







## Terrascope status update

CGS Workshop, Frascati IT  
5 December 2018, D. Clarijs









# Terrascope status

-  September 2017: Agreement between ESA and BELSPO
-  VITO is designated entity in Belgium for CGS
-  Website released Dec 2017
-  Terra viewer released March 2018
-  Focus on easy access for users + APIs



# Terrascope dataset offer

| Source   | Products                            | Coverage          |
|--|-------------------------------------|-------------------|
|  <b>sentinel-1</b>  | GRD, SLC, GRD-0                     | Belgium           |
|  <b>sentinel-2</b>  | L2A (enh), FAPAR, FCOVER, LAI, NDVI | BeNeLux (EU, AFR) |
|  <b>sentinel-3</b>  | (SYN-VGT products)                  | (Global)          |
|  <b>sentinel-5p</b> | TBD (NO, SO, CO)                    | EU                |
|  <b>proba-v</b>     | All                                 | Global            |
|  <b>VEGETATION</b>  | All                                 | Global            |





# Viewing services

The screenshot shows the TerraScope web viewer interface. The browser address bar displays the URL: [https://viewer.terrascope.be/terrascope/?language=eng&layer=CGOS\\_S2\\_RADICOMETRY&date=18/9/2018&bbox=4.43658813730025150,7592326626891.5,09576782480025150,96920644515171&overlay=false](https://viewer.terrascope.be/terrascope/?language=eng&layer=CGOS_S2_RADICOMETRY&date=18/9/2018&bbox=4.43658813730025150,7592326626891.5,09576782480025150,96920644515171&overlay=false). The interface includes a search bar, a date selector (18/9/2018), and a zoom level (10%). The main display area shows a satellite image of a forest with various vegetation indices overlaid. The layers panel on the left lists the following layers:

- Sentinel 2 - color image** (checked): Natural color image made from images in blue, green and red
- Sentinel 2 - color infrared image** (unchecked): Color image made from images in green, red and infrared. Shows vegetation in red
- Sentinel 2 - FAPAR** (unchecked): FAPAR shows the photosynthetic activity of green vegetation
- Sentinel 2 - NDVI** (unchecked): NDVI describes the greenness of vegetation
- Sentinel 2 - LAI** (unchecked): LAI show the amount of green leaf area per square meter ground surface
- Sentinel 2 - FCOVER** (unchecked): FCOVER is the fraction of ground surface which is covered by vegetation

At the bottom of the layers panel, there is a toggle for "Street overlay" which is currently turned OFF. The main image area has navigation controls on the right, including zoom in (+), zoom out (-), home (E), and full screen (F).

Contains modified Copernicus Sentinel data 2018



# Viewing services

The screenshot shows the TerraScope web viewer interface. The browser address bar displays the URL: [https://viewer.terrascope.be/terrascope/?language=en&layer=CGS\\_S2\\_NIR&date=17/8/2018&box=-2.7127286909255703,3.1089042481571454,3.042318534675571,51.19340455218483&overlay=false](https://viewer.terrascope.be/terrascope/?language=en&layer=CGS_S2_NIR&date=17/8/2018&box=-2.7127286909255703,3.1089042481571454,3.042318534675571,51.19340455218483&overlay=false). The interface includes a search bar, a date selector (17/8/2018), a language dropdown (EN), and a layers panel on the left. The main map area displays a satellite image of a field with various vegetation indices overlaid in red and green. The layers panel on the left lists the following layers:

- Sentinel 2 - color image**  
Natural color image made from images in blue, green and red
- Sentinel 2 - color infrared image** (checked)  
Color image made from images in green, red and infrared. Shows vegetation in red
- Sentinel 2 - FAPAR**  
FAPAR shows the photosynthetic activity of green vegetation
- Sentinel 2 - NDVI**  
NDVI describes the greenness of vegetation
- Sentinel 2 - LAI**  
LAI show the amount of green leaf area per square meter ground surface
- Sentinel 2 - FCOVER**  
FCOVER is the fraction of ground surface which is covered by vegetation

At the bottom of the layers panel, there is a toggle for "Street overlay" which is currently turned OFF. The main map area shows a satellite image of a field with various vegetation indices overlaid in red and green. The interface also includes a "LAYERS" panel on the right with "COMPARE" and "EXPORT" options, and a "VIEWPORT INTERACT" panel with zoom and pan controls. A scale bar at the bottom right indicates 1000m. A footer note at the bottom right states "Contains modified Copernicus Sentinel data 2018".





# Viewing services

The screenshot shows the Terrascope web viewer interface. The browser address bar displays the URL: [https://viewer.terrascope.be/terrascope/?language=en&layer=CGS\\_S2\\_FAPAR&date=2/6/2018&bbox=3.190412521362305,50.9820460711006,3.3552074432373047,51.035376209357935&overlay=false](https://viewer.terrascope.be/terrascope/?language=en&layer=CGS_S2_FAPAR&date=2/6/2018&bbox=3.190412521362305,50.9820460711006,3.3552074432373047,51.035376209357935&overlay=false). The interface includes a search bar, a date selector set to 2/6/2018, and a zoom level of 100%. On the left, a 'Layers' panel lists several data layers:

- Sentinel 2 - color image**: Natural color image made from images in blue, green and red
- Sentinel 2 - color infrared image**: Color image made from images in green, red and infrared. Shows vegetation in red
- Sentinel 2 - FAPAR**: FAPAR shows the photosynthetic activity of green vegetation (checked)
- Sentinel 2 - NDVI**: NDVI describes the greenness of vegetation
- Sentinel 2 - LAI**: LAI show the amount of green leaf area per square meter ground surface
- Sentinel 2 - FCOVER**: FCOVER is the fraction of ground surface which is covered by vegetation

At the bottom of the layers panel, there is a toggle for 'Street overlay' which is currently turned OFF. The main map area displays a satellite image of a rural landscape with a color scale legend on the right side, ranging from 0.00 (dark brown) to 1.00 (dark green). The legend is labeled 'AREAS OF INTEREST' and includes a 'COMPARSE' button. The bottom right corner of the map area contains the text: 'Contains modified Copernicus Sentinel data 2018'.



# Comparison of data



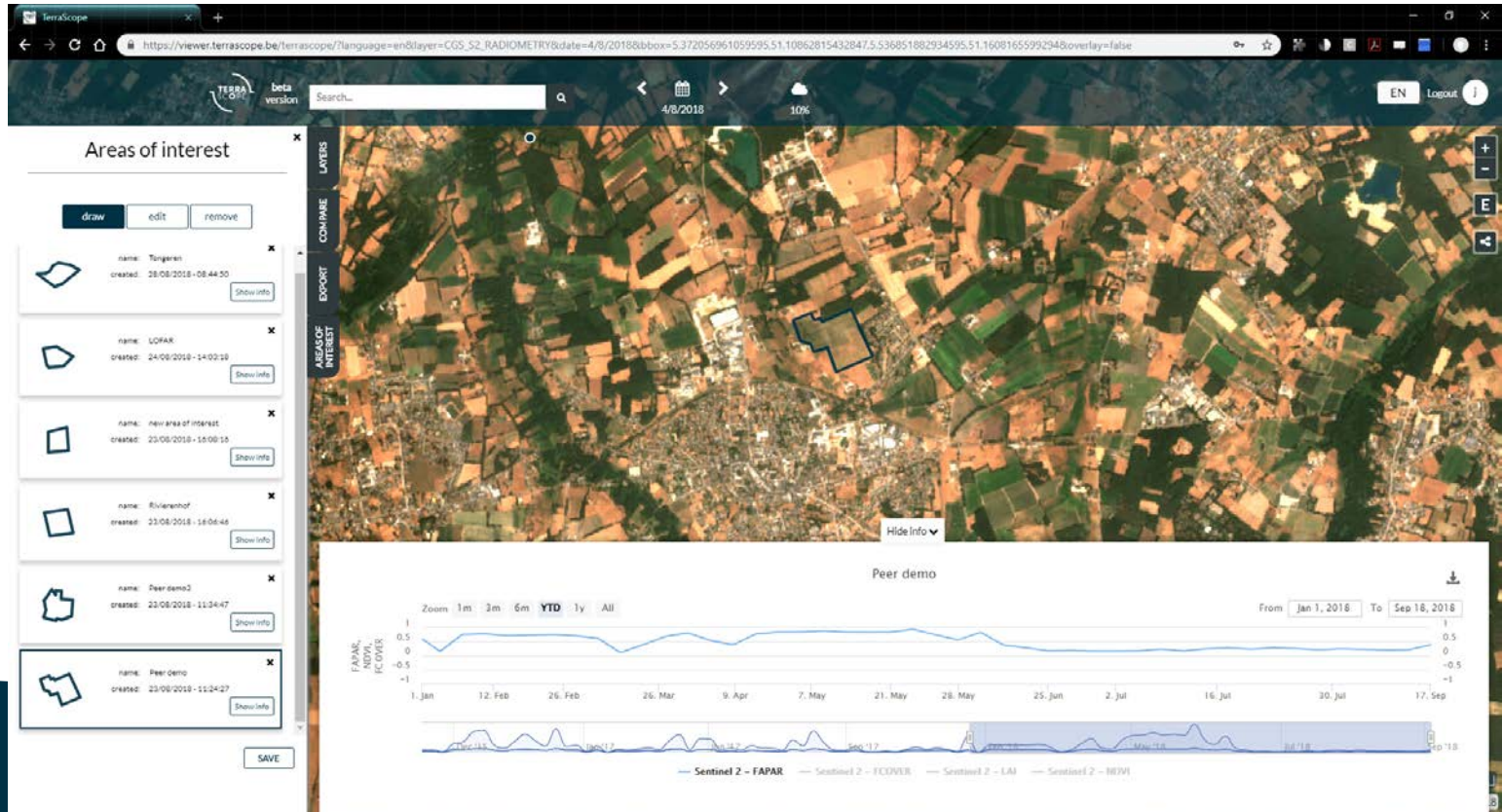


# Comparison of data





# Time series analysis



# Time lapses

05/02/2018



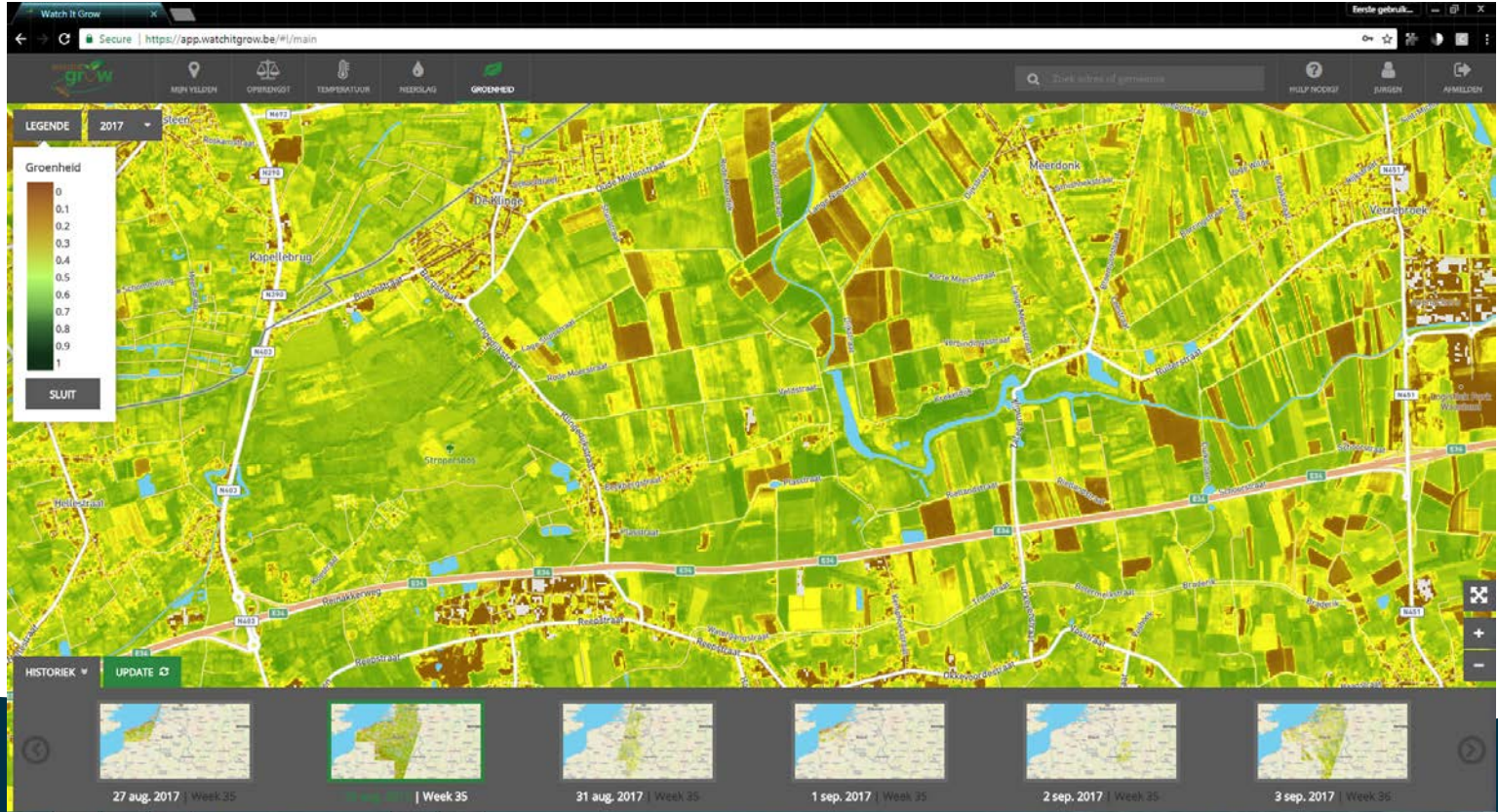




# OGC web services available on Sentinel data

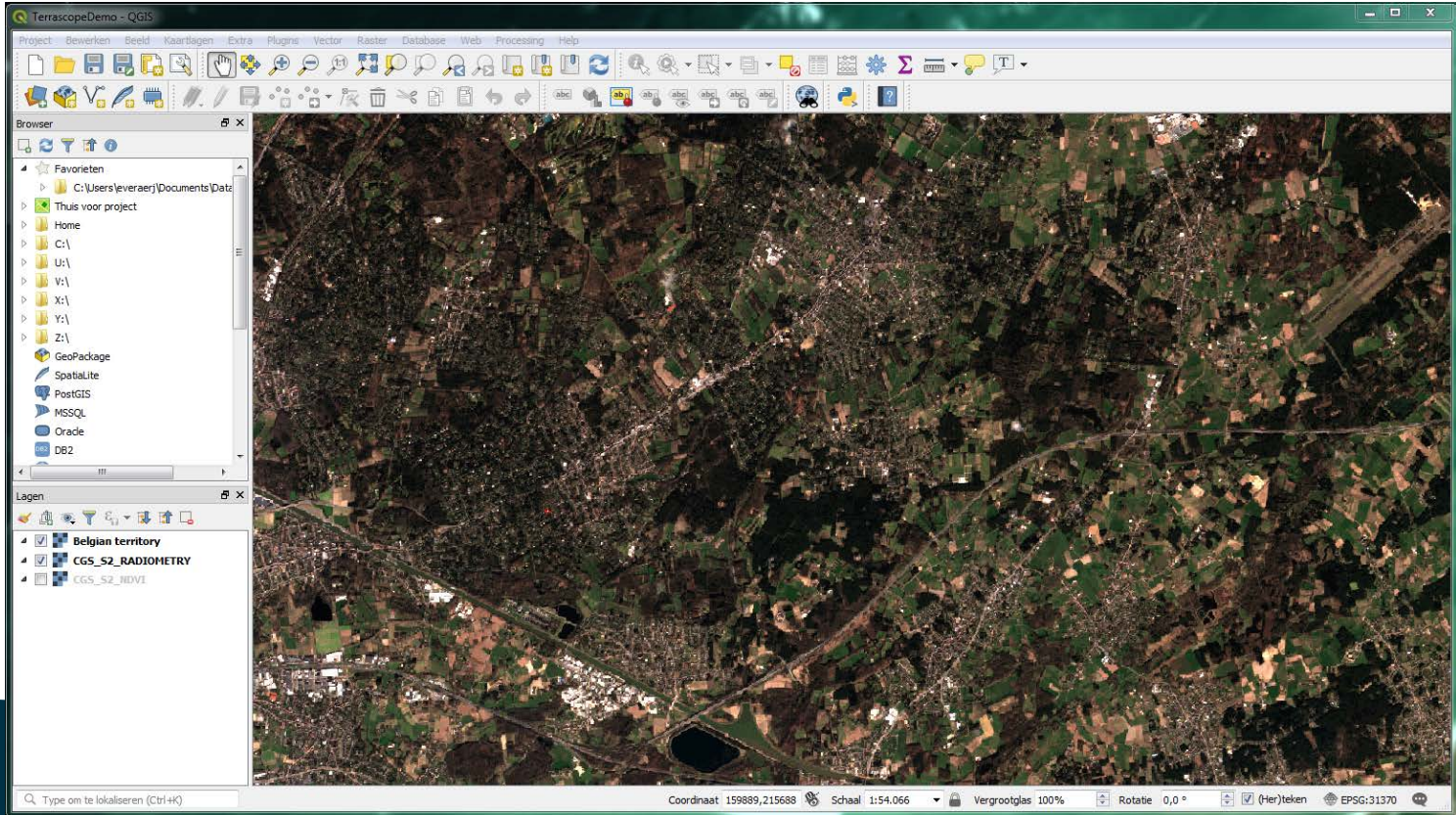
- Product catalogue service
- Time series query service
- OpenSearch
- WMTS service
- WMS service
- WCS service

# OGC web services available on Sentinel data

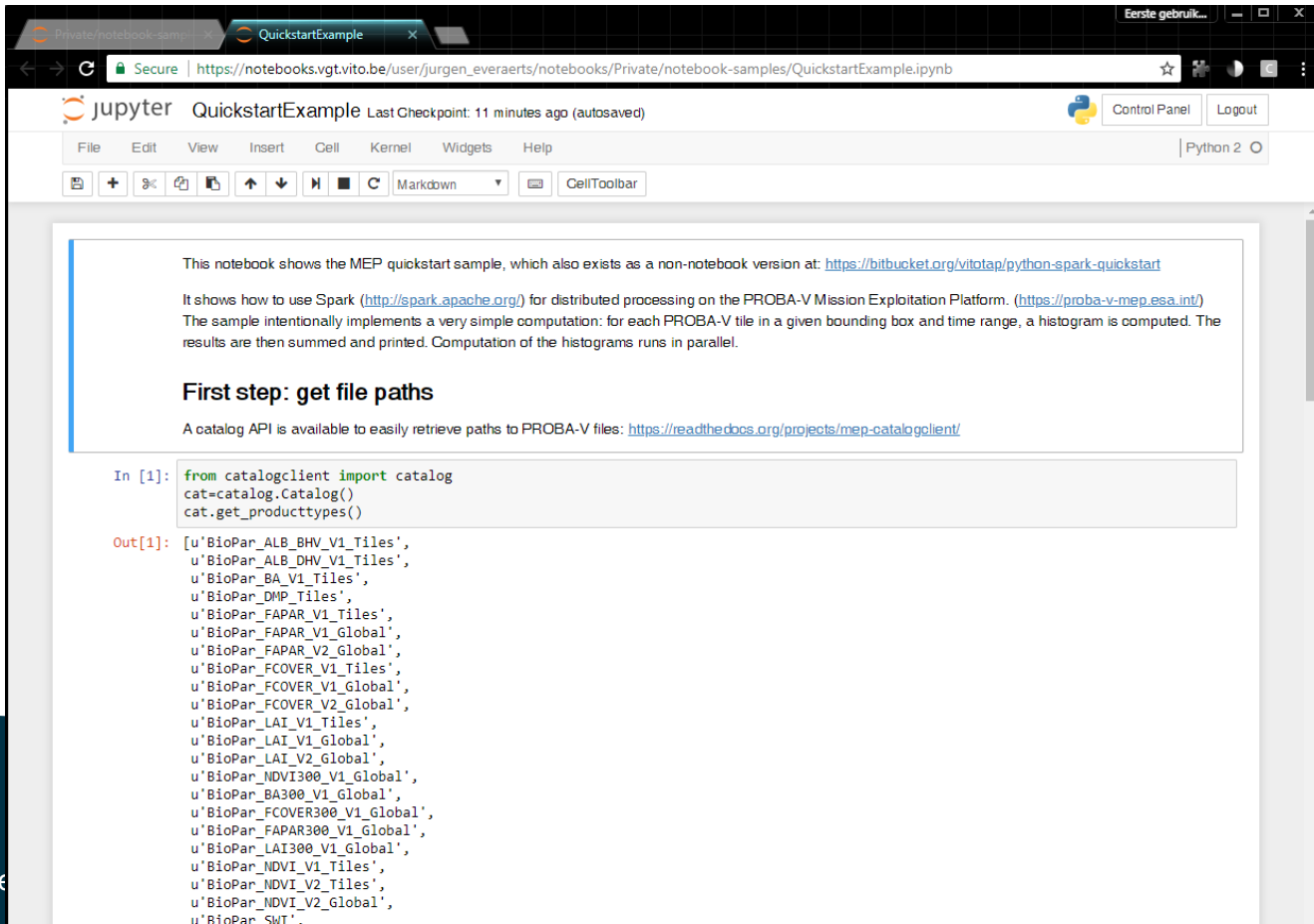




# OGC web services available on Sentinel data



# Jupyter Notebooks



QuickstartExample Last Checkpoint: 11 minutes ago (autosaved)

File Edit View Insert Cell Kernel Widgets Help Python 2

This notebook shows the MEP quickstart sample, which also exists as a non-notebook version at: <https://bitbucket.org/vitotap/python-spark-quickstart>  
 It shows how to use Spark (<http://spark.apache.org/>) for distributed processing on the PROBA-V Mission Exploitation Platform. (<https://proba-v-mep.esa.int/>)  
 The sample intentionally implements a very simple computation: for each PROBA-V tile in a given bounding box and time range, a histogram is computed. The results are then summed and printed. Computation of the histograms runs in parallel.

### First step: get file paths

A catalog API is available to easily retrieve paths to PROBA-V files: <https://readthedocs.org/projects/mep-catalogclient/>

```
In [1]: from catalogclient import catalog
cat=catalog.Catalog()
cat.get_producttypes()

Out[1]: ['BioPar_ALB_BHV_V1_Tiles',
'BioPar_ALB_DHV_V1_Tiles',
'BioPar_BA_V1_Tiles',
'BioPar_DMP_Tiles',
'BioPar_FAPAR_V1_Tiles',
'BioPar_FAPAR_V1_Global',
'BioPar_FAPAR_V2_Global',
'BioPar_FCOVER_V1_Tiles',
'BioPar_FCOVER_V1_Global',
'BioPar_FCOVER_V2_Global',
'BioPar_LAI_V1_Tiles',
'BioPar_LAI_V1_Global',
'BioPar_LAI_V2_Global',
'BioPar_LAI_V2_Global',
'BioPar_NDVI300_V1_Global',
'BioPar_BA300_V1_Global',
'BioPar_FCOVER300_V1_Global',
'BioPar_FAPAR300_V1_Global',
'BioPar_LAI300_V1_Global',
'BioPar_NDVI_V1_Tiles',
'BioPar_NDVI_V2_Tiles',
'BioPar_NDVI_V2_Global',
'BioPar_SWI']
```



# Preconfigured Virtual machines (Q1/2019)





# Preconfigured Virtual machines + access to HPC

- Built on top of existing PROBA-V PDGS infrastructure
- Storage capacity: 7 PB
- Hadoop processing cluster: 2800 cores + 7.4 TB RAM
- OpenStack architecture





## User statistics

Users for download of data (registered) since January 2018

- 108 active users of 51 companies/universities
- 21 different nationalities
- 7 TB downloaded
- 56 956 products delivered

Viewing services (non-registered) since June 2018

- 872 users



# Roadshow

- Active approach towards:
  - Industry
  - Education system (ESERO Belgium)
  - Public sector
- Novice users: Remote sensing + using the viewer
- Experienced users: Viewer + Notebooks + VMs

A promotional poster for a TerraScope event. The top right corner features a satellite image of Earth from space. The TerraScope logo is in the top left. The main title "ON THE ROAD!" is in a large orange box. Below it, the event details are listed: "INTERACTIEVE WORKSHOP WERKEN MET SATELLIETBEELDEN COPERNICUS SENTINEL OPEN DATA". The date and time are "7 DECEMBER 2018 13.30 - 15.30". The location is "HOGent GEBOUW P" and it is "GRATIS DEELNAME". At the bottom, there are links for "info/register" and "terrascope.be" along with a Twitter handle "@Terrascope\_BE".

TERRA SCOPE INSIGHTS FROM SPACE

## ON THE ROAD!

INTERACTIEVE WORKSHOP  
WERKEN MET SATELLIETBEELDEN  
COPERNICUS SENTINEL  
OPEN DATA

7 DECEMBER 2018  
13.30 - 15.30  
HOGent  
GEBOUW P  
GRATIS DEELNAME

info/register  
terrascope.be @Terrascope\_BE





## Way forward

- Addition of Sentinel 5P data (EU)
- DIAS exploration
- Datacube/streaming technologies exploration
- OGC WPS Service
- Open WMS/WMTS field
- Revision of the data distribution system to new standards
- Further stabilization and improvements

