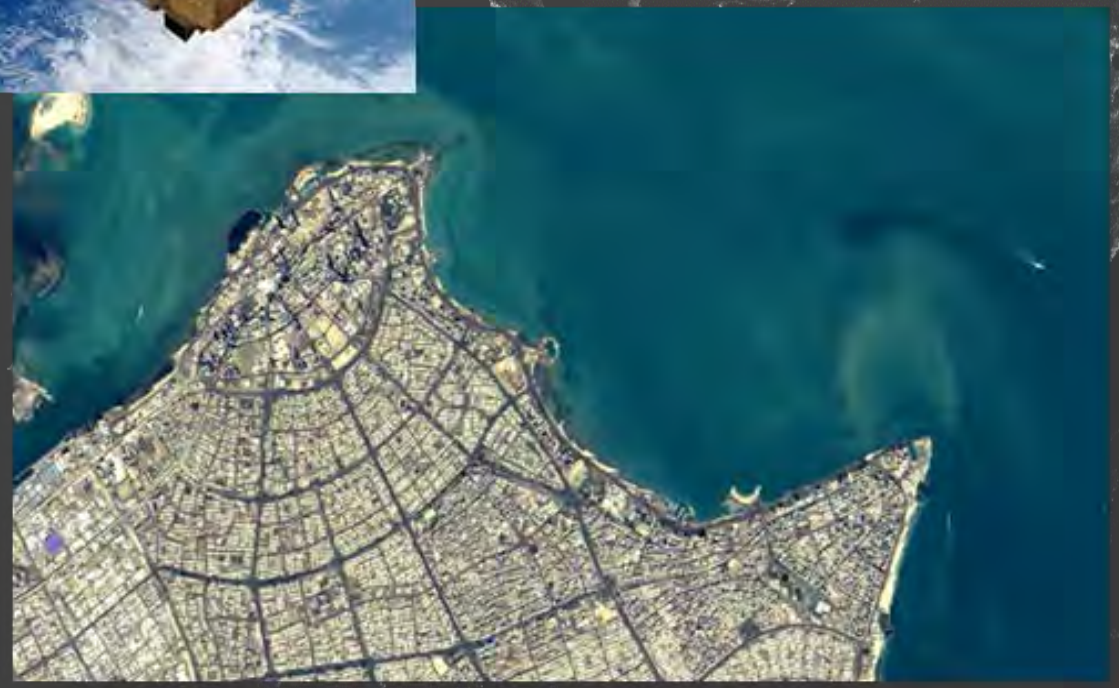
Pesaresi M., Julea A.M. and V. Syrris ; A New Method for Earth Observation Data Analytics Based on Symbolic Machine Learning., Remote Sens. 8(5):399, 2016. doi:10.3390/rs8050399.

Sustainability of built-up measurements through Copernicus



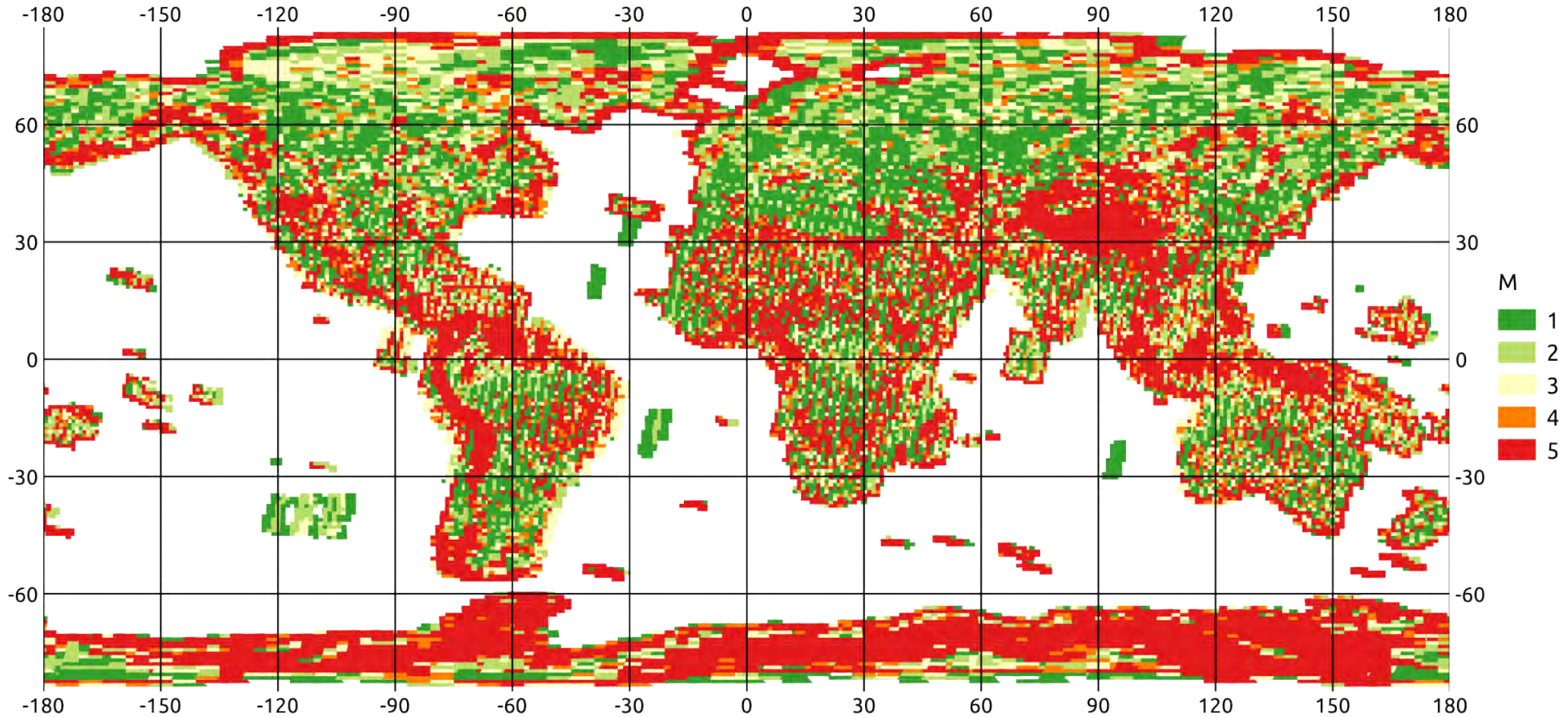
The transition to Sentinel-2

SENTINEL-2



opernicus
Europe's eyes on Earth

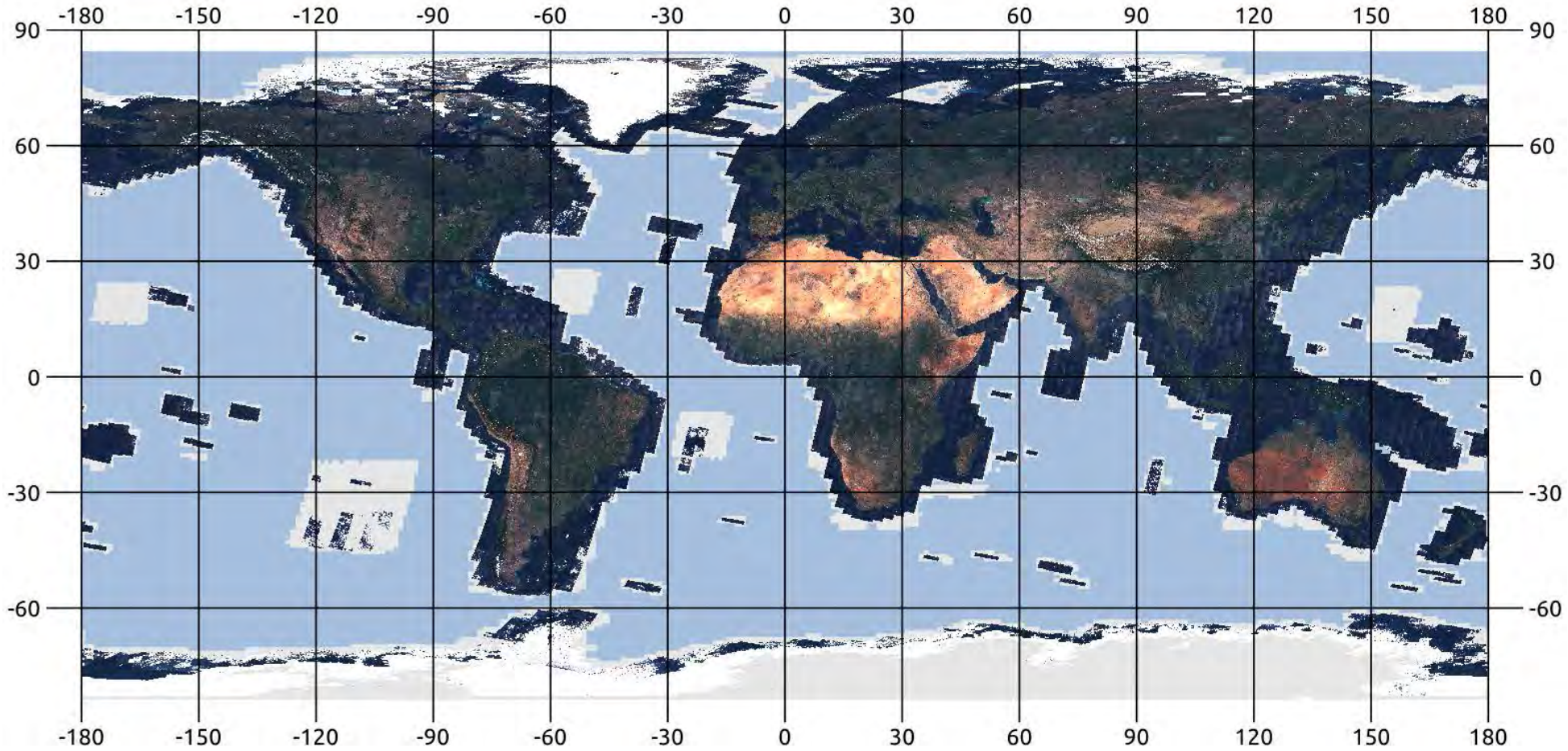
Optimized Global Coverage of Sentinel-2 Input Data (2017-2018)



NUMBER OF OVERLAPPING IMAGE TILES (M) IN THE OPTIMAL SUBSET OBTAINED FROM THE SELECTION ALGORITHM WITH MAX(M)=5.

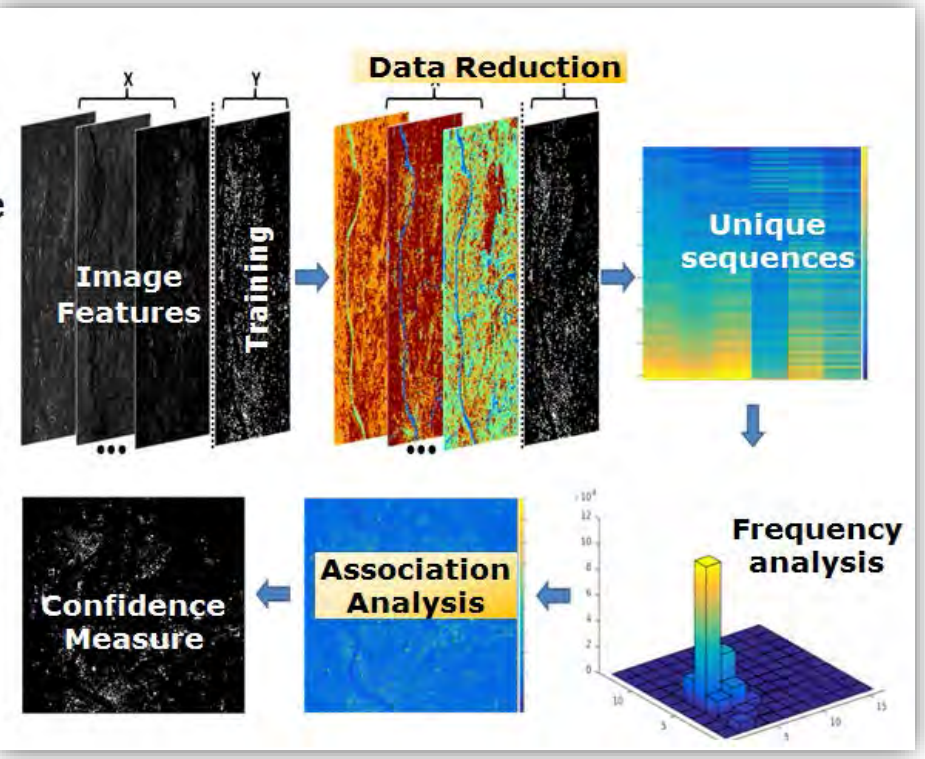
P. Kempeneers & P. Soille (2017) Optimizing Sentinel-2 image selection in a Big Data context, Big Earth Data, 1:1-2, 145-158

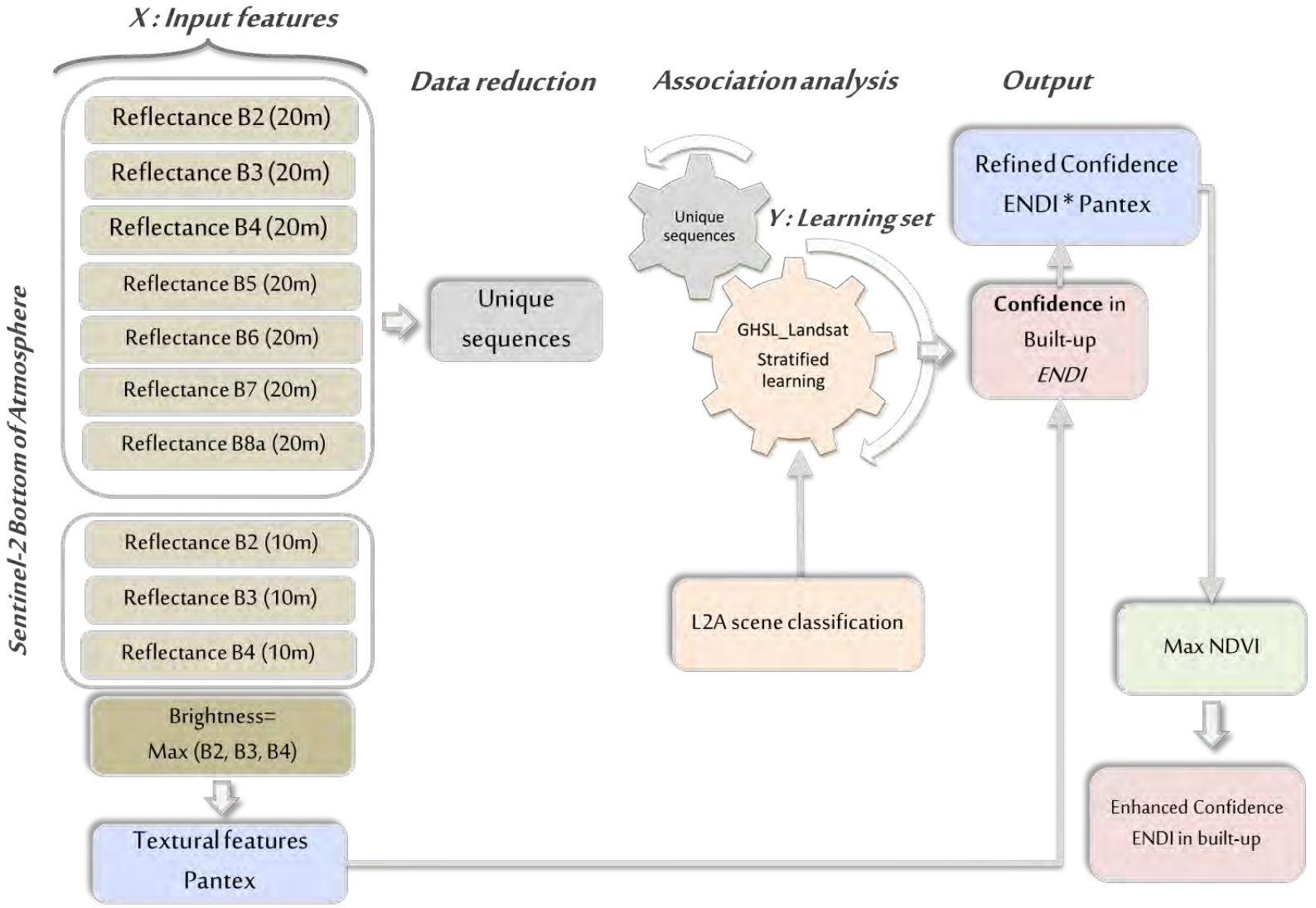
World composite based on optimal Sentinel-2 tiles



92,985 DOWNLOADED TILES WERE STORED ON THE JEODPP AND ATMOSPHERICALLY CORRECTED USING THE SEN2COR L2A PROCESSOR

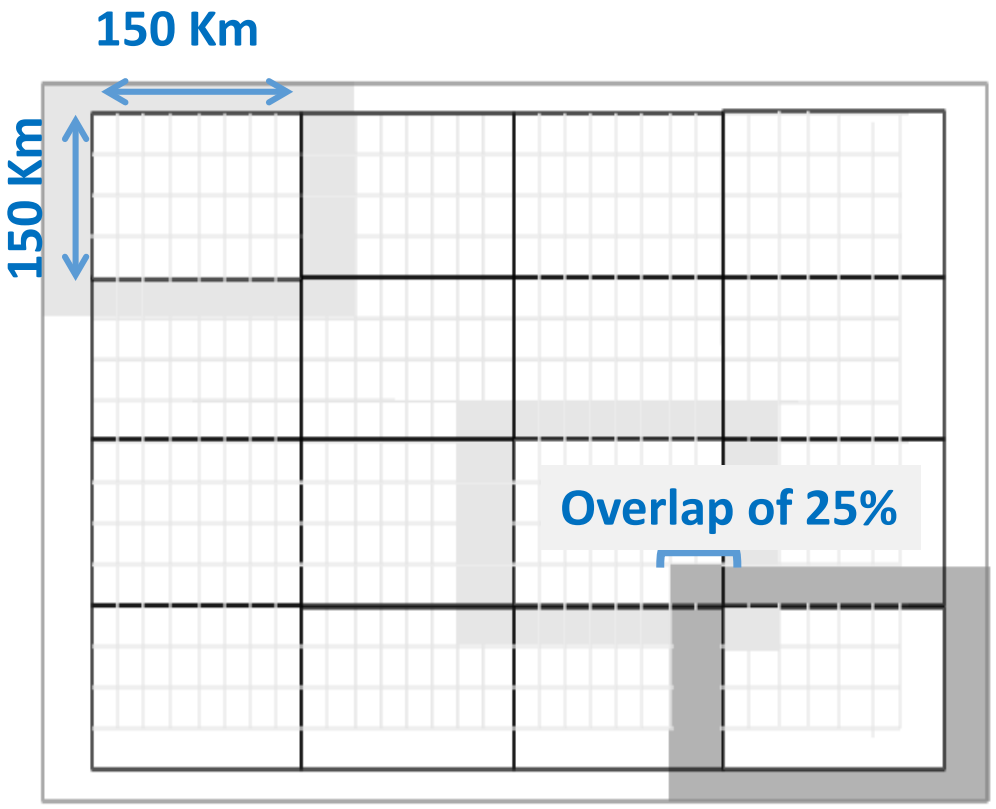
Tile-based processing workflow

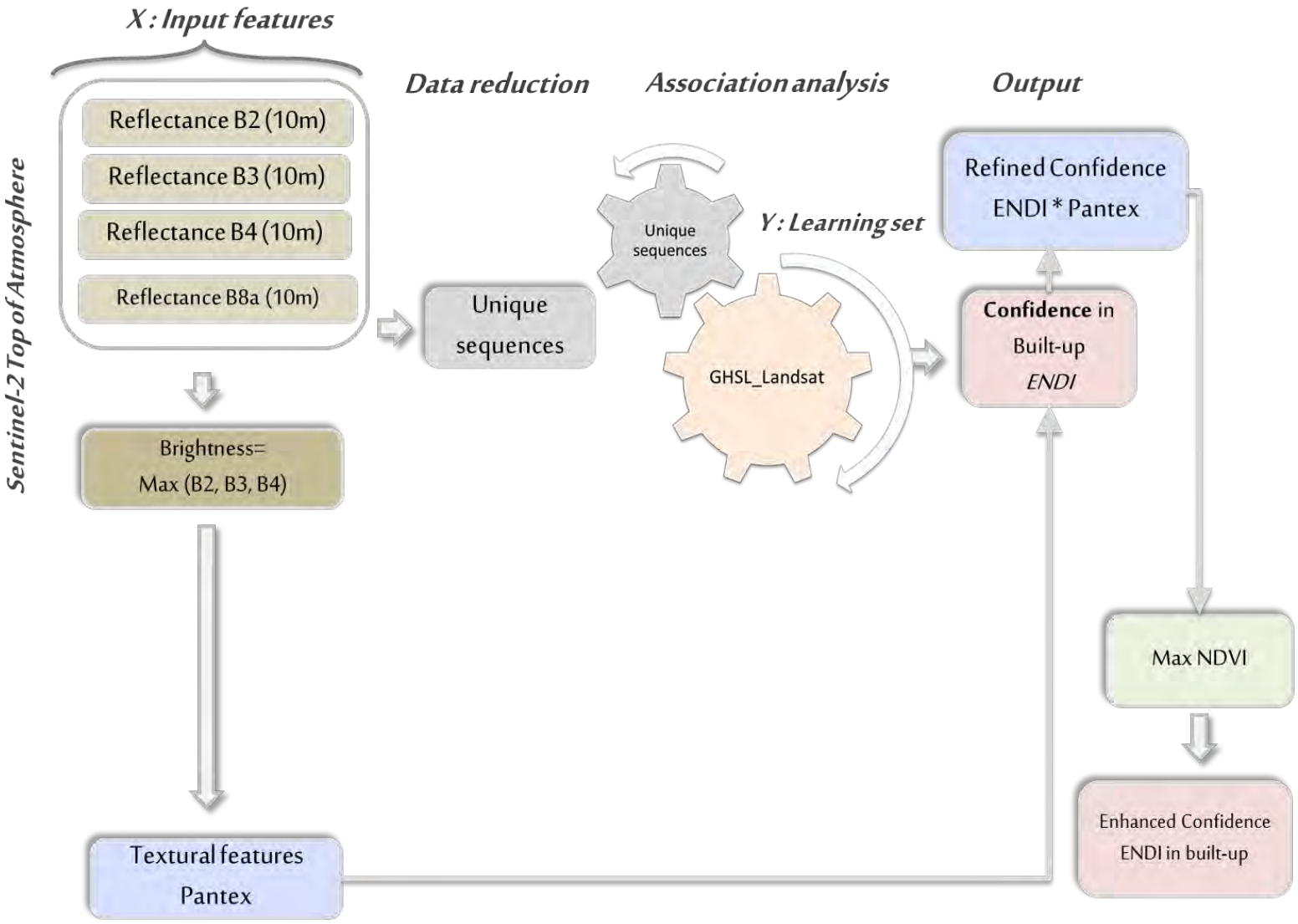




Composite-based processing workflow

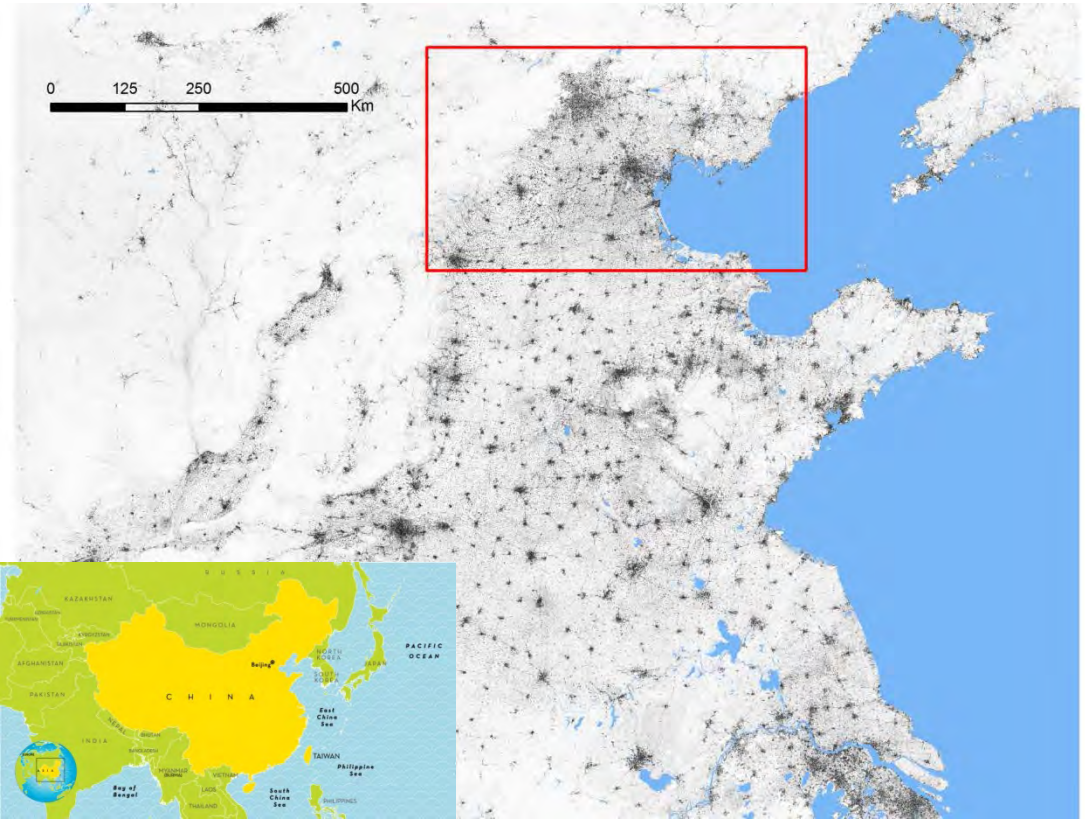
Block processing approach





RESULTS & WAY FORWARD

Results on 6,062 S2 tiles covering China

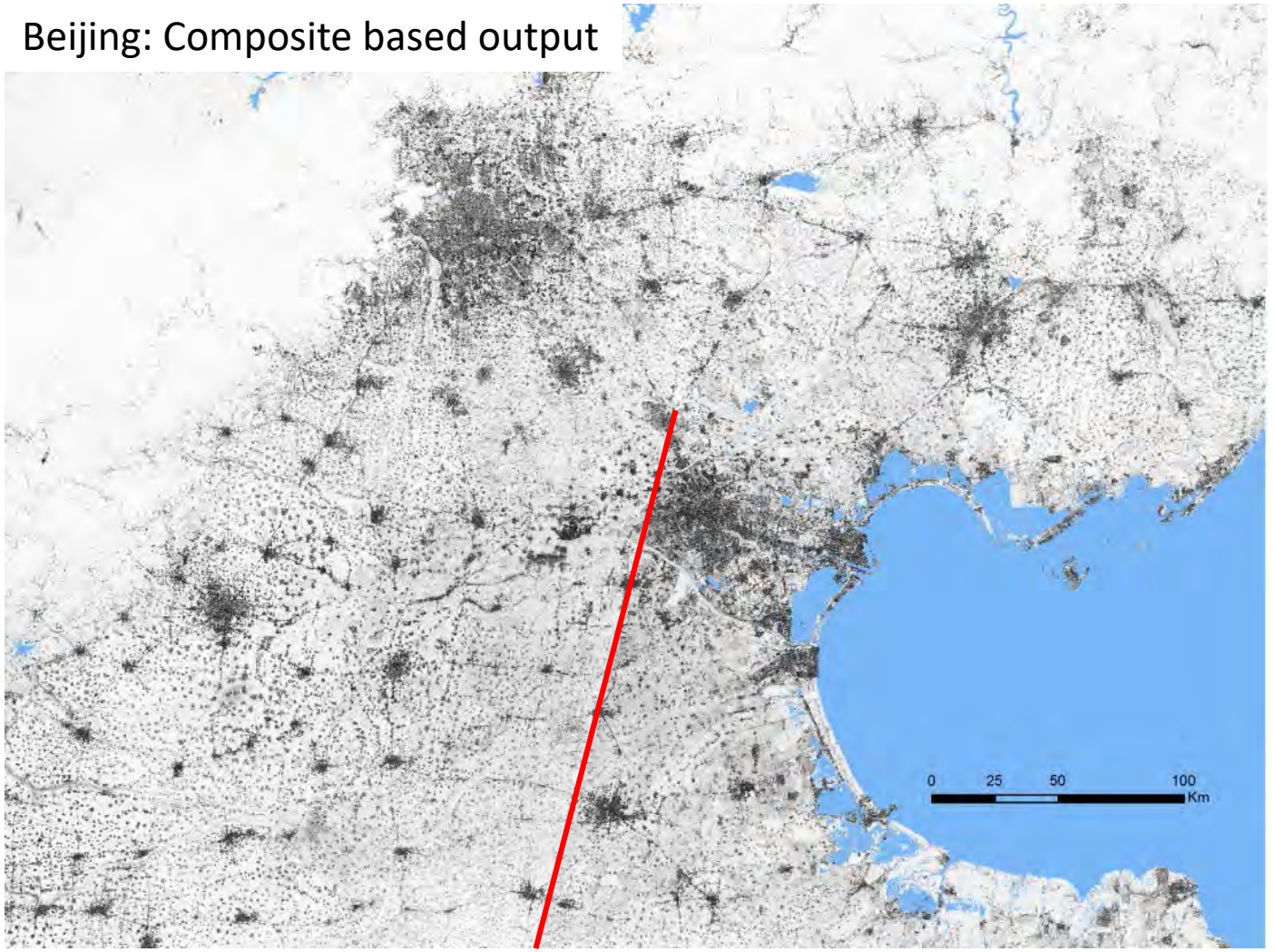


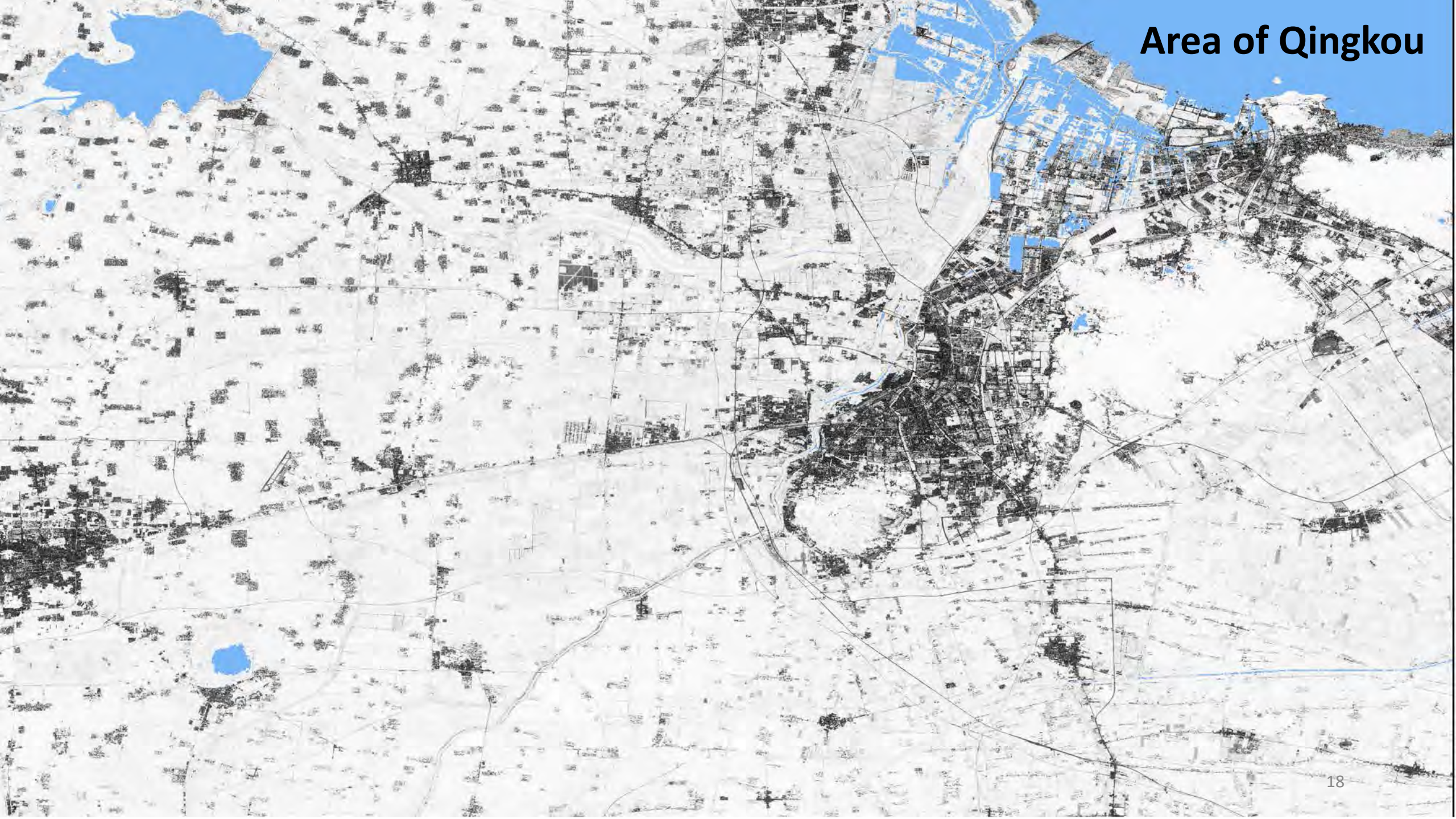
Confidence in built-up areas

High : 1

Low : 0

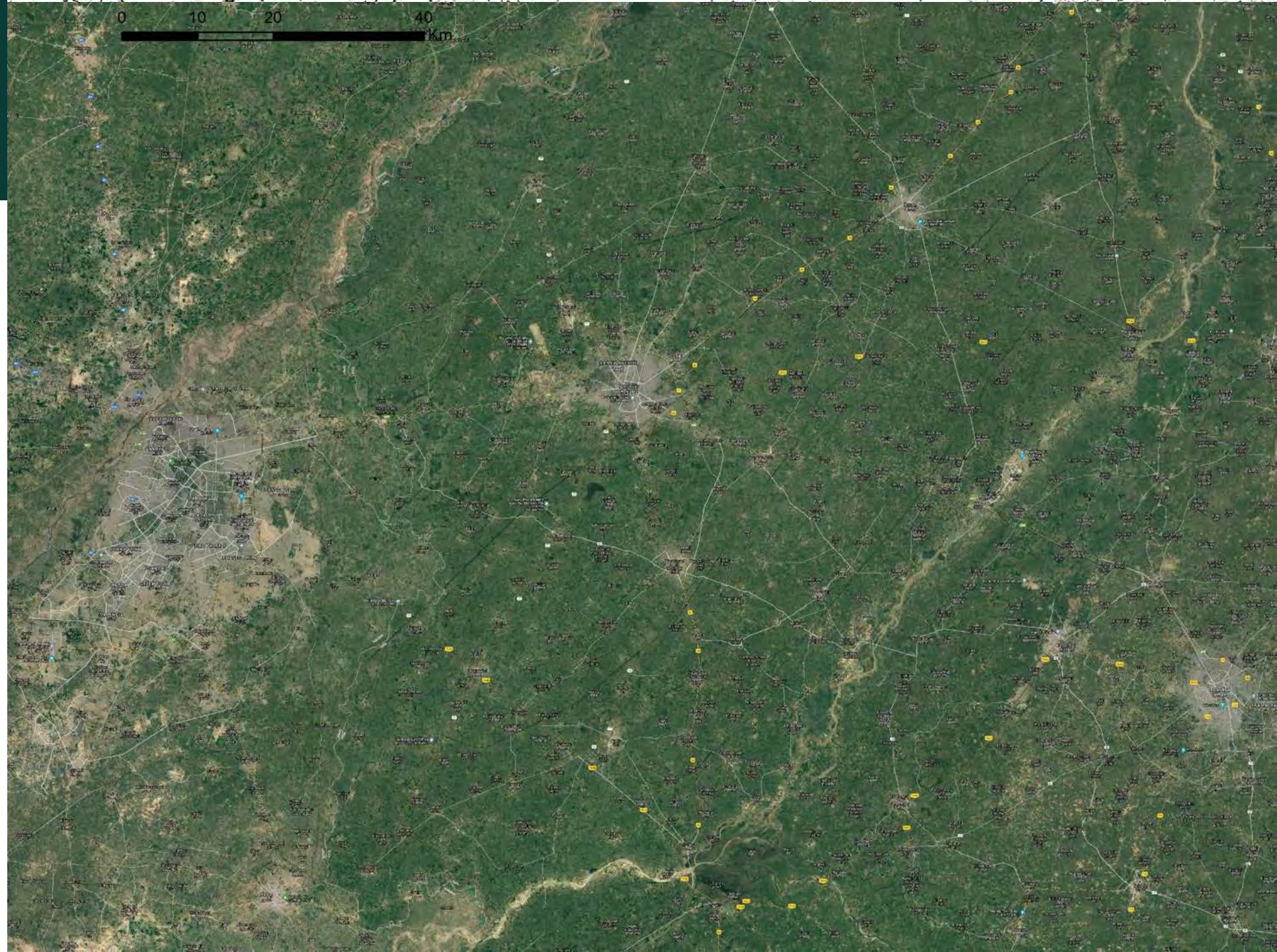
Beijing: Composite based output




Area of Qingkou

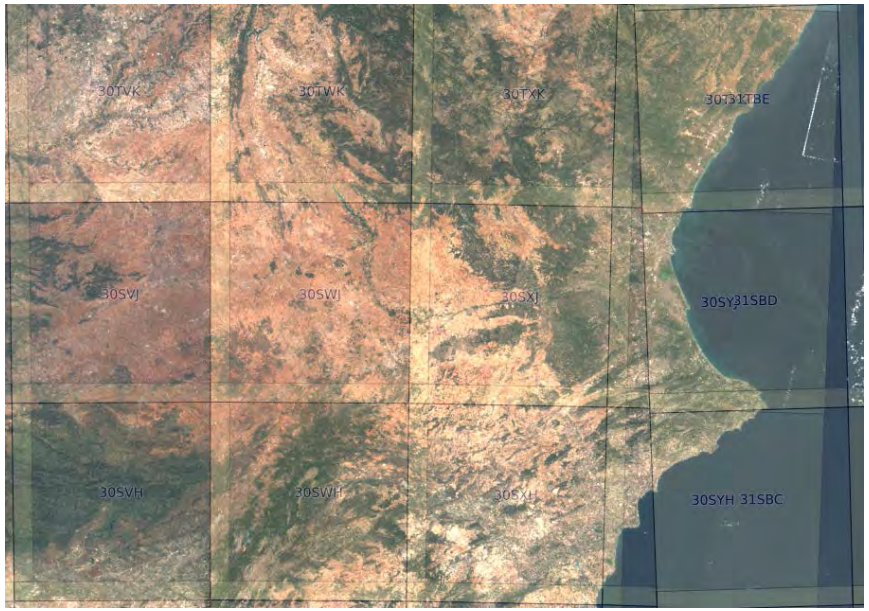
Results Laho

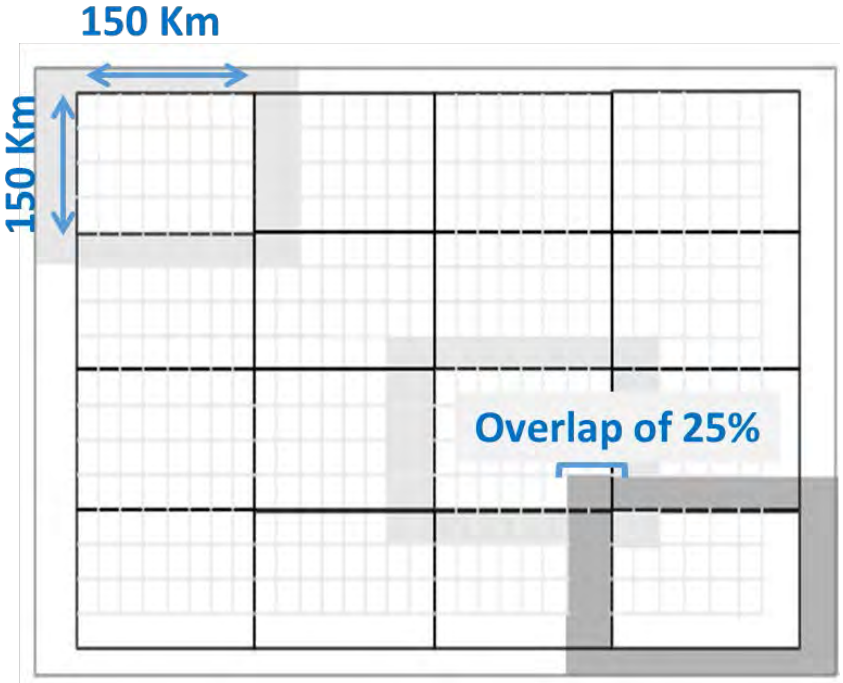
GHSL_S2 (2017-2018)



Performance assessment of the two workflows

Area of 6 000 000 km²
Cluster: 16 processing nodes
Total RAM: 256 GB
CentosOS 6.9

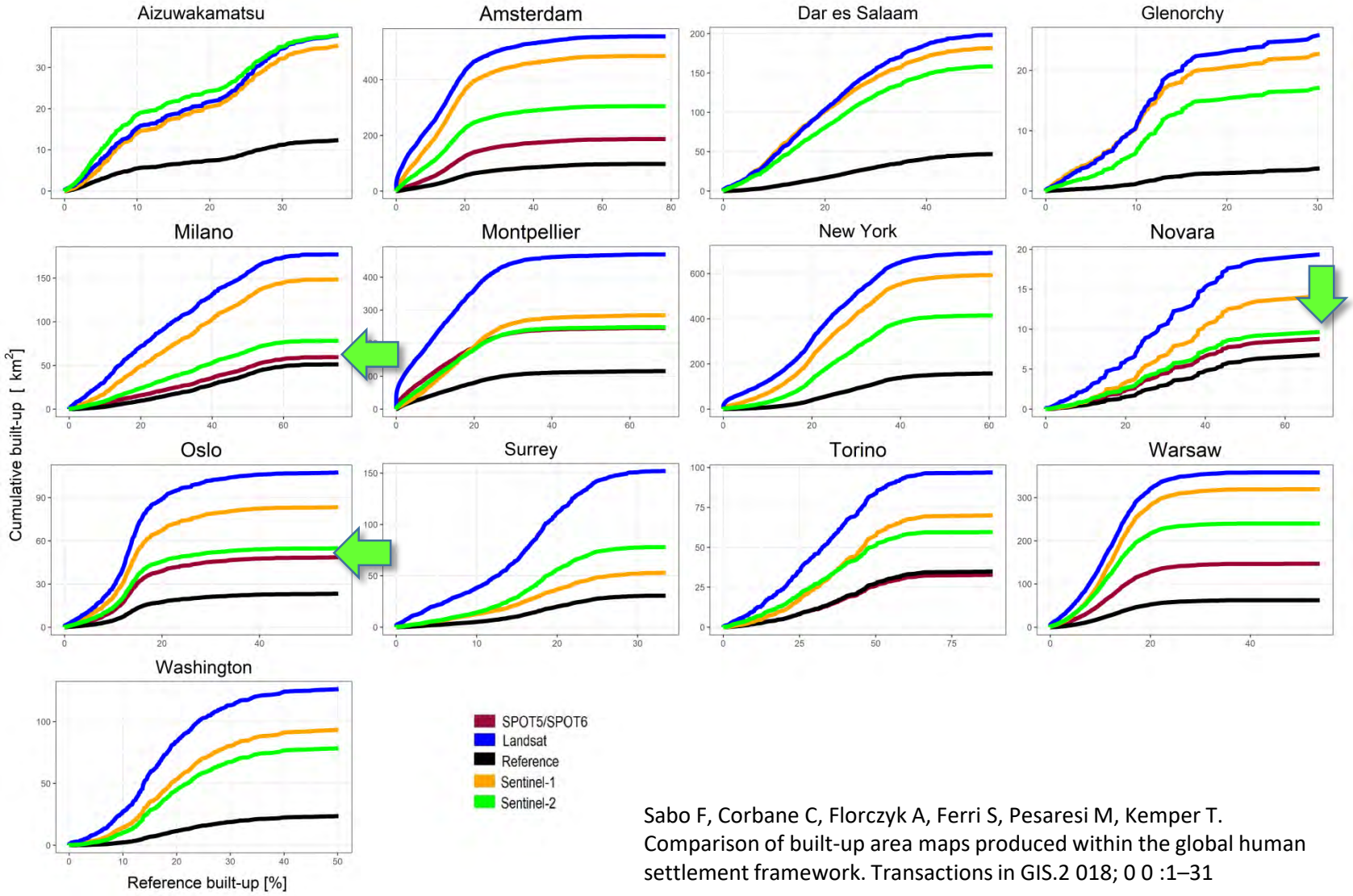




	Tile Based workflow	Composite based workflow
Input	1865 S2 tiles (100 x 100 km tiles)	276 blocks (150x150 km blocks)
Processing time	15 h	12 h
Number of concurrent jobs	10	2
RAM requirements per job	22 GB	120 GB

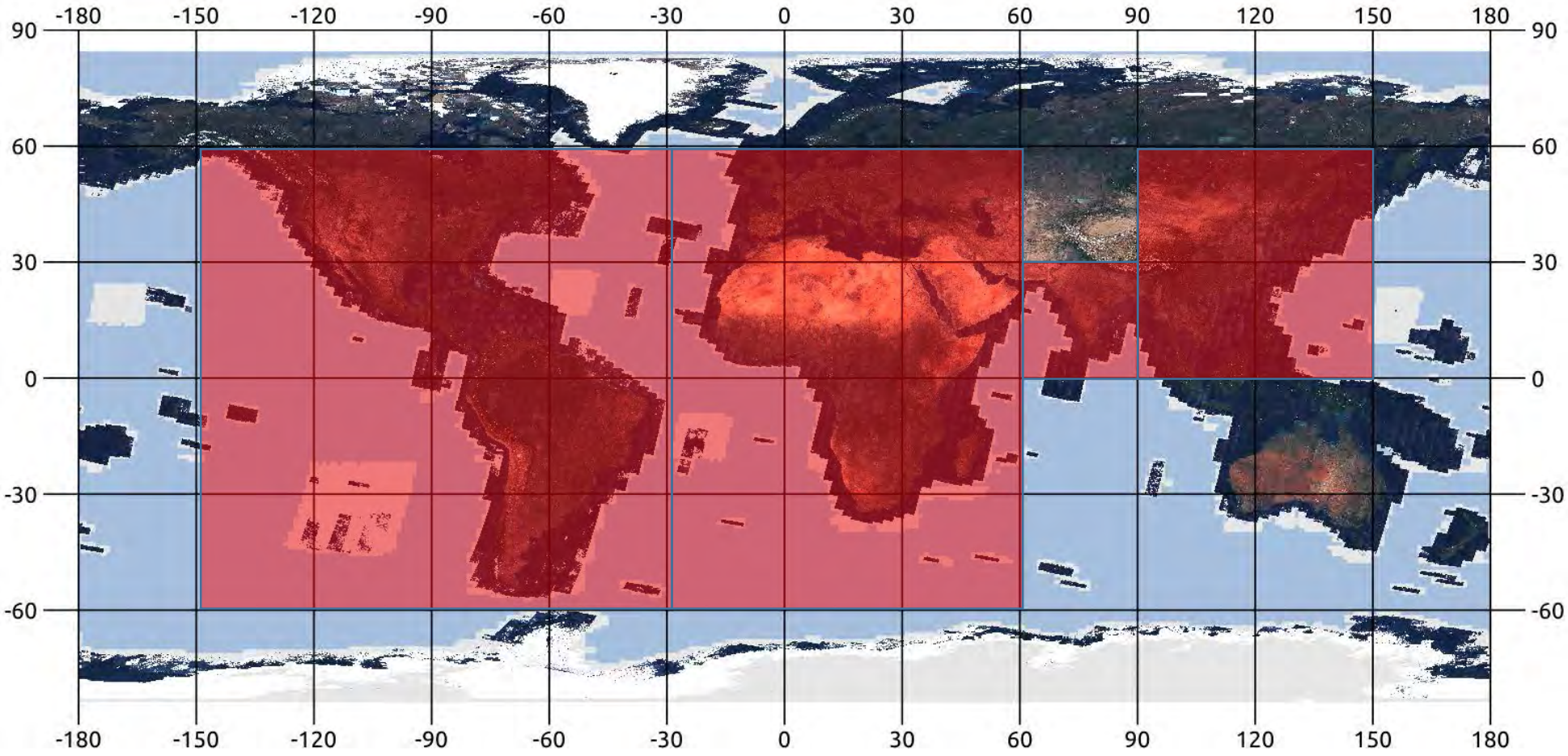
Quantitative assessment and comparison

Reference: building footprints rasterized at 1m



Sabo F, Corbane C, Florczyk A, Ferri S, Pesaresi M, Kemper T. Comparison of built-up area maps produced within the global human settlement framework. Transactions in GIS.2 018; 0 0 :1–31

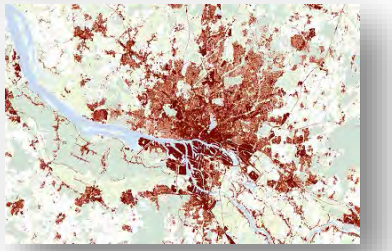
Status and next steps



Completed areas

Status and next steps

- **Global Built-up (S1 & S2 based) production under the Copernicus Global Land Component WP2020**
- **Global Multipurpose Validation exercise**
- **Integration of GHSL workflows into DIAS (Web Advanced Space Developer Interface (WASDI)- ONDA DIAS)**
- **Delivery of free tools for built-up areas extraction from Big Earth Data (MASADA v.2 – to be released soon)**

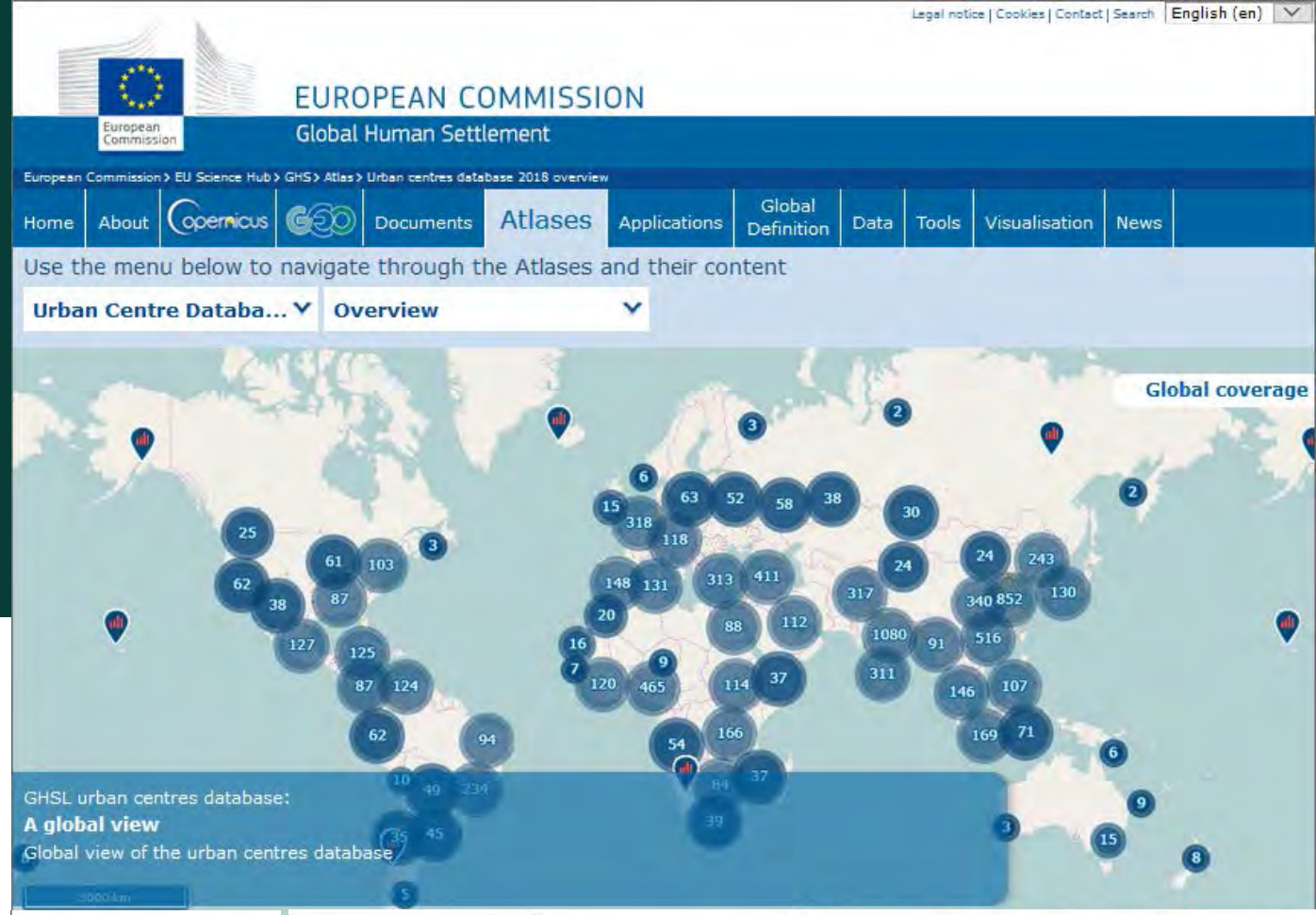


https://ghsl.jrc.ec.europa.eu/tools.php

Thank you

Christina.corban@ec.europa.eu

http://ghsl.jrc.ec.europa.eu/



Description of the GHS Urban Centre Database 2015 GHS-UCDB R2019A (4.32 MB)

Atlas of the Human Planet 2018 (29.83 MB)

Atlas of the Human Planet 2017 (9.90 MB)

GHSL Basic facts (999.99 KB)

Atlas of the Human Planet 2017 Key findings