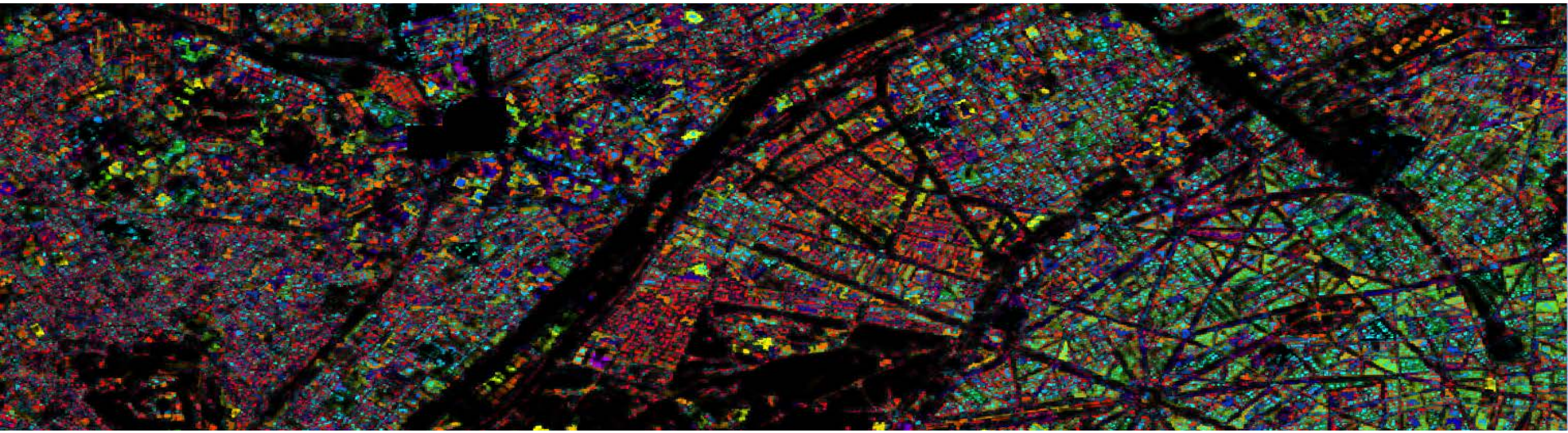
European Commission



Mapping Urban Areas From Space Conference

4-5 November 2015 ESA-Esrin, Frascati, Rome, Italy

THE GLOBAL HUMAN SETTLEMENT LAYER

Joint Research Centre

Background

- European Commission JRC supports R&D
  - automatic satellite image data interpretation for Global Human Settlement Layer (GHSL)
- Data revolution - Open Science (Open Access).
  - Access to global high-resolution satellite data (Landsat, Sentinel) is free, full and open for the broad Regional, National, European and International user community
- Automatic image information retrieval
  - Possibility to process consistently global fine-scale information
  - Sustainable information production
  - Information democratization
  - Open, public and reproducible information

Global Human Settlement Layer (GHSL)

basic philosophy

- Fine-scale, global, open and free-access data
- Any sensor input data and fully automated classification engine design
- Land cover / use integration with environmental, socio-economical and census data
- Information supporting policies
  - Information for action, policy
  - Evidence-based policy support
- Indicators for international frameworks
  - Sendai (DRR), SDGs, Clima

JRC
EUROPEAN COMMISSION

NEWSRELEASE

Brussels, 21 February 2011

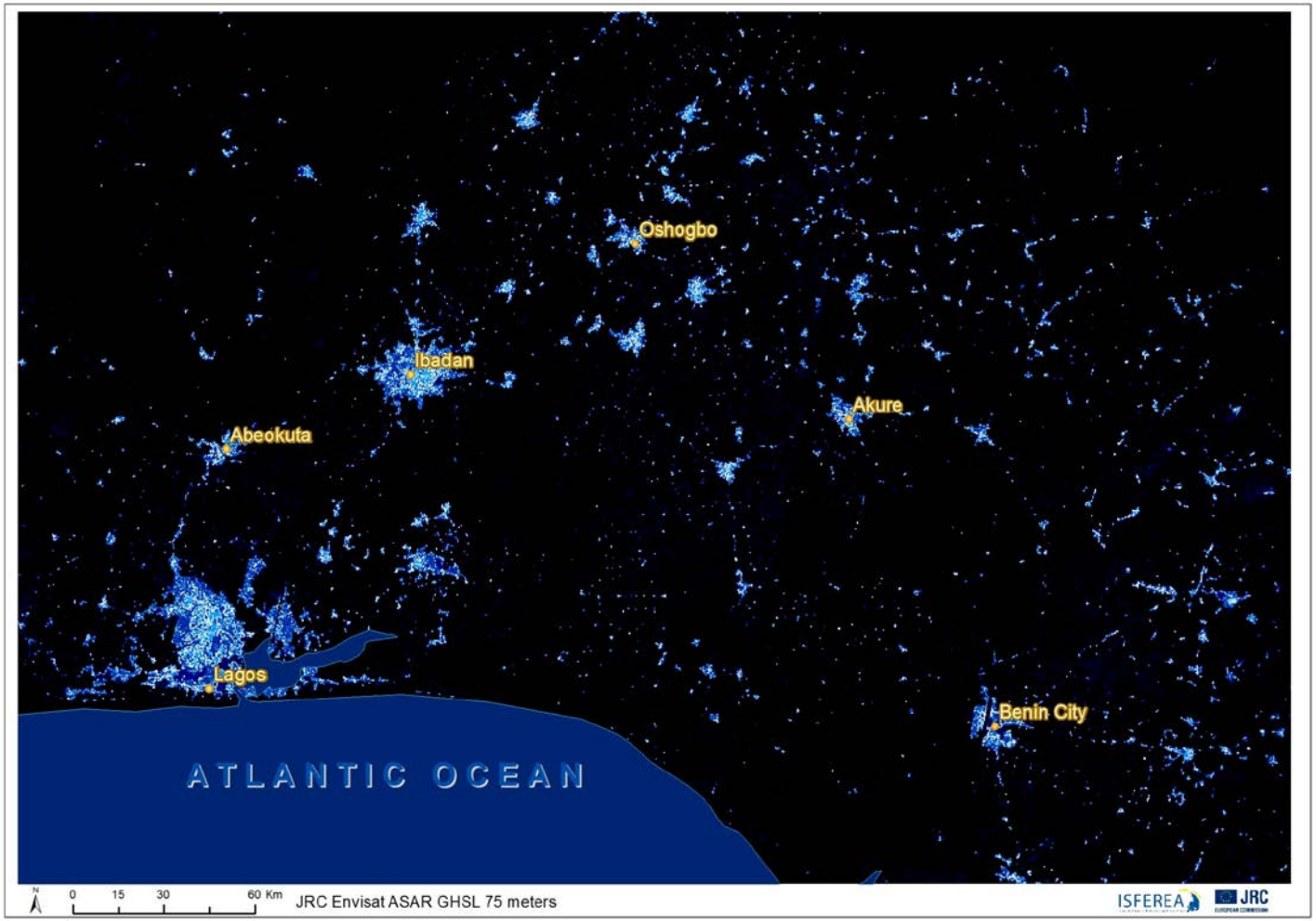


Fig. 1. Geographic distribution of the HR/VHR input images processed during the experiment.

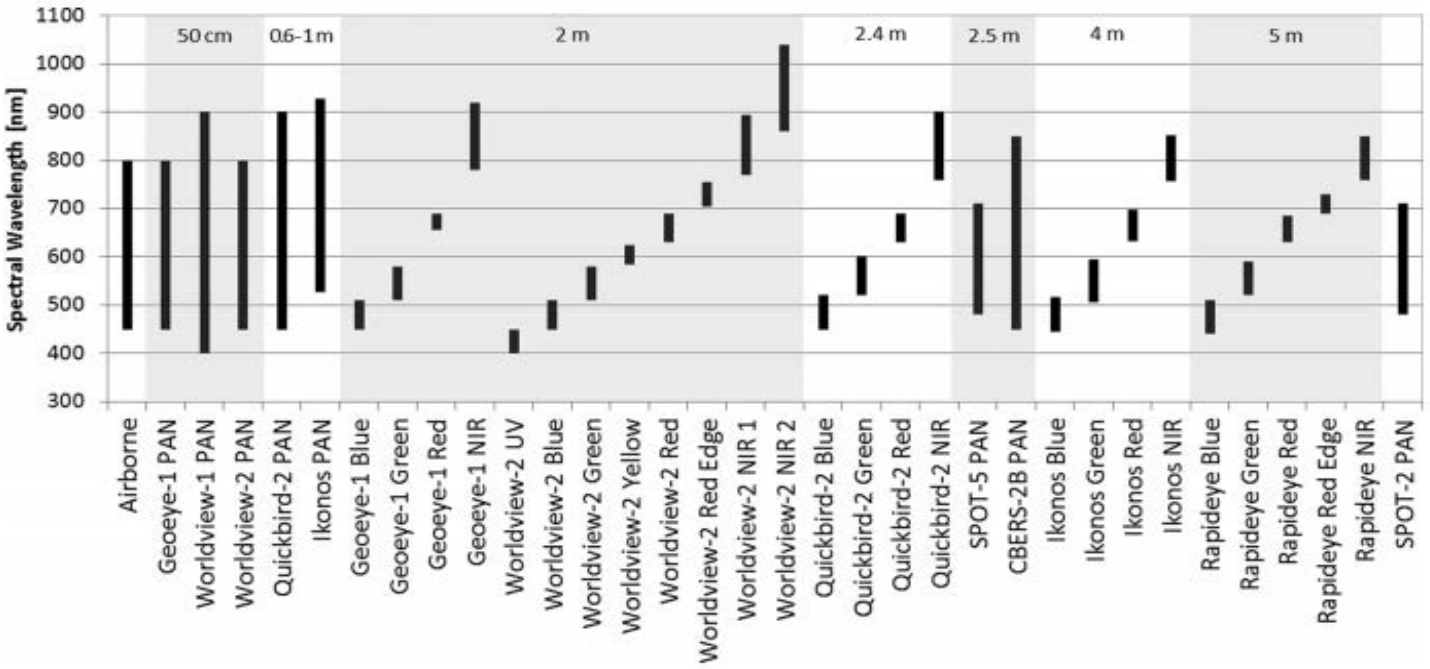


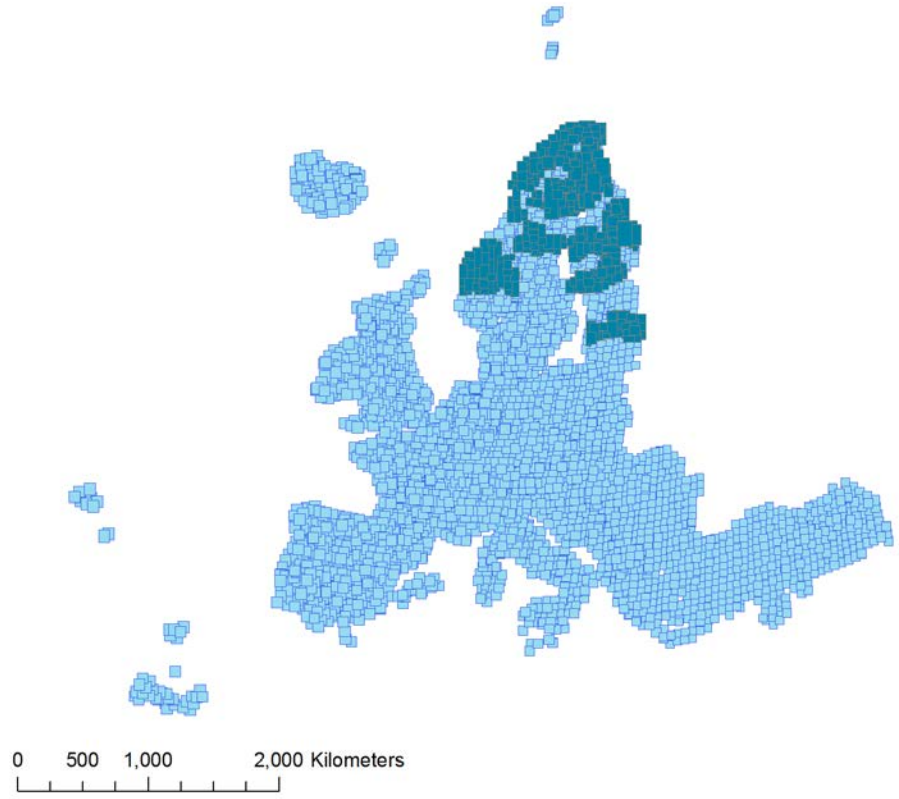
Fig. 2. Spectral coverage of sensors used in the study. The satellites cover a wide spectral range in the visible and NIR part of the spectrum. The spatial coverage includes various resolutions from 50 cm airborne to 10 m panchromatic images of SPOT 2.

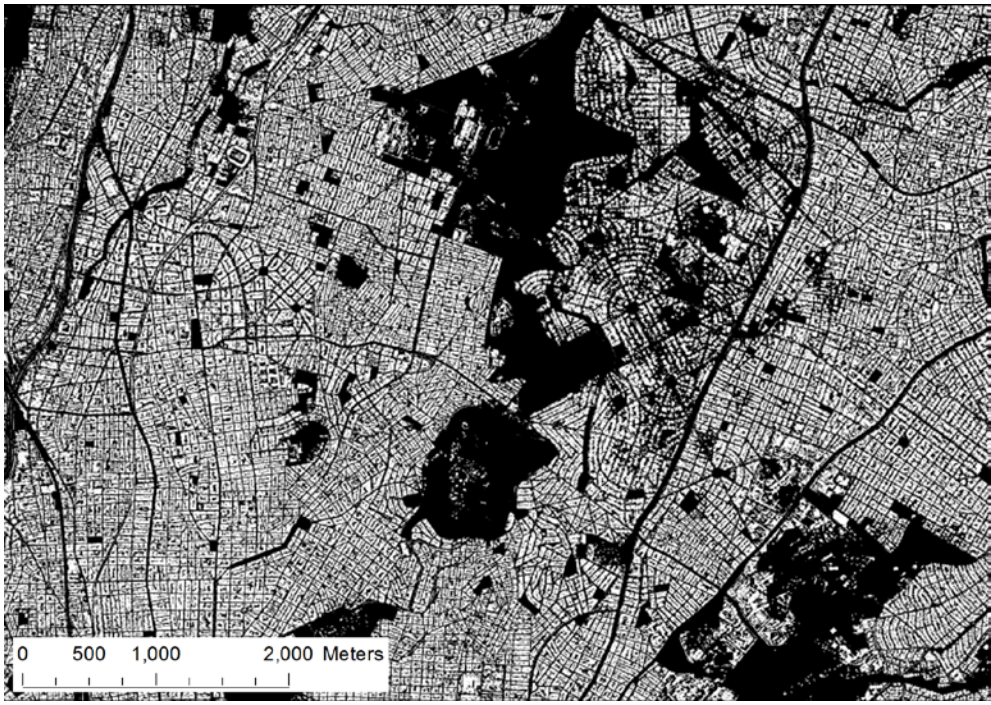
2012
Proof of concept

50Millions km^2

Large set of sensors under test

Input resolution 0.5m – 10m

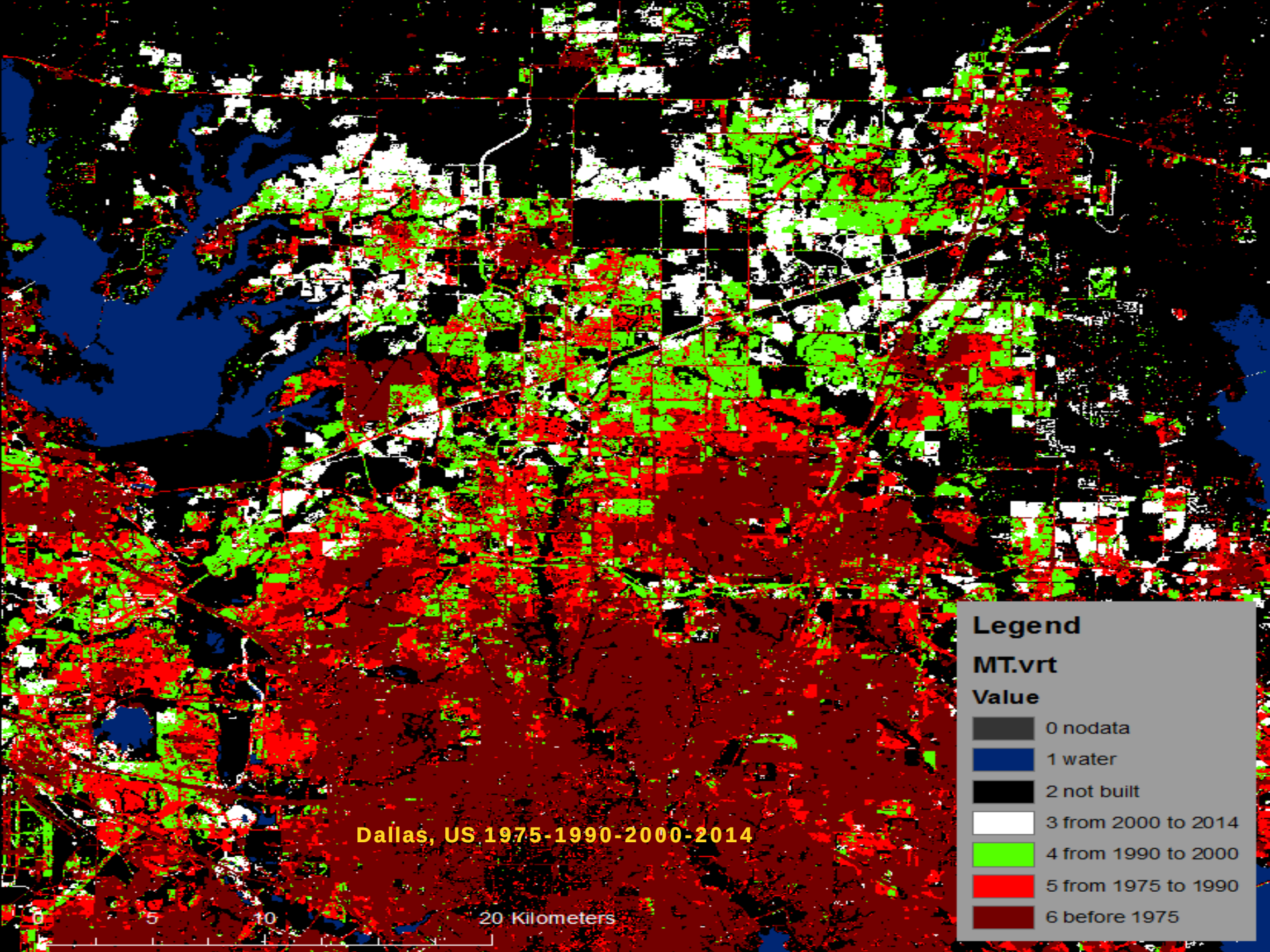




2013 GHSL European Settlement Map
Spot 2,5m – continental coverage

New methods on (old) data create new information

2014 – first tests on automat. assessment of global built-up areas using Landsat data GLS1975,GLS1990,GLS2000, and 2014 JRC collection 15,30,75-m-res input


Dallas, US 1975-1990-2000-2014
0
5
10
20 Kilometers
Legend
MT.vrt
Value
0 nodata
1 water
2 not built
3 from 2000 to 2014
4 from 1990 to 2000
5 from 1975 to 1990
6 before 1975

Land cover / use integration with environmental, socio-economical and census data

Indicators for monitoring the implementation of international frameworks Sendai (DRR), SDGs, Clima

Year	(1)WB Pop	(2)GHSL Landsat BU	(3)estim. Landsat BU	(4)estim. Landsat BU per capita	(5)estim. C10K BU	(6)estim. C10K BU per capita
1975	4.03946E+09	3.08779E+11	4.05165E+11	100.30	8.76777E+10	21.71
1990	5.25428E+09	5.32197E+11	5.32197E+11	101.29	1.15167E+11	21.92
2000	6.07504E+09	6.29508E+11	6.29508E+11	103.62	1.36225E+11	22.42
2014	7.09653E+09	7.74530E+11	7.74530E+11	109.14	1.67608E+11	23.62
2050	9.60000E+09		1.29988E+12	135.40	2.81293E+11	29.30

Table 7: Global assessments of population and built-up surfaces

European Commission

Pre-operational SENTINEL 1,2 GHSL – Copernicus Service 2018+

GHSL will be updated with Sentinel data
production of indicators monitoring the implementation of international frameworks

2016 first test global mosaic of S1 GHSL
2017 first test global mosaic of S2 GHSL
2018+ tech specs for operational Copernicus service with integrated S1-S2 input data

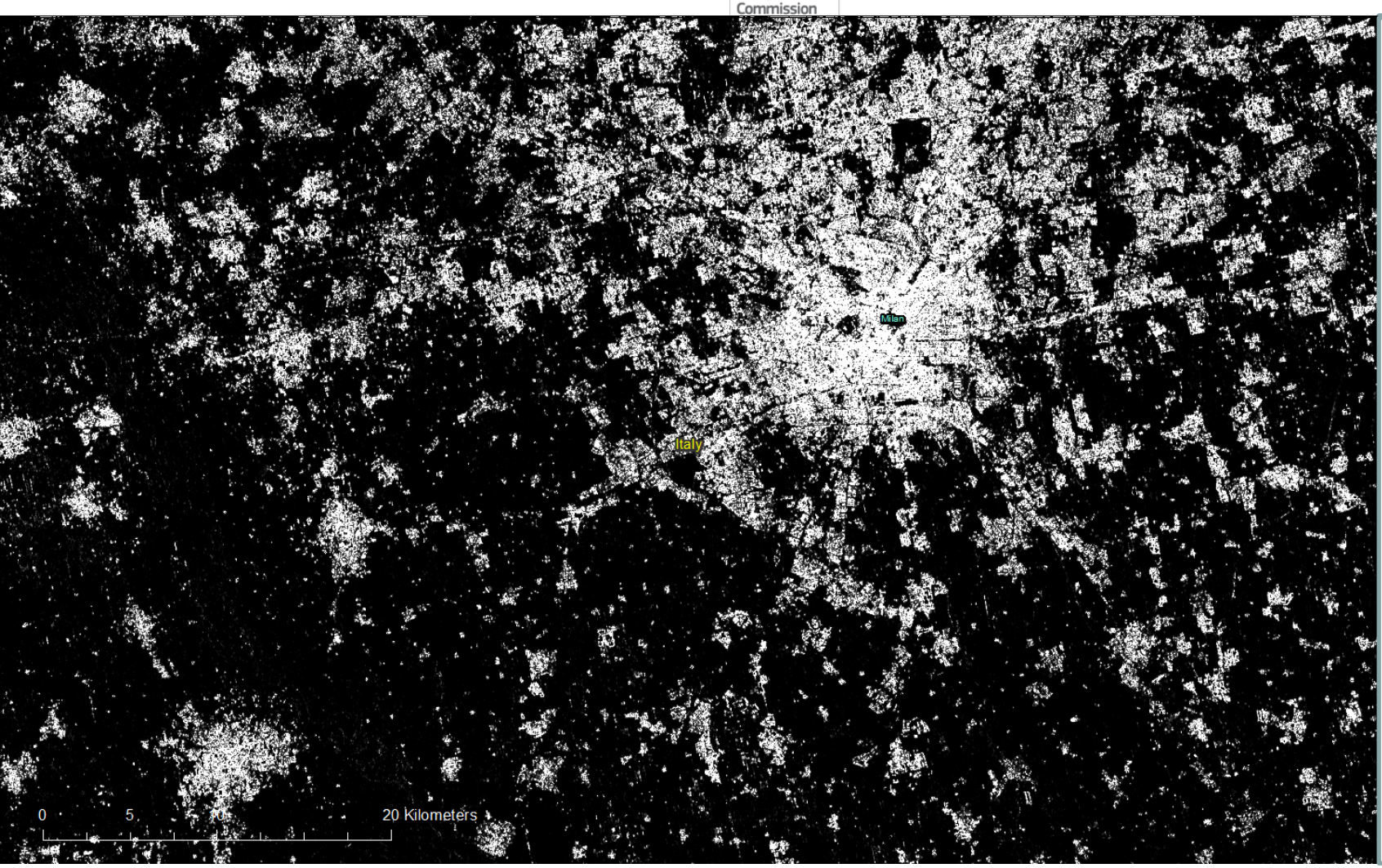
Global – 10m-resolution – yearly update
Open and free-access data policy

Joint Research Centre

Copernicus

GHSL Built-up areas recognition

European Commission



Milano, IT

GHSL S1 StripMap

Joint Research Centre

Copernicus

GHSL Land / water recognition

European Commission

Po Delta

GHSL S2A

Water

Joint Research Centre

Copernicus

Conclusions and Outlook

- GHSL is global, open and free in support to SDG, Sendai DRR,
- New paradigm for satellite data classification – robust and computationally cheap
- Large range of sensors tested (optical, radar)
- Global mosaics with Landsat, next Sentinel 1,2
- New Copernicus service in 2018+
- Automatic approach – reproducible, sustainable continuous information production streams – generalization to multiple class
- Human costs/efforts moving from the information extraction phase (that become trivial) to the validation, cross-comparison, analysis.

Public release of the Landsat GHSL October 2016

Public release of the Sentinel GHSL October 2018

Since Oct 2014, on-going sharing in the GHSL pre-release data inside the working group GEO GROUP ON EARTH OBSERVATIONS

Join us! martino.pesaresi@jrc.ec.europa.eu

THANKS

GHSL contributors (May 2015)

M. Pesaresi – action leader, method design, coordination & planning
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A. Florczyk – system development – web services and data integration
S. Freire – methodological development - population modelling
F. Haag - image interpreter – quality control and validation
M. Halkia – application development - European regional analysis
A.M. Julea – algorithm development - image processing
T. Kemper – application development – IDP camps, slums, vulnerability
V. Syrris – algorithm development – distributed computing
P. Soille - algorithm development - distributed computing
L. Zanchetta – IT support, computing infrastructure design