

Copernicus Sentinel imagery and potential added value to CAP On The Spot Controls

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Overview

Free and Open high resolution sensors: the Copernicus Sentinels

Update on Sentinel 1

Expectations for S1 and S2 use in CAP OTSC

Use of satellite imagery in agriculture

Resolution	Revisit	Application	Limits
300 m – 1 km	Daily	Global crop production trends	Not crop specific, difficult to separate area and phenology
10-30 m	Weekly	Crop area, crop type, phenology, crop diversity/rotation	Requires massive data processing, globally consistent methodology
0.5-5 m	On demand	Area measurement, detailed measures, precision farming	Costly, on sample basis only

Free & Open

Commercial, but plenty choice

What is Copernicus?



European
independence &
contribution to
global observing
system

Global, timely and
easily accessible
information



Copernicus



Sentinel-1A

S1A is the very first of the Copernicus Sentinels.

A C-band SAR, dual-polarization, with several “modes”, 12 day repeat cycle. Together with S1B (2016), 6 day repeat cycle!

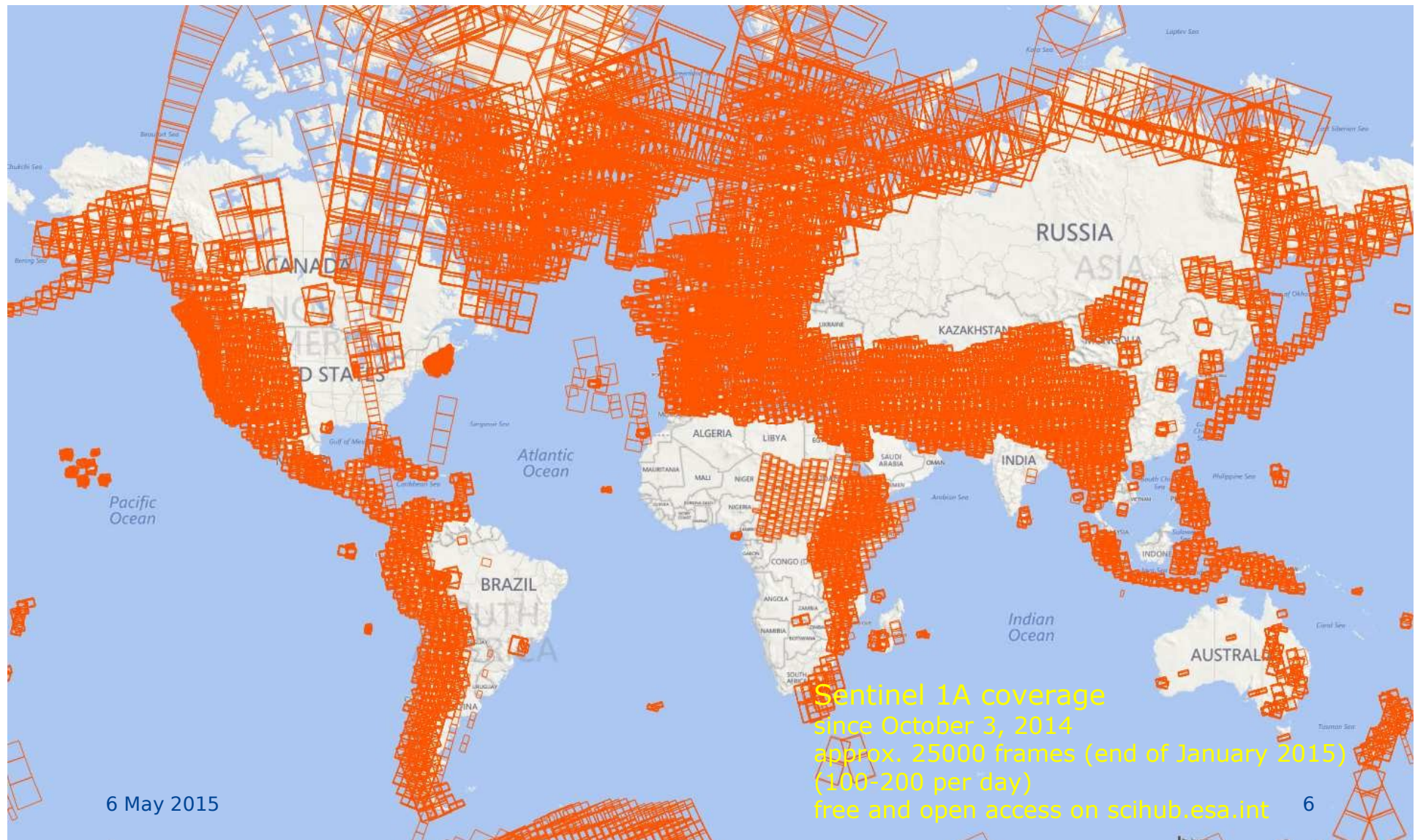
Interferometric Wide (IW) mode is default [land] mode, 10 m resolution, 185 km swath. ~0.8 Gb per polarisation channel.

“Full, Free and Open” access. Geocoding possible with the open source S1-toolbox, in batch mode

S1TBX also supports calibration, and a host of other [SAR specific] image processing functions



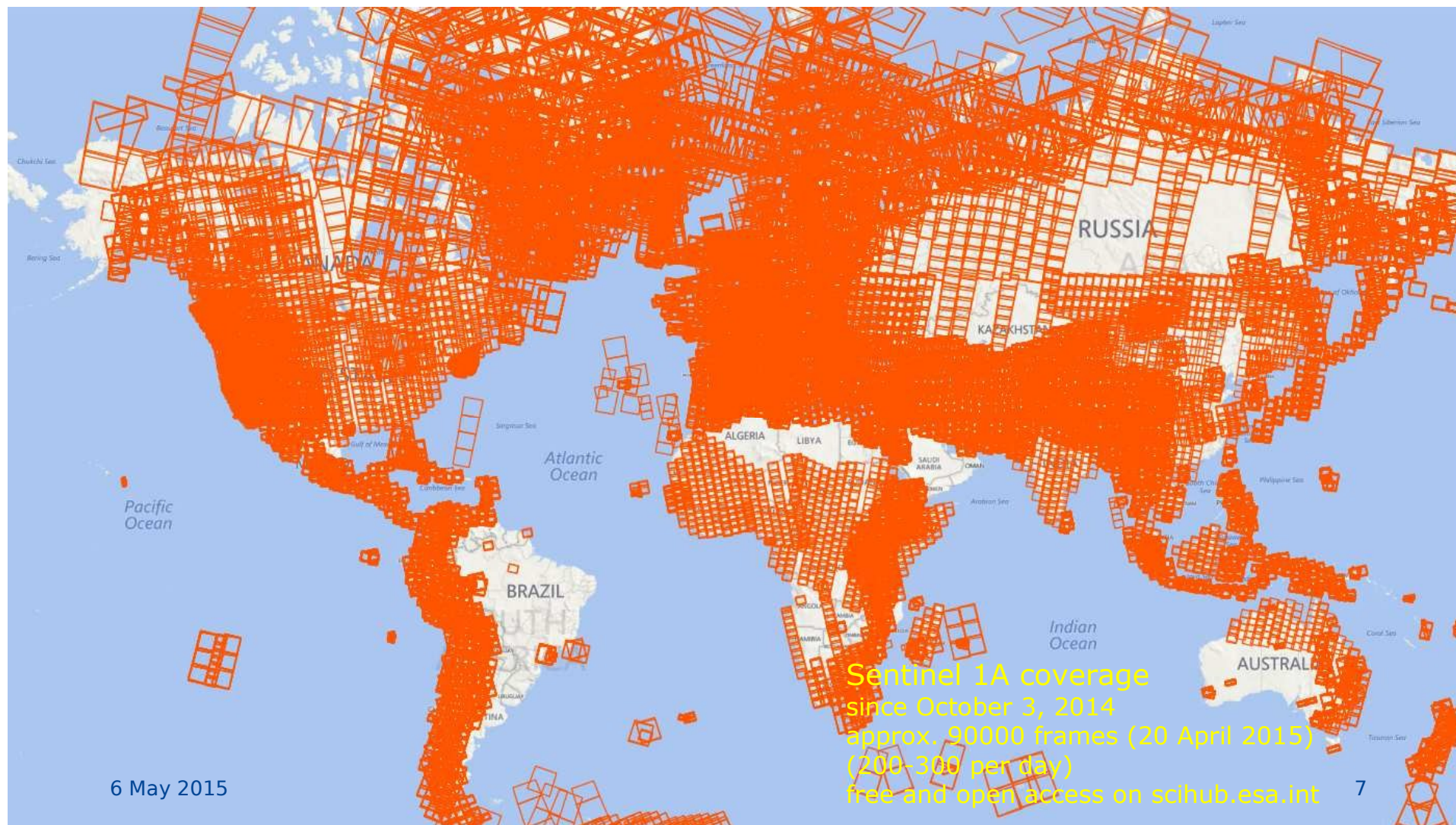
European
Commission



Sentinel 1A coverage
since October 3, 2014
approx. 25000 frames (end of January 2015)
(100-200 per day)
free and open access on scihub.esa.int

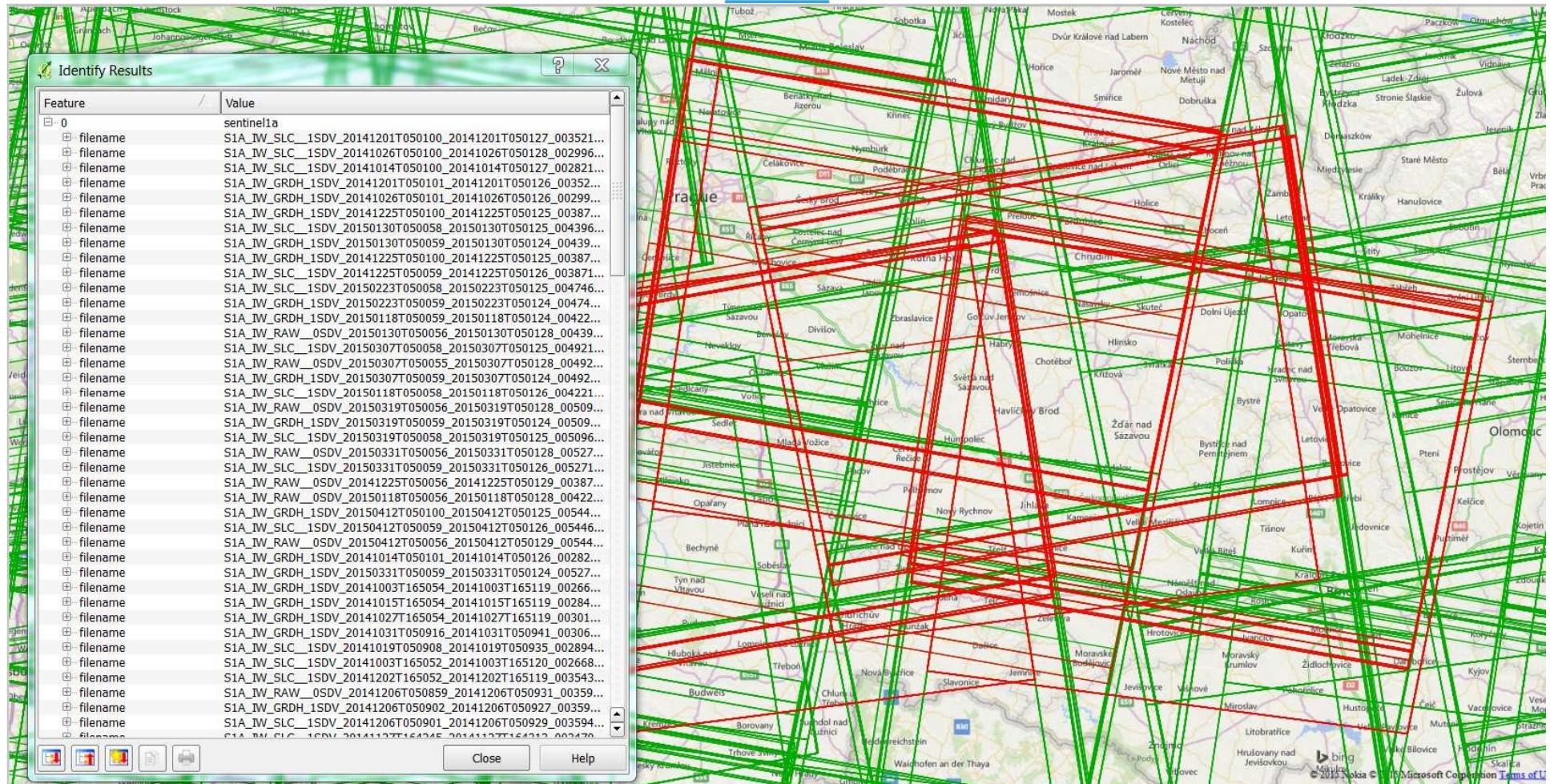


European
Commission





European
Commission



In Europe, multiple coverage from overlapping ascending and descending orbits!

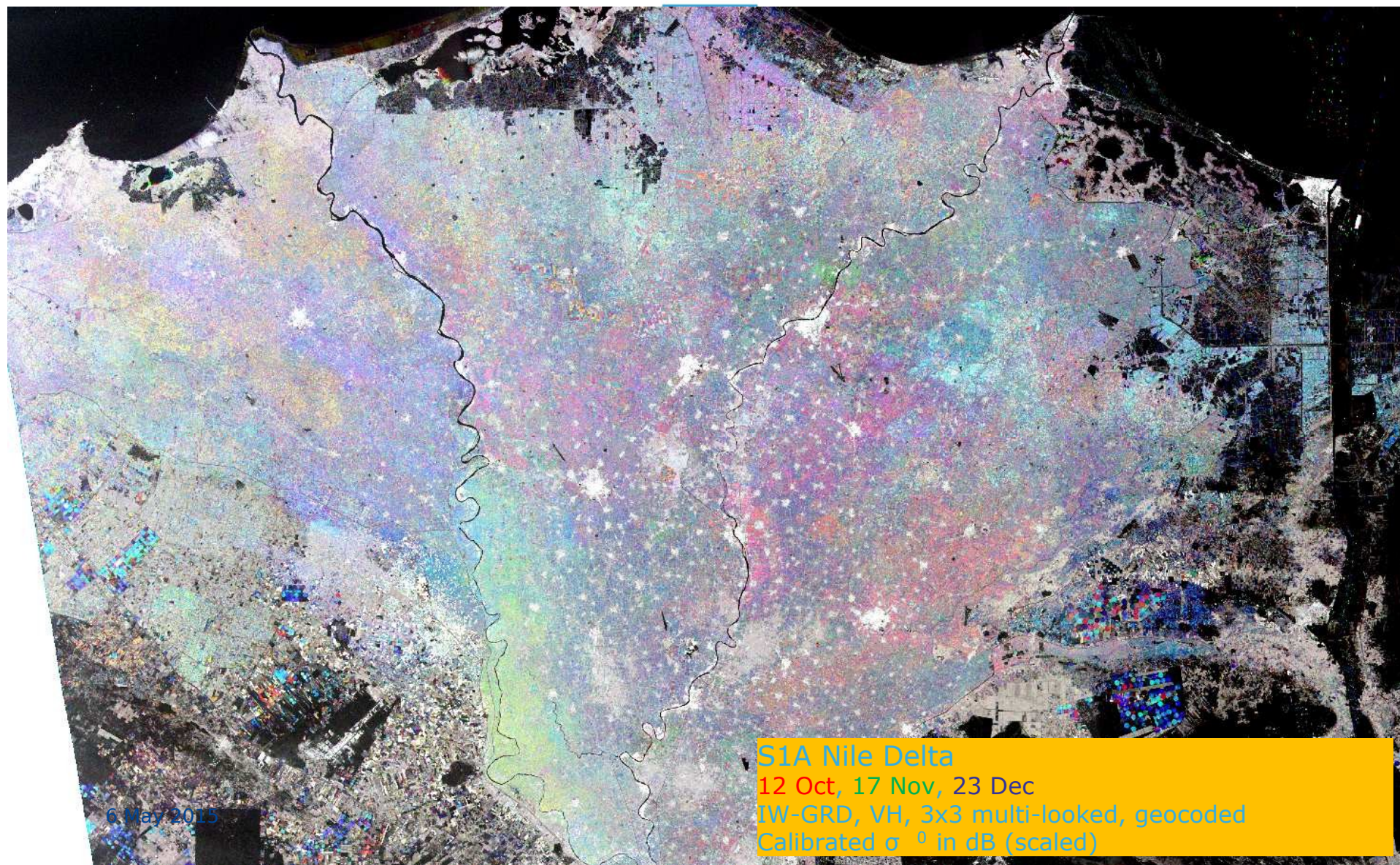
6 May 2015

Joint
Research
Centre

8



European
Commission



S1A Nile Delta

12 Oct, 17 Nov, 23 Dec

IW-GRD, VH, 3x3 multi-looked, geocoded

Calibrated σ^0 in dB (scaled)

6 May 2015



European
Commission

Google Earth Engine

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Help

gg

Scripts Docs

NSW_S1A_combi

Get Link

Save

Run

Reset



Inspector

Console

Tasks

microeco_ELEC
NAIP_features2
NCEP display test
NDWI_extract
NHU_S1A_combi
NHU_S1A_only
NSW_S1A_combi

```
1 // NSW_S1A_combi
2 // ASC
3 var s1_20141009 = ee.Image('04506042925739229745-04010150827404158855');
4 var s1_20141021 = ee.Image('04506042925739229745-02094782379573228579');
5 var s1_20141114 = ee.Image('04506042925739229745-18217876338472823932');
6 var s1_20141126 = ee.Image('04506042925739229745-06060588760989137524');
7 var s1_20141208 = ee.Image('04506042925739229745-06060588760989137524');
8 // DESC
```

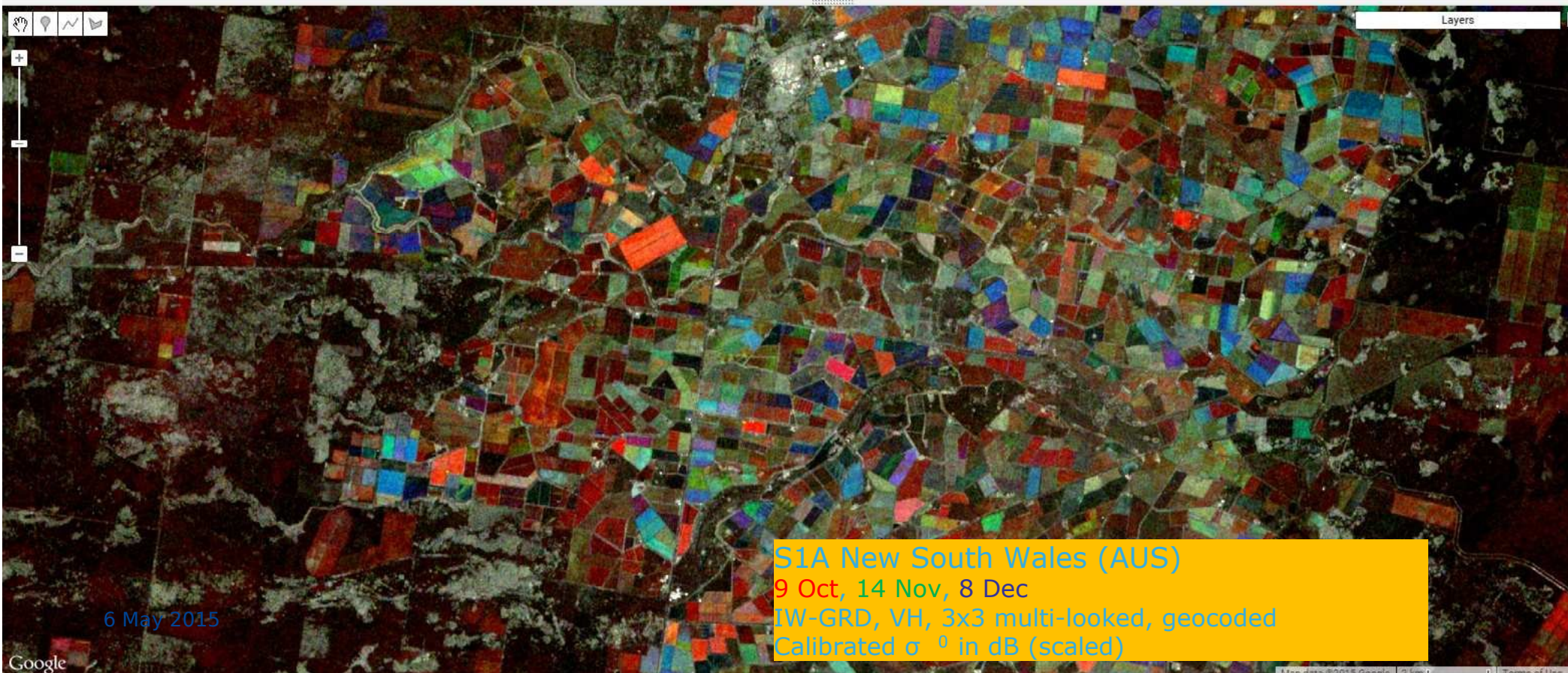
Use print(...) to write to the console.

ImageCollection LC8_L1T_8DA

ImageCollection MODIS/MCD43

FeatureCollection (2036 ele

Layers



Google

Map data ©2015 Google | 2 km | Terms of Use



European
Commission

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Search places and datasets...



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Console Tasks

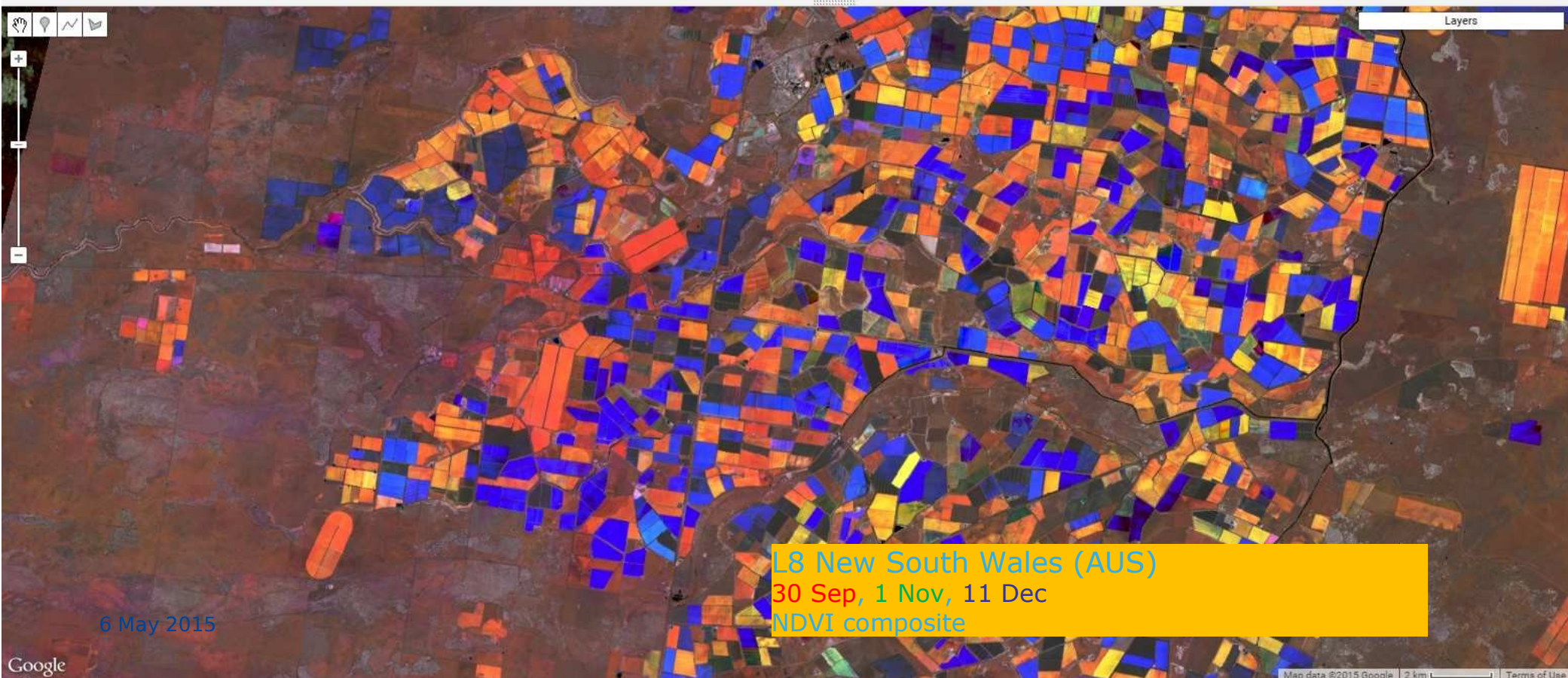
NSW_S1A_combi
NAIP_features2
NCEP_display_test
NDWI_extract
NHU_S1A_combi
NHU_S1A_only
NSW_S1A_combi

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Use print(...) to write to the console.

- ImageCollection LC8_L1T_8DA
- ImageCollection MODIS/MCD43
- FeatureCollection (2036 elements)

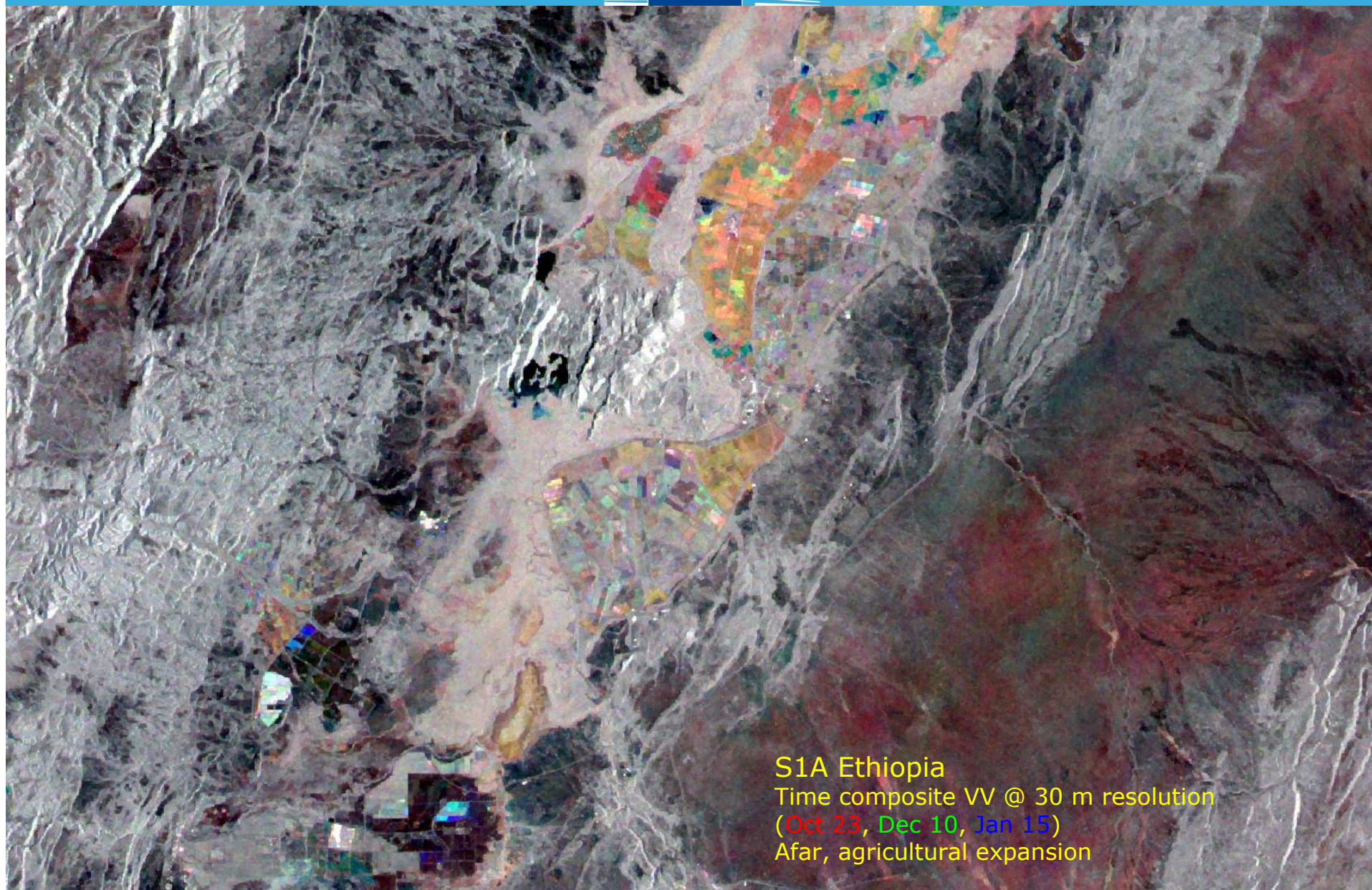
Layers



6 May 2015

Google

Map data ©2015 Google 2 km Terms of Use



S1A Ethiopia
Time composite VV @ 30 m resolution
(Oct 23, Dec 10, Jan 15)
Afar, agricultural expansion

Copernicus Sentinels



S1A/B: Radar Mission

3 Apr 2014/early 2016



S2A/B: High Resolution Optical Mission

JUNE 12, 2015 /2016



S3A/B: Medium Resolution Imaging and Altimetry Mission

2015/2017



S4A/B: Geostationary Atmospheric Chemistry Mission

2021/2027



S5P: Low Earth Orbit Atmospheric Chemistry Mission

2015



S5A/B/C: Low Earth Orbit Atmospheric Chemistry Mission

2021/2027



S6A/B: Altimetry Mission

2020/2026

Copernicus: the (near) future

S1A will eventually produce approx. 1 Tb/day (~ Q2/2015).

S2A will produce 3 Tb/day (10 m BGRN (4x), 20 m RNS (6x), 60 m BNS (3x) with global land coverage, every 12 days.

S1B and S2B scheduled for launch in 2016. Another 4 Tb/day.

S1/2 C&D planned to guarantee continuity until, at least, 2025.

To be followed by S1/2 “next generation”.

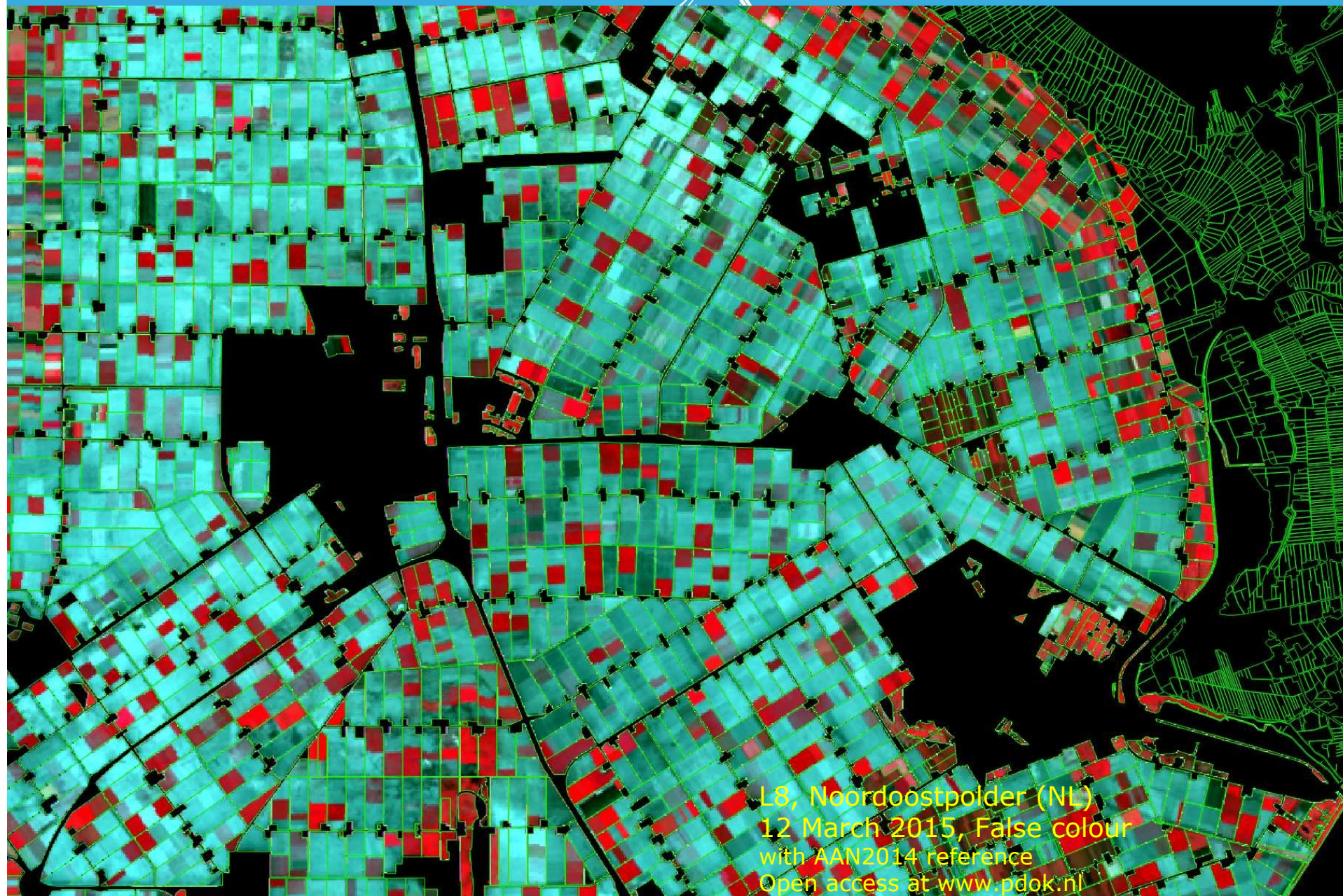
“Big Data ”, but still manageable at Member State scales!

Relevance for CAP OTSC

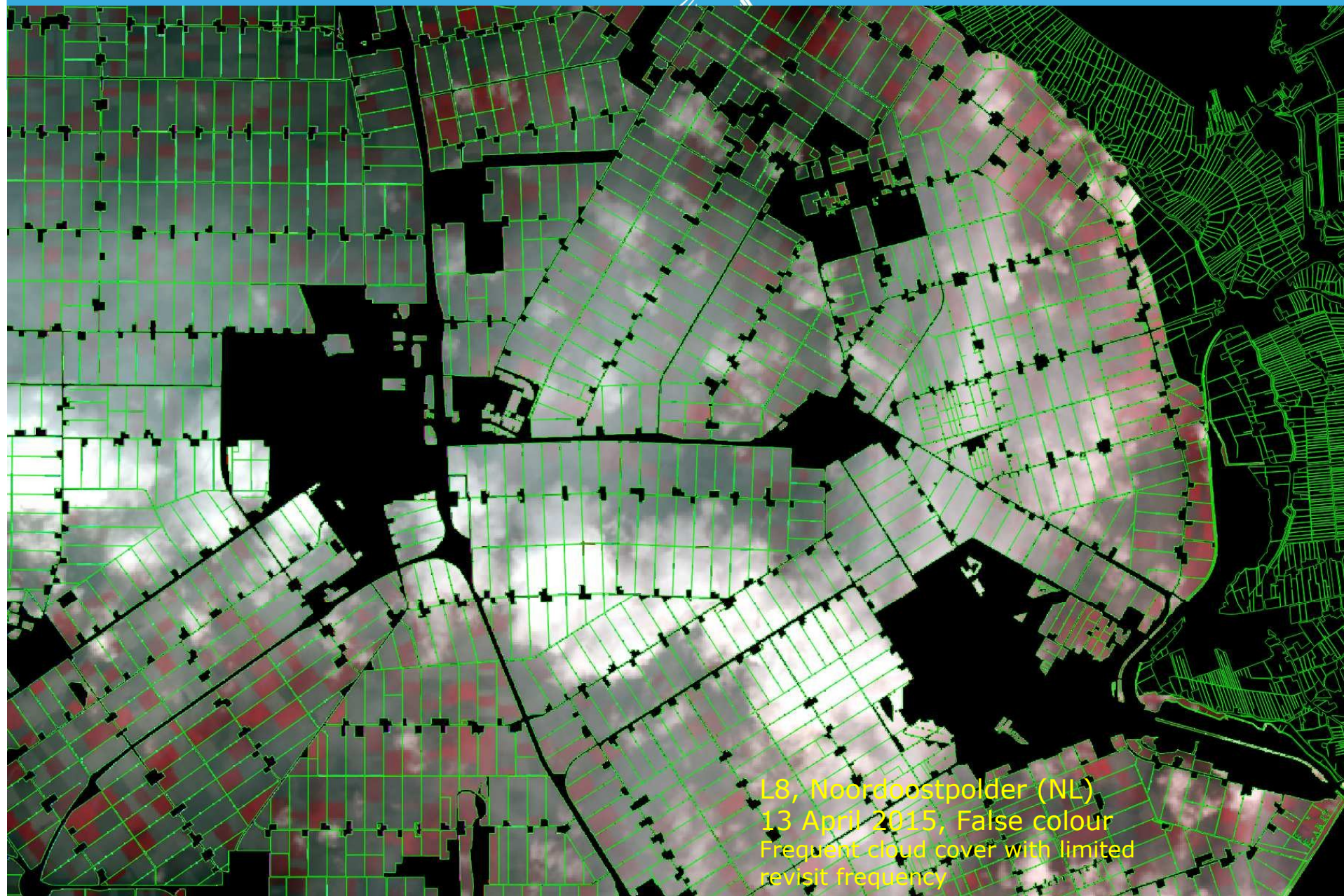
Sentinel-2 will become the prime satellite source for (public and private) agri-monitoring applications, with Landsat-8 as a gap-filler, and S-1 as complimentary, consistent reference;

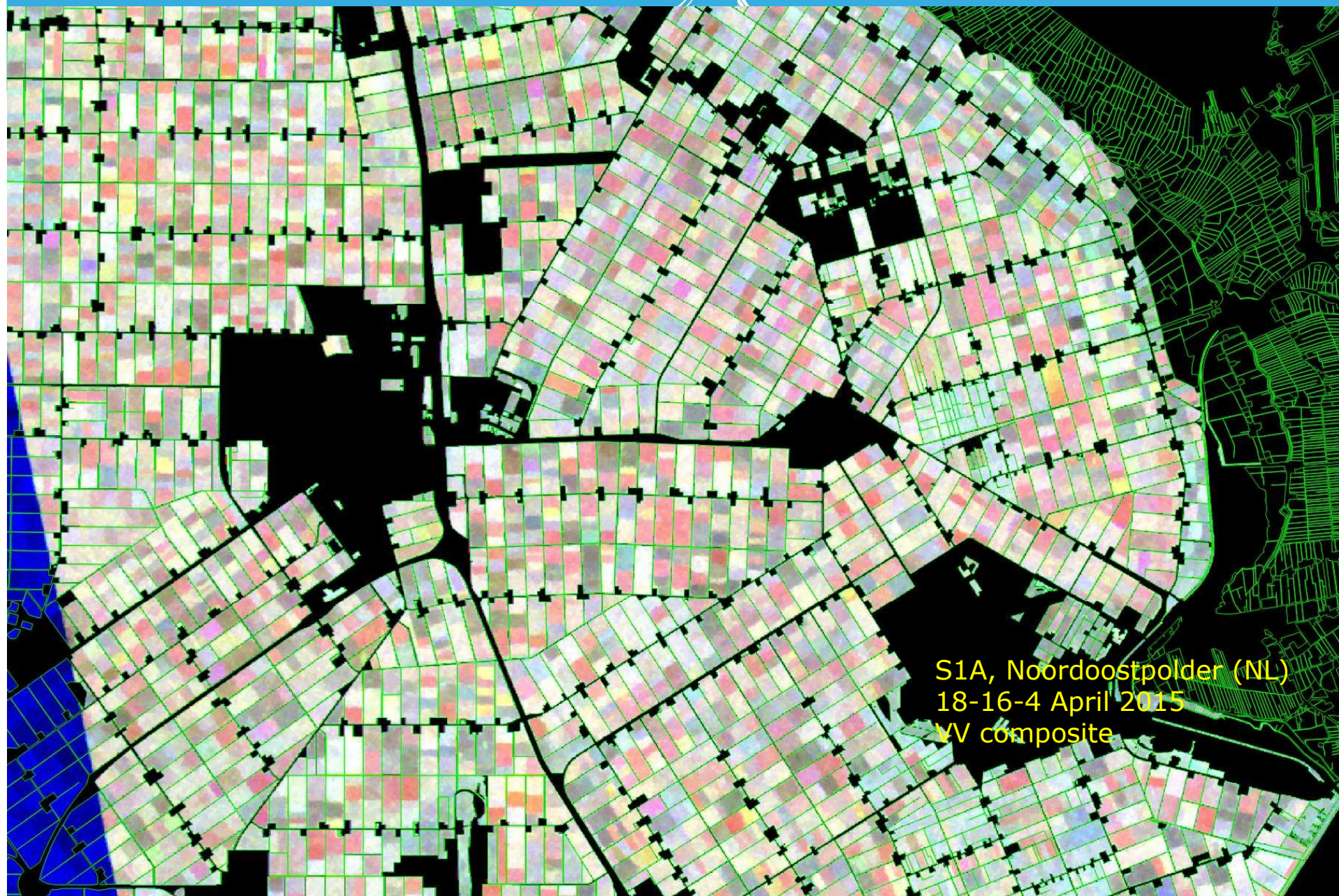
In the context of controls, S-1 and S-2 will contribute to checks on crop rotation/crop diversity, grassland conversion, some EFA elements (TBD) and alternative sampling schemes;

Potential for highly automated processing and logical “alert” based steering, with moderate needs for processing infrastructure [and fully based on open source software]



L8, Noordoostpolder (NL)
12 March 2015, False colour
with AAN2014 reference
Open access at www.pdok.nl





S1A, Noorddoostpolder (NL)
18-16-4 April 2015
VV composite



Thank you!

Sentinel-1:

Data hub: <https://scihub.esa.int/dhus>
(requires registration and login)

Sentinel toolboxes: <https://earth.esa.int/web/sentinel-tbx>
(no registration required)