
Netherlands
Space Office

Netherlands Space Office

- Established in 2009
- Space agency of the Netherlands government
- Reporting to:
  - Ministry of Economic Affairs
  - Ministry of Education, Culture and Science
  - Ministry of Infrastructure and Environment
  - Netherlands Organisation for Scientific Research (NWO)
- Task:

Develop the Netherlands space policy and implement it

NSO: responsibilities and activities

- Represent Netherlands government to space agencies (ESA) and space industry
- National programmes:
  - TROPOMI-instrument
  - Satellite data portal
  - Geodata for Agriculture & Water (G4AW)
  - ESA Business Incubation Centre
- Stimulate international cooperation with Dutch industry
- Invest in the future's space pioneers (students and young entrepreneurs)

Vision: a change in space

- From driven by technology to driven by demand
- Added value of space technology and satellite data is the key to global solutions, scientific break trough's and new markets
- Needs of society and opportunities on the market give direction to the development of space technology and applications
- This gives opportunities for commercial markets
- This asks for:

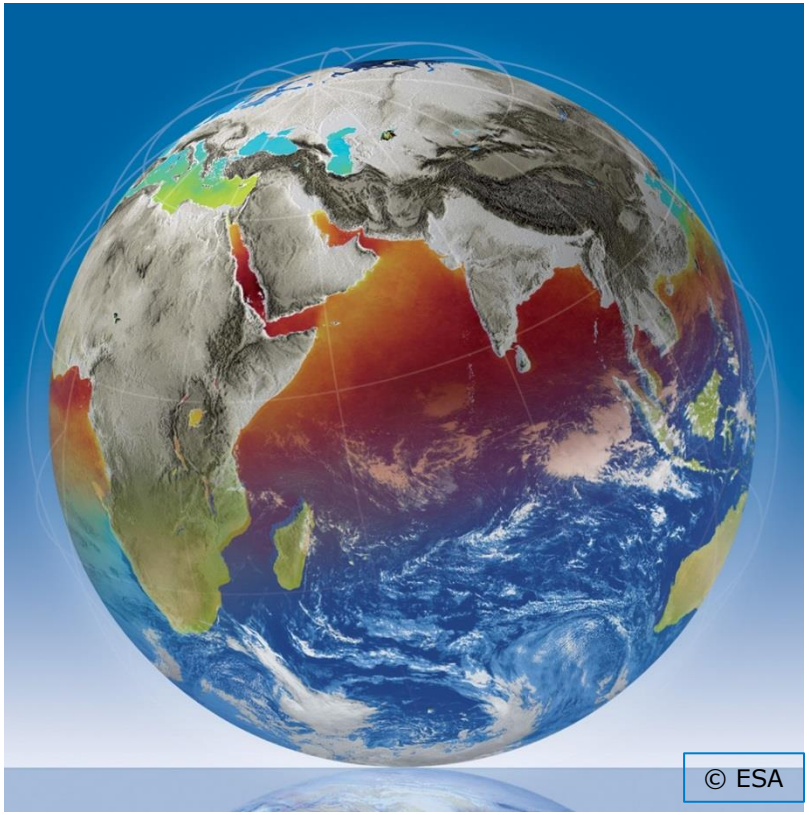
  - More synergy space and non-space
  - More and broader international cooperation


Satellite Data
ESA Earth Explorers
Copernicus
NL Satellite Data Portal
Radboud Koop (NSO)

ESA – Earth Explorers

"Satellites to understand our changing Earth"

- science and research element of ESA's Living Planet Programme
- focus on:
  - atmosphere, biosphere, hydrosphere, cryosphere, Earth's interior
  - interactions between these components
  - impact that human activity is having on natural Earth processes
- Core and Opportunity missions



Gravity

GOCE – Gravity Field and Steady-State Ocean Circulation Explorer

Launch: 17 March 2009
End: 11 November 2013
Instruments:
Gravity Gradiometer
High-accuracy GPS-receiver
Laser Retro-Reflector (LRR)
Orbit:
about 260 km altitude, polar, Sun-synchronous
Objectives:
- gravity-field anomalies, accuracy 1 mGal
- geoid, accuracy 1-2 cm.
- both at a spatial resolution better than 100 km

Applications:
- Ocean circulation
- Solid Earth
- Geodesy
- Sea-level change

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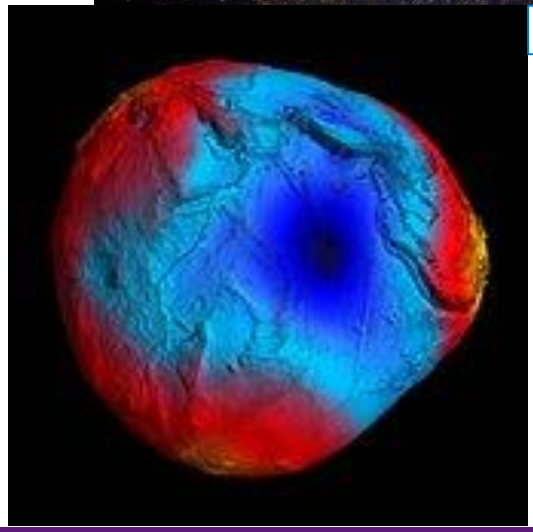

Magnetic Field

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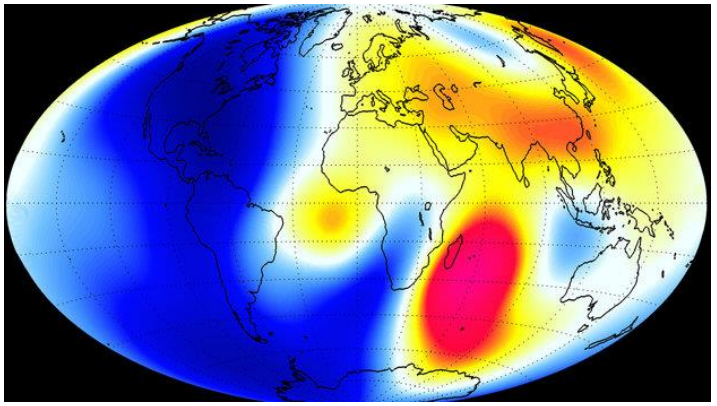
SWARM

Launch: 22 November 2013
Mission duration: 4 years
Orbit:
2 sats at 460 → 300 km; 3rd sat at 530 km
Constellation: 3 identical satellites
Instruments:
vector field magnetometer,
absolute scalar magnetometer,
electric field instrument,
accelerometer, GPS receiver,
startrackers, laser retroreflector
Objectives:

- core dynamics, geodynamo processes, core–mantle interaction;
- magnetism of the lithosphere and its geological context;
- 3D electrical conductivity of the mantle related to composition;
- magnetic signature related to ocean circulation;
- Sun's influence on Earth system (electric currents in magnetosphere and ionosphere; impact of solar wind on dynamics of upper atmosphere)



Ice

CryoSat

Launch: 8 April 2010
Mission duration: > 3 years
Instruments:
SAR Interferometric Radar Altimeter (SIRAL),
DORIS (positioning)
Laser Retro-Reflector (LRR)
Orbit:
mean altitude 717 km, inclination 92°,
non-Sun-synchronous
Objectives:

- changes in ice thickness to an accuracy of about 10% of the expected interannual variation,
- over sea ice this is about 1.5 cm/year, over small areas of ice sheet this is about 3 cm/year,
- integrated over the whole of Greenland, the required accuracy is is 0.7 cm/year

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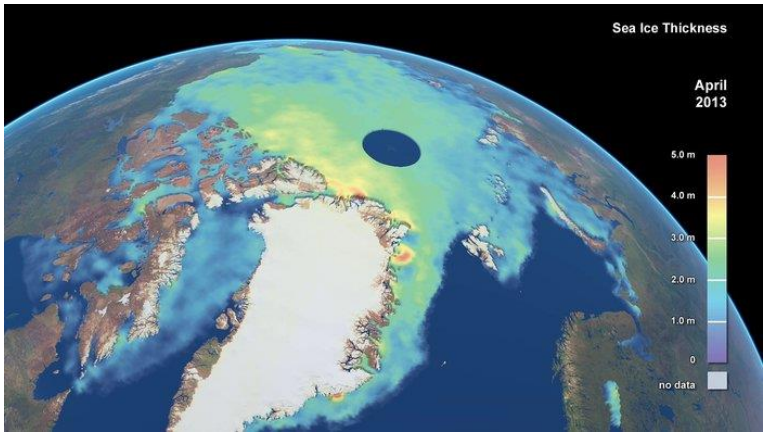
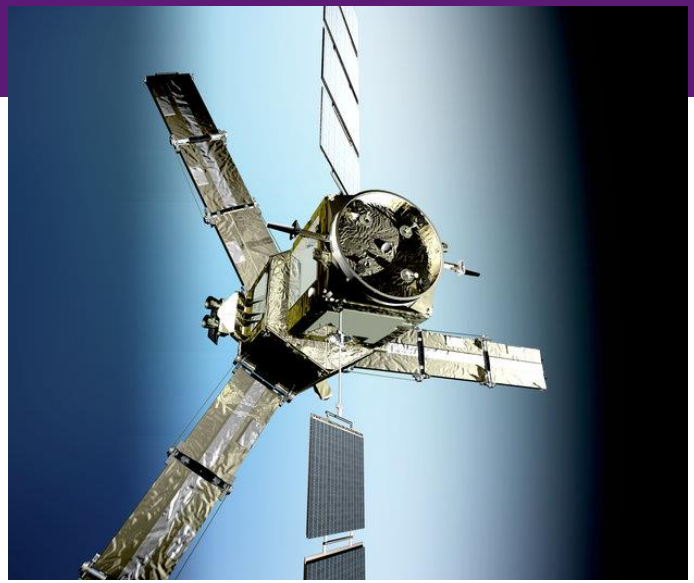


Water

SMOS – Soil Moisture and Ocean Salinity Mission

Launch: 2 November 2009
Mission duration: > 3 years
Instruments:
Microwave Imaging Radiometer using Aperture Synthesis (MIRAS)
2D interferometric L-band radiometer at 1.4 GHz (21 cm wavelength)
Orbit:
mean altitude 758 km, inclination 98.44°,
Sun-synchronous, quasi-circular, dusk-dawn,
23-day repeat cycle, 3-day sub-cycle
Objectives:
- Soil moisture over land
- Salinity over oceans
- Water cycle, atmosphere-surface exchange
- Weather and climate models



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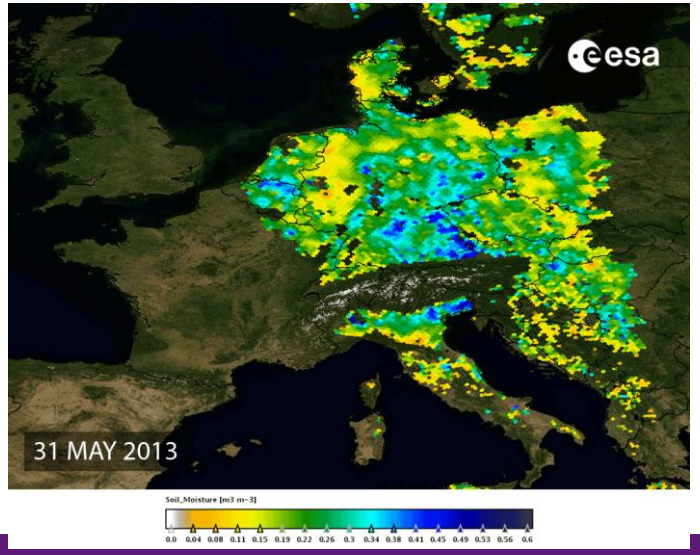
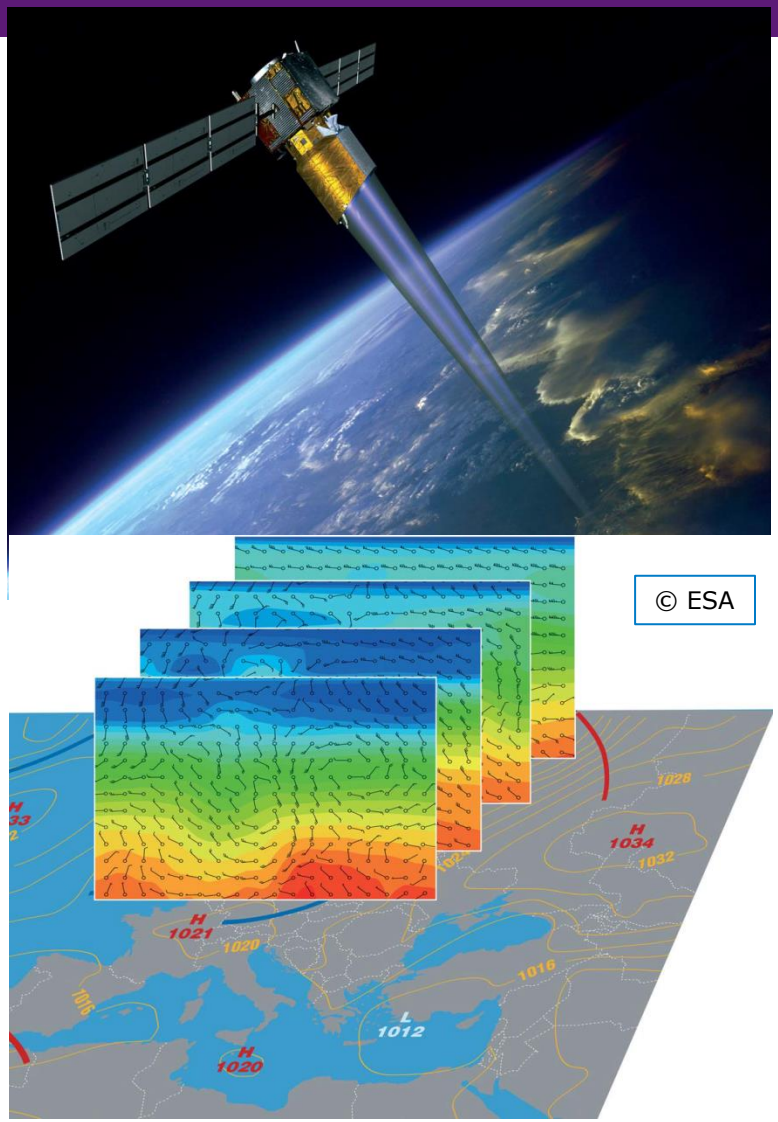


Wind

ADM-Aeolus

Launch: 2017
Mission Duration: > 3 years
Orbit:
Sun-synchronous, 408 km, inclination 97°
Instruments:
atmospheric Laser Doppler Instrument 'Aladin'
Objectives:
- global wind profiles up to an altitude of 30 km
- wind to an accuracy of 1 m/s in the planetary boundary layer (up to an altitude of 2 km)
- wind to an accuracy of 2 m/s in the free troposphere (up to an altitude of 16 km)
- average wind velocity over 100 km tracks
- 100 wind profiles per hour



Clouds and aerosols

EarthCare

Launch: 2018
Mission duration: > 3 years
Instruments:
- active: high-resolution atmospheric lidar
- active: radar
- passive: multispectral imager
- passive: broadband radiometer

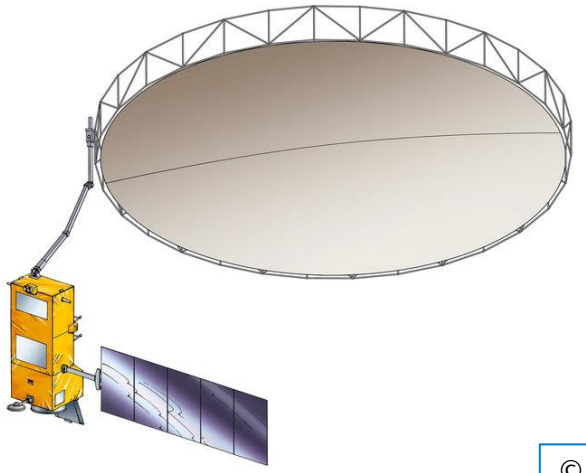
Objectives:
global observations of
- clouds,
- aerosols and
- radiation

Forest

BIOMASS

Launch: >2020
Mission duration: > 5 years
Orbit:
660 km, Sun-synchronous
Instruments:
synthetic aperture radar P-band (435 MHz);
fully polarimetric
Objectives:

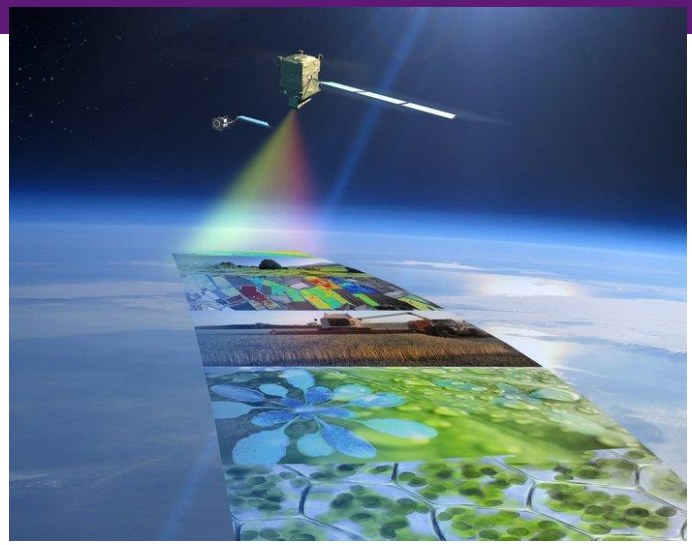
- information about the state of our forests and how they are changing
- carbon cycle
- maps of forest biomass and forest height at 200 m resolution
- experimental 'tomographic' phase to provide 3D views of forests

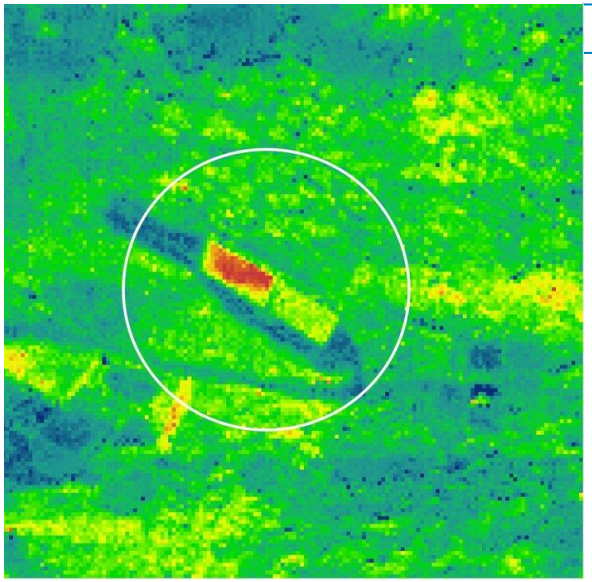


Vegetation

FLEX

Launch: >2022
Instrument:
High-resolution imaging grating spectrometer (FLORIS),
500 – 780 nm, sampling 0.1 nm
Objectives:
- Observe fluorescence emission spectra
- Leaf chlorofyll content, leaf area index
- Global terrestrial vegetation monitoring
- Functioning and photosynthetic efficiency of vegetation





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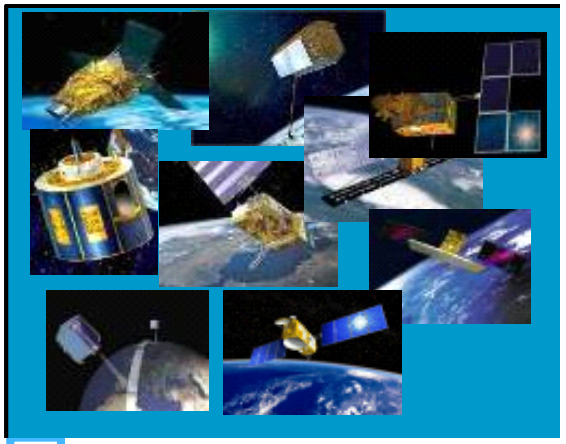
opernicus
The European Earth Observation Programme



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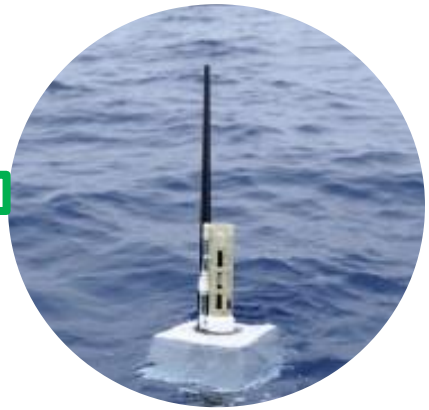
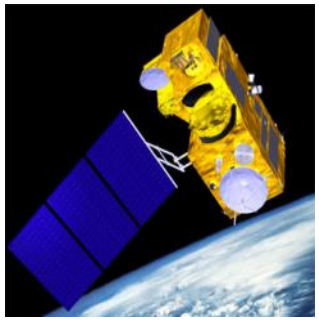
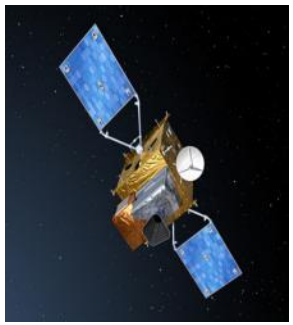
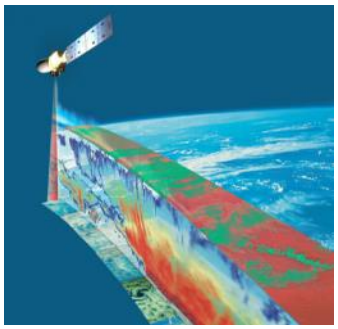


Earth Observation services

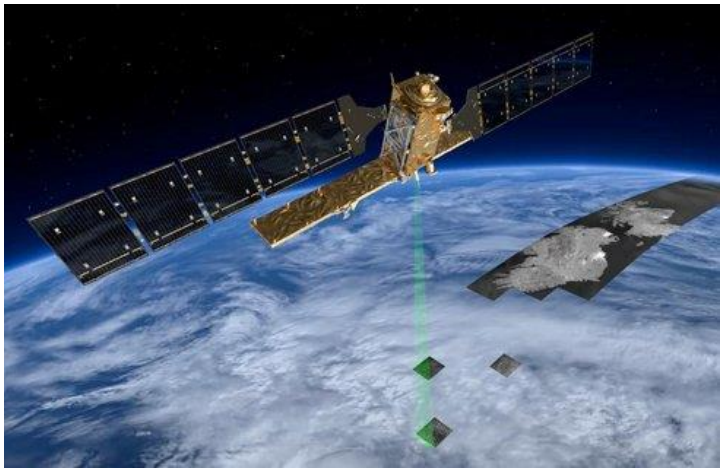


Sentinel-1	RADAR	(land and marine applications)	✓
Sentinel-2	Multispectral	(land / river applications)	✓
Sentinel-3	Hyperspectral, altimetry	(land and marine applications)	✓
Sentinel-4	Multispectral	(atmosphere, geostationairy)	2021
Sentinel-5P	Multispectral	(atmosphere, polar)	2016
Sentinel-5	Multispectral	(atmosphere, polar)	2021
Sentinel-6	Altimetry	(marine applications)	2020

Free and open data, guaranteed stream of data

Sentinel 1



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Launch Sentinel1A:
3 April 2014 from Kourou, French Guyana

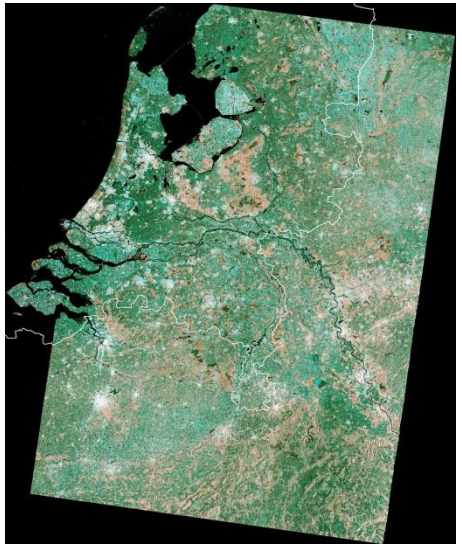
Orbit:
Polar, Sun-synchronous, altitude 693 km

Revisit time:
Six days from two-satellite constellation

Life:
Minimum of 7 years

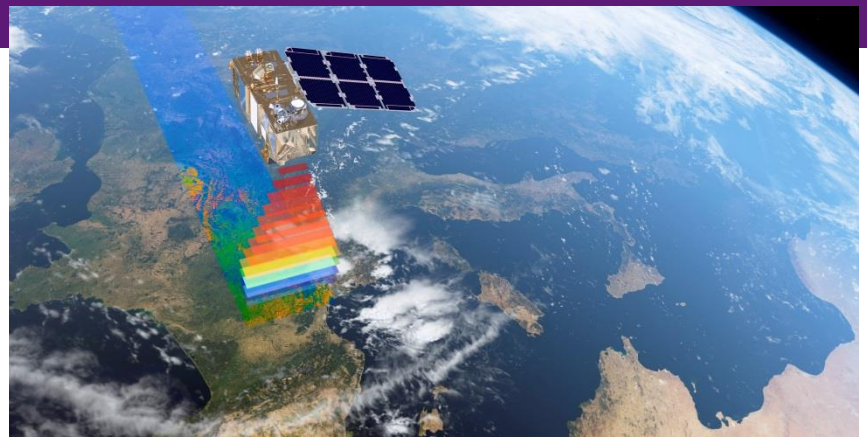
Instrument:
C-band synthetic aperture radar (SAR) at 5.405 GHz

Operational modes:
- Interferometric wide-swath mode at 250 km and 5×20 m resolution
- Wave-mode images of 20×20 km and 5×5 m resolution (at 100 km intervals)
- Strip map mode at 80 km swath and 5×5 m resolution
- Extra wide-swath mode of 400 km and 20×40 m resolution



Main applications:
- sea ice, oil spills, marine winds & waves,
- land-use change, land deformation among others,
- floods and earthquakes emergency response

Sentinel 2



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Launch Sentinel2A:
23 June 2015 from Kourou, French Guyana

Orbit:
Polar, Sun-synchronous, altitude 786 km

Revisit time:
Five days from two-satellite constellation (at equator)

Coverage:
Land and coastal areas between 84°N and 56°S

Life: Minimum of 7 years

Instrument:
multispectral imager (MSI), 13 spectral bands (443 nm–2190 nm),
swath width 290 km
spatial resolutions: 10 m (vis/NIR bands),
20 m (red-edge/SWIR bands)
60 m (3 atmospheric correction bands)

Main applications:

- agriculture, forests, land-use change, land-cover change;
- biophysical variables e.g.leaf chlorophyll content, leaf water content, leaf area index;
- monitoring coastal and inland waters;
- risk mapping and disaster mapping

Sentinel 3

Launch Sentinel3A:
16 February 2016 from Plesetsk, Russia

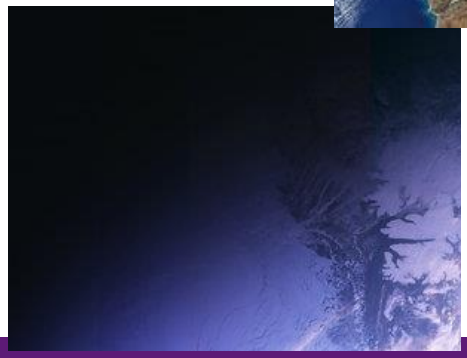
Orbit:
Polar, Sun-synchronous, altitude 815 km

Revisit time (ocean)
SLSTR ~1 day, OLCI ~2 days, SRAL 27 days

Life: Planned for 7 years (consumables for 12 years)

Instruments:

- Ocean and Land Colour Instrument (OLCI), 21 spectral bands (400–1020 nm) swath width of 1270 km
- Sea and Land Surface Temperature Radiometer (SLSTR), 9 spectral bands (550–12 000 nm), swath widths of 1420 km (nadir) and 750 km (backwards)
- Synthetic Aperture Radar Altimeter (SRAL) Ku-band and C-band
- Microwave Radiometer (MWR) dual frequency at 23.8 & 36.5 GHz



Main applications:

- Sea-level change & sea-surface temperature, water quality
- sea-ice extent and thickness, numerical ocean prediction
- land-cover, vegetation health
- glaciers; water resources
- wildfire detection, numerical weather prediction

Sentinel 4

Goal:
continuous monitoring from a geostationary orbit
of the atmospheric chemistry
in order to support air quality monitoring
and forecast over the skies of Europe

Satellite:
2 instruments on 2 Meteosat Third Generation-Sounder satellites (MTG-S1 and MTG-S2)

Coverage:
Europe and North Africa (Sahara)
(scanning 8.8° East-West x 16.6° North-South, with a repeat cycle of about 60 minutes)

Instrument:
UVN high resolution spectrometer
Spectral bands: UV (305-400 nm), VIS (400-500 nm), NIR (750-775 nm)
Spatial resolution: 8 km
Spectral resolution: between 0.12 and 0.50 nm

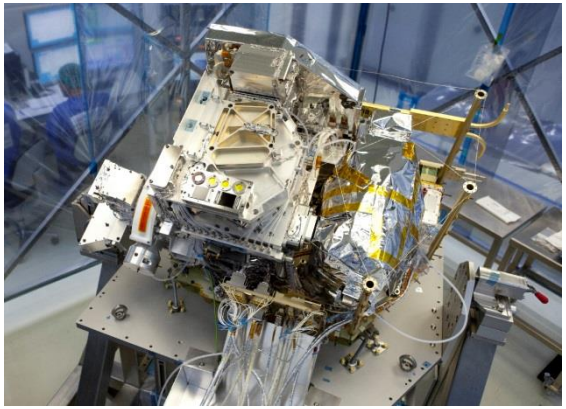
Sentinel 5 Precursor

Goal:
- atmospheric chemistry at high temporal & spatial resolution
- increase frequency of cloud-free observations for the study of troposphere variability
- measurements of ozone, NO2, SO2, CH4, CO and aerosol

Sentinel 5P will bridge gap between
Envisat/EOS Aura and Sentinel-5 (expected launch 2020)

Lifetime: 7 years
Orbit: sun-synchronous, altitude 830 km
Repeat cycle: 17 days

Instrument: **TROPOMI**
- UV-VIS-NIR-SWIR push-broom grating spectrometer
- UVN module provided as a national contribution by NL
- 4 channels
- spectral range: 270-495 nm, 710-775 nm, 2305-2385 nm



Access to Sentinel data

Access for Copernicus Services

(Consortia members only)

Open data for everyone

(slow acces, will be improved in 2017)

https://scihub.copernicus.eu

National initiatives

(mirror sites, ground stations)

Satellietdataportaal
Beschikbare data
Uitleg data
Registreren
Deelnemende partijen
Veelgestelde vragen
Contact
Disclaimer

Registreren

Het Netherlands Space Office is in de licentieovereenkomst met de aanbieders van satellietdata overeengekomen dat elke aanvrager een Nederlandse rechtspersoon, Nederlandse instelling of Nederlandse ingezetene is. Indien u een Nederlandse rechtspersoon bent kunt u dit op het registratieformulier aangeven en een gebruikersaccount aanvragen. Het NSO beoordeelt dan samen met de dataleverancier uw aanvraag en verstrekt na goedkeuring inloggegevens die u toegang verschaffen tot de gewenste data.

Gegevens van de aanvrager

Naam* Dhr.

Adres*

Postcode*

Plaats*

Telefoon*

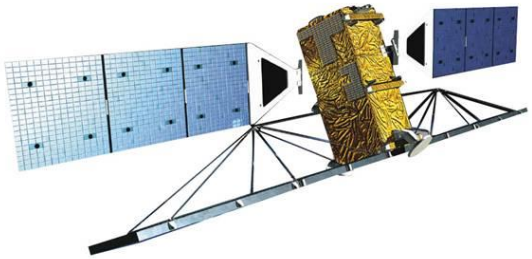
E-Mailadres*

Organistatie*

De aanvrager verklaart Nederlandse rechtspersoon, Nederlandse instelling of Nederlandse ingezetene te zijn.

Beoogd gebruik

Data portfolio

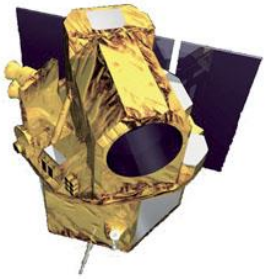


Preparation for Sentinel-1:

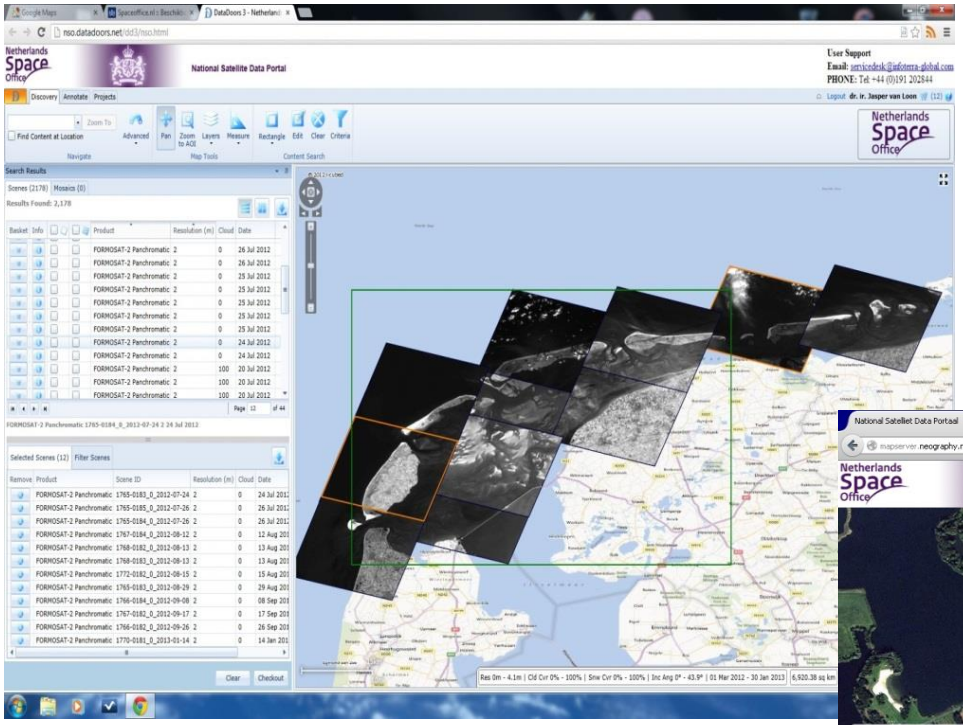
- Radarsat-2 (radar) : 5 meter, 1x per 24 days(VV, VH)
  : 25 meter, 1x per 24 days (HH, HV)

Preparation for Sentinel-2:

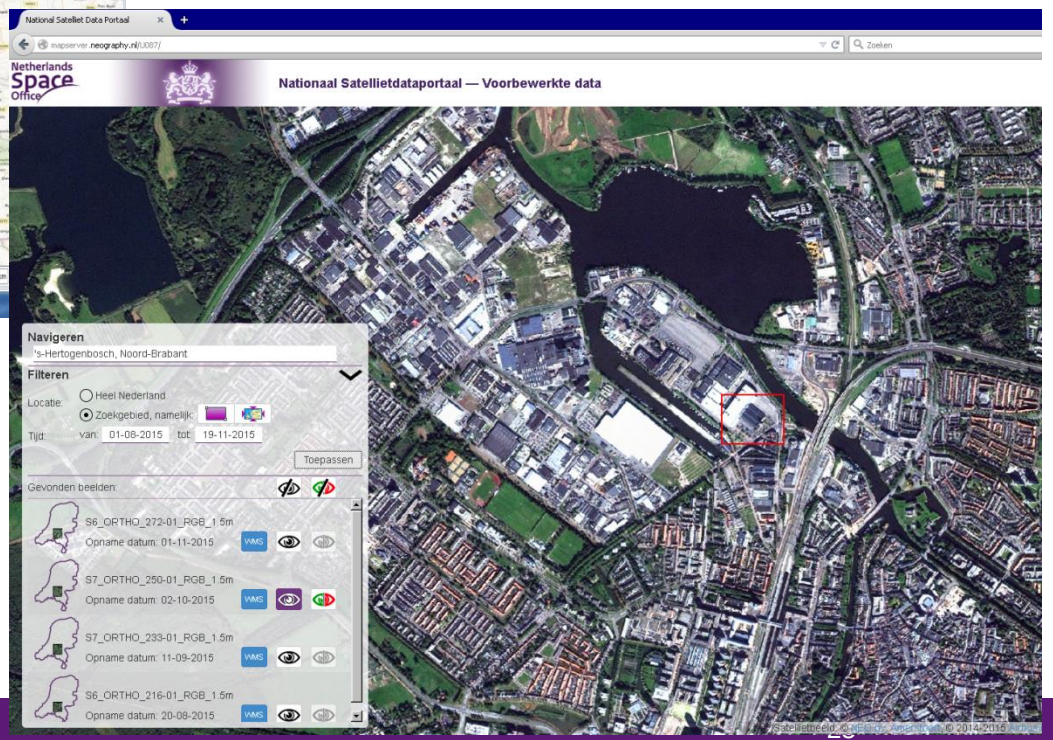
- DMC-satellites (MS) : 22 meter, 2x per week, 3 bands
- SPOT-6/7 (MS) : 6 meter, 1x per month, 4 bands
- SPOT-6/7 (PAN) : 1,5 meter, 1x per month, 1 band



Period:
March 2012 – March 2017
Extended till 2020



www.satellietdataportaal.nl
'Raw' data



'Pre-processed' data:
1.5 m, 'GIS-ready' (WMS)
www.satellietbeeld.nl

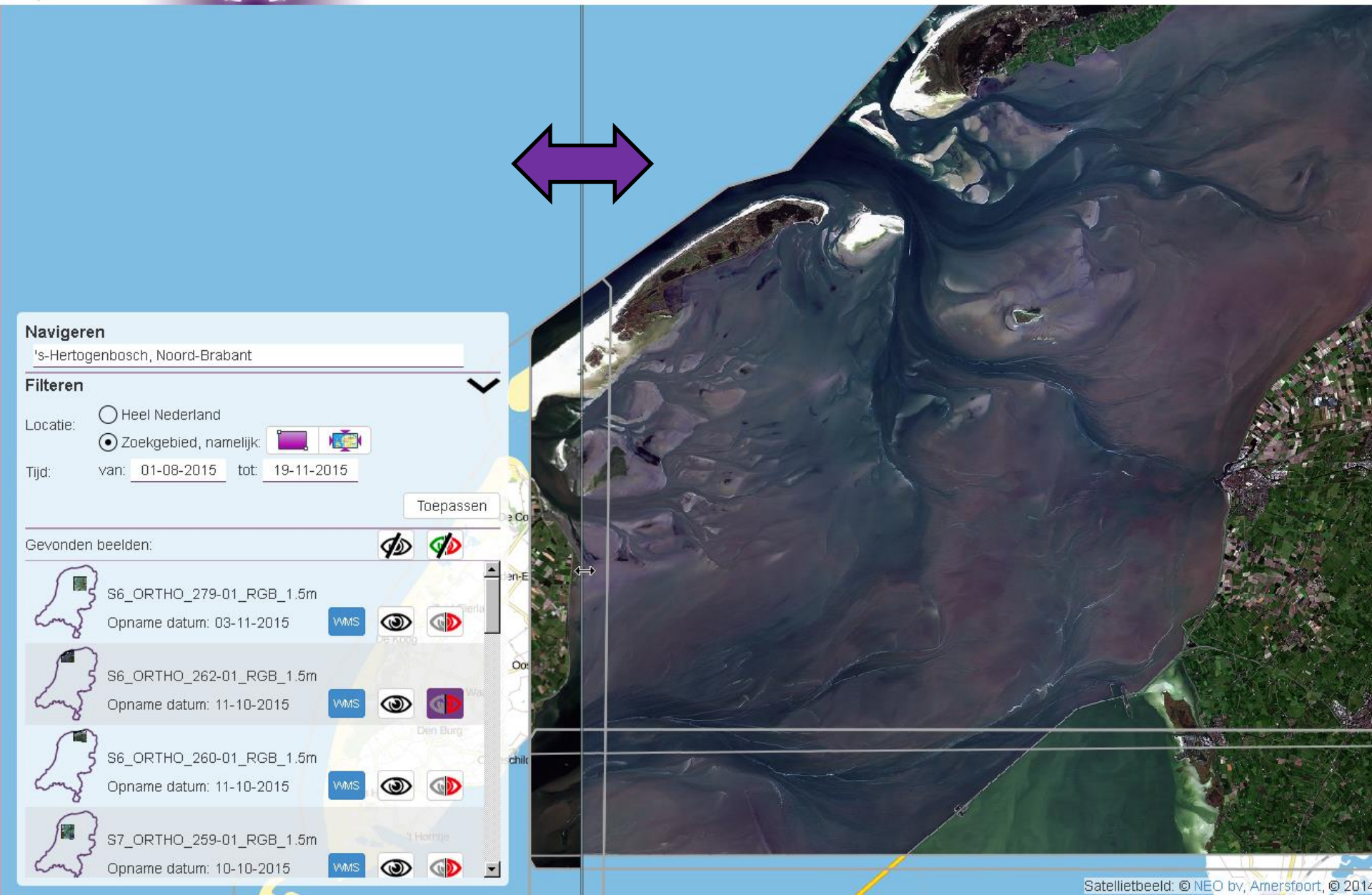
National Satelliet Data Portaal

mapserver.neography.nl/U087/

Zoeken

Netherlands Space Office

Nationaal Satellietdataportaal — Voorbewerkte data



Navigeren

's-Hertogenbosch, Noord-Brabant

Filteren

Locatie: ◯ Heel Nederland ◉ Zoekgebied, namelijk:

Tijd: van: 01-08-2015 tot: 19-11-2015

Toepassen

Gevonden beelden:

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Opname datum: 03-11-2015 WMS

S6_ORTHO_262-01_RGB_1.5m
Opname datum: 11-10-2015 WMS

S6_ORTHO_260-01_RGB_1.5m
Opname datum: 11-10-2015 WMS

S7_ORTHO_259-01_RGB_1.5m
Opname datum: 10-10-2015 WMS

Satellietbeeld: © NEO bv, Amersfoort, © 2014

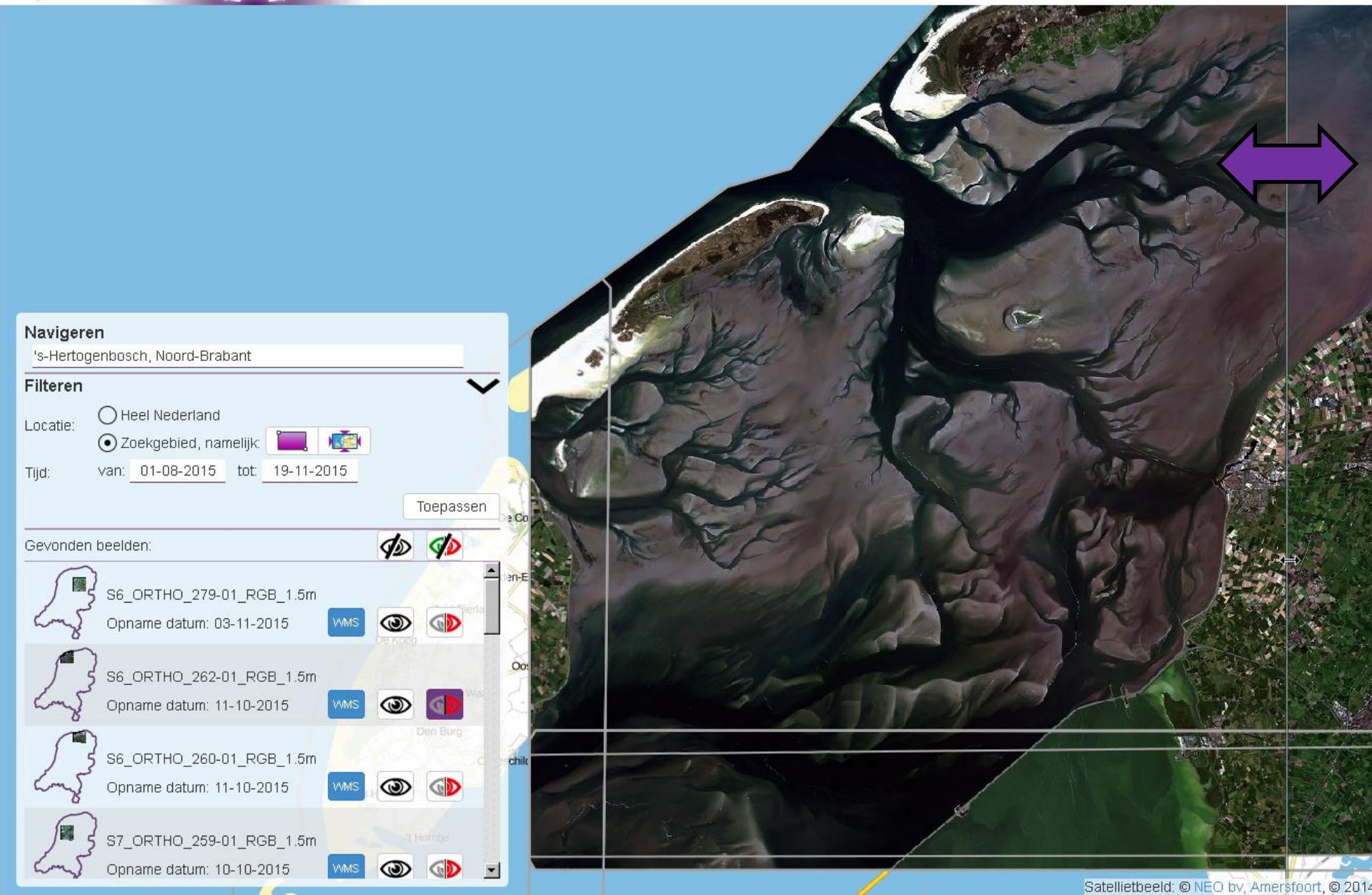
National Satelliet Data Portaal

mapserver.neography.nl/U087/

Zoeken

Netherlands Space Office

Nationaal Satellietdataportaal — Voorbewerkte data



Navigeren

's-Hertogenbosch, Noord-Brabant

Filteren

Locatie: ○ Heel Nederland ◉ Zoekgebied, namelijk:

Tijd: van: 01-08-2015 tot: 19-11-2015

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Opname datum: 03-11-2015 WMS

S6_ORTHO_262-01_RGB_1.5m
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S6_ORTHO_260-01_RGB_1.5m
Opname datum: 11-10-2015 WMS

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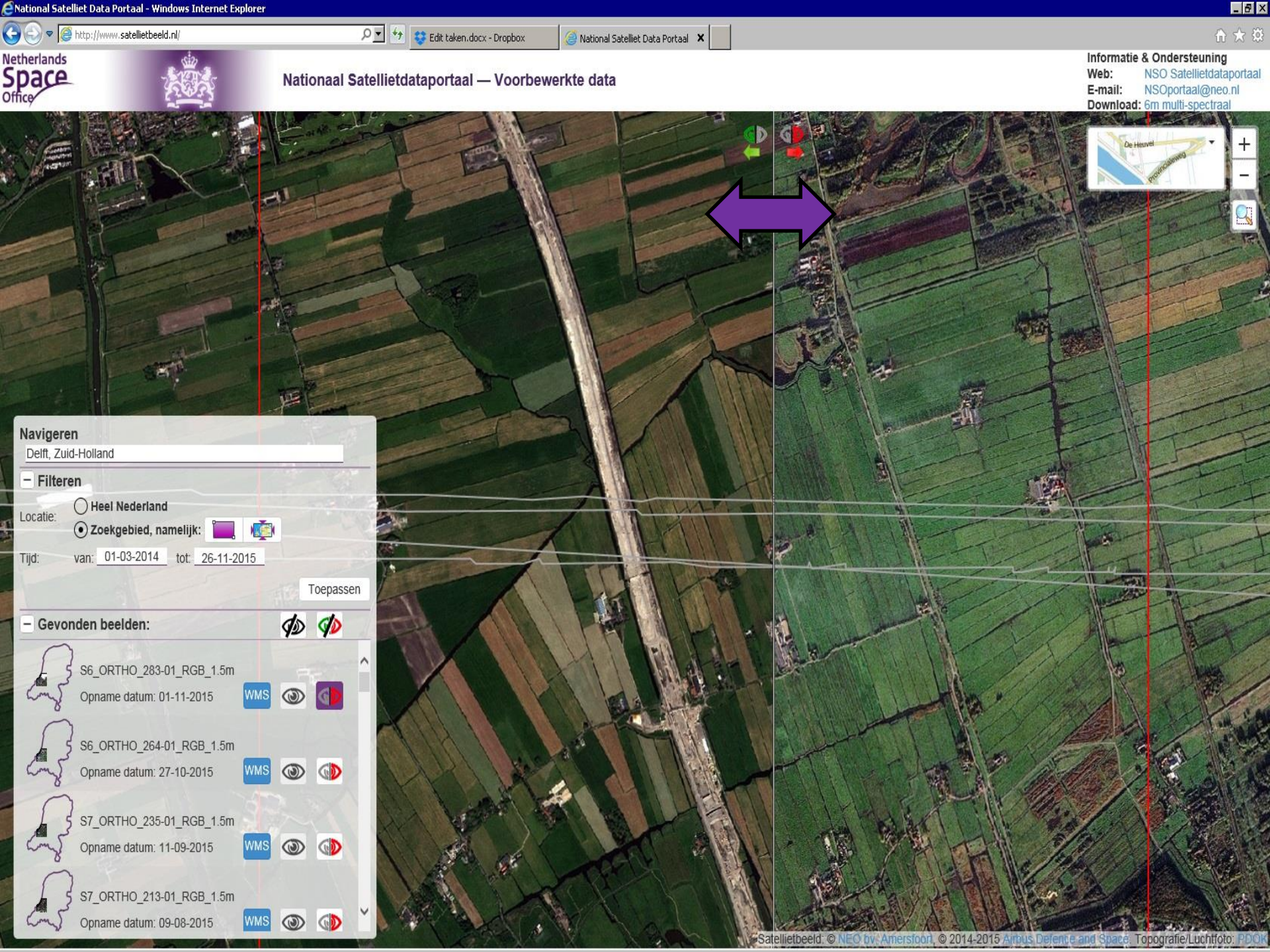
Opname datum: 10-10-2015 WMS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http://www.satellietbeeld.nl/
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Informatie & Ondersteuning
Web: NSO Satellietdataportaal
E-mail: NSOportaal@neo.nl
Download: 6m multi-spectraal
Navigeren
Delft, Zuid-Holland
Filteren
Locatie:
Heel Nederland
Zoekgebied, namelijk:
Tijd:
van: 01-03-2014
tot: 26-11-2015
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WMS
S6_ORTHO_264-01_RGB_1.5m
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S7_ORTHO_235-01_RGB_1.5m
Opname datum: 11-09-2015
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S7_ORTHO_213-01_RGB_1.5m
Opname datum: 09-08-2015
WMS
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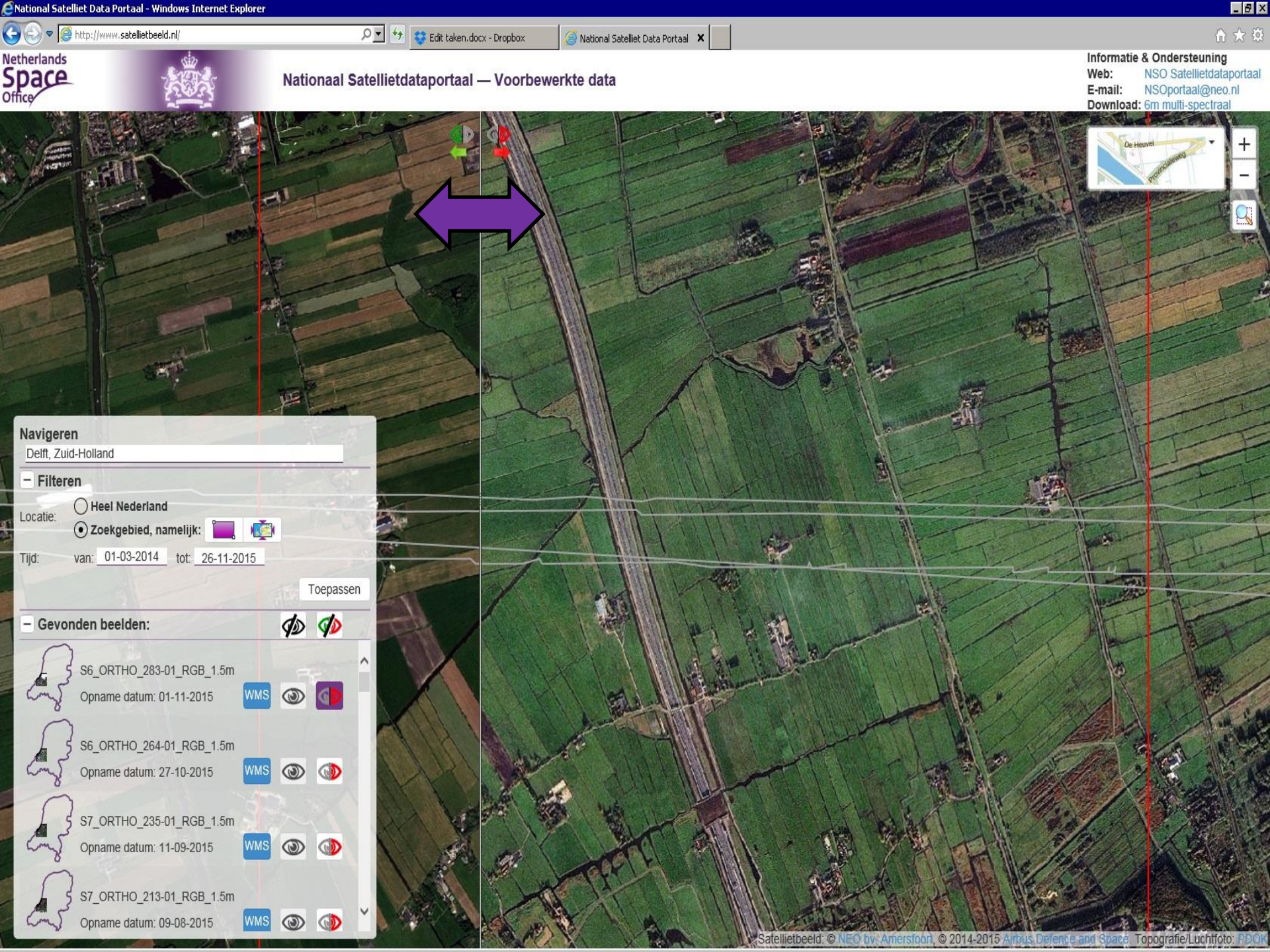
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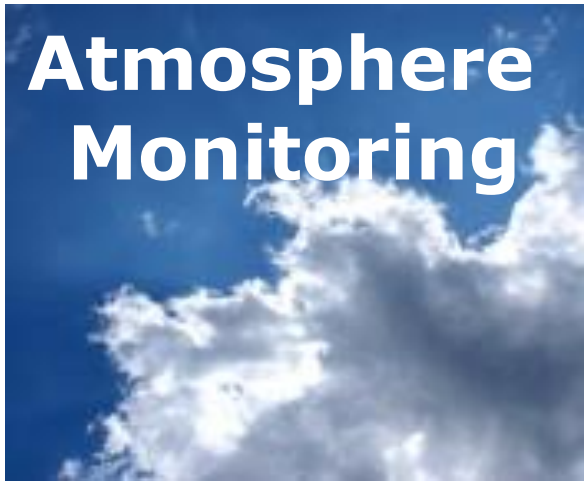
National Satelliet Data Portaal
Netherlands Space Office
Nationaal Satellietdataportaal — Voorbewerkte data
Informatie & Ondersteuning
Web: NSO Satellietdataportaal
E-mail: NSOportaal@neo.nl
Download: 6m multi-spectraal
Navigeren
Delft, Zuid-Holland
Filteren
Locatie:
Heel Nederland
Zoekgebied, namelijk:
Tijd:
van: 01-03-2014
tot: 26-11-2015
Toepassen
Gevonden beelden:
S6_ORTHO_283-01_RGB_1.5m
Opname datum: 01-11-2015
WMS
S6_ORTHO_264-01_RGB_1.5m
Opname datum: 27-10-2015
WMS
S7_ORTHO_235-01_RGB_1.5m
Opname datum: 11-09-2015
WMS
S7_ORTHO_213-01_RGB_1.5m
Opname datum: 09-08-2015
WMS
De Heuvel
Satellietbeeld: © NEO by, Amersfoort, © 2014-2015 Airbus Defence and Space. Topografie/Luchtfoto: PDOK


Land
Monitoring


Atmosphere
Monitoring


Emergency
Management


Climate
Change


Marine
Environment
Monitoring


Security

Emergency Management Service

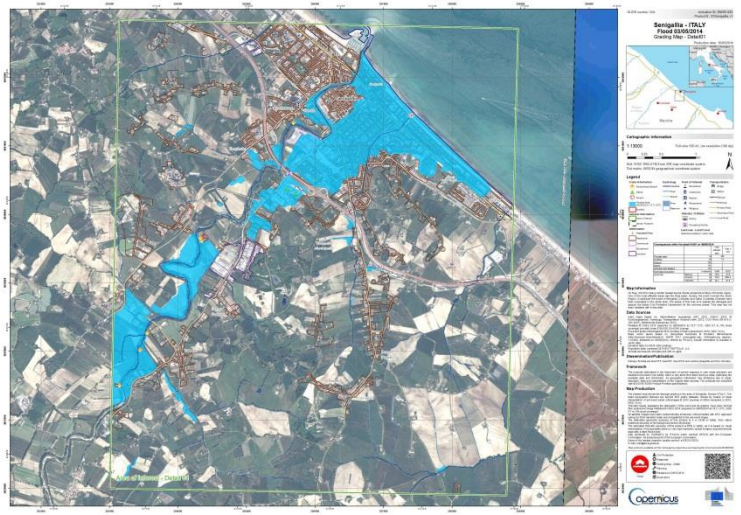
Goal:

Deliver products to support users who monitor environment, security and the effects of natural and human induced disasters inside and outside Europe

Components:

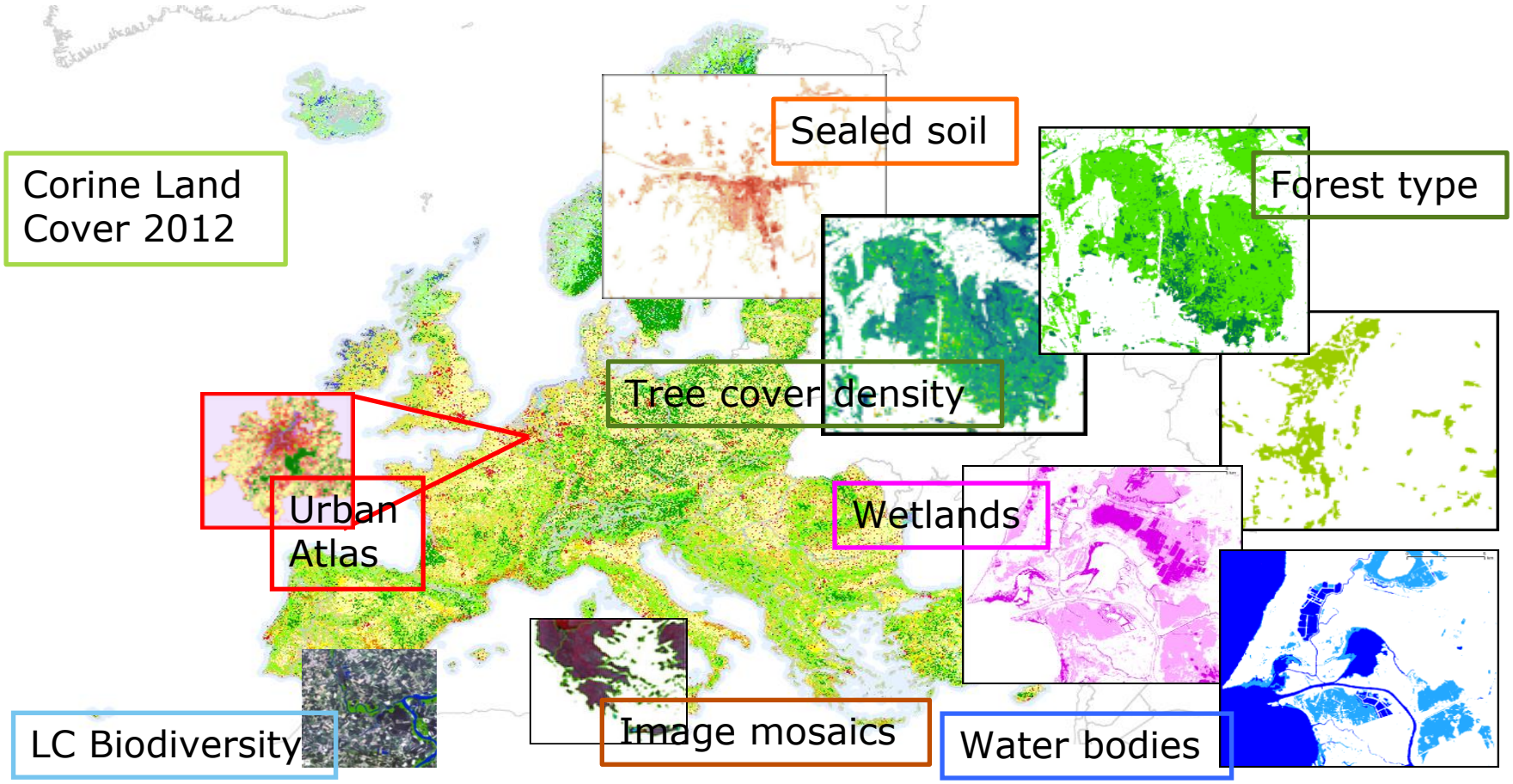
1. EMS mapping service
   - Rush mode: immediate response
   - Non-rush mode:
     - preventive actions
     - disaster risk analysis
     - Recovery
2. EFAS European Flood Awareness System

First operational warning system for floods and hydrological network

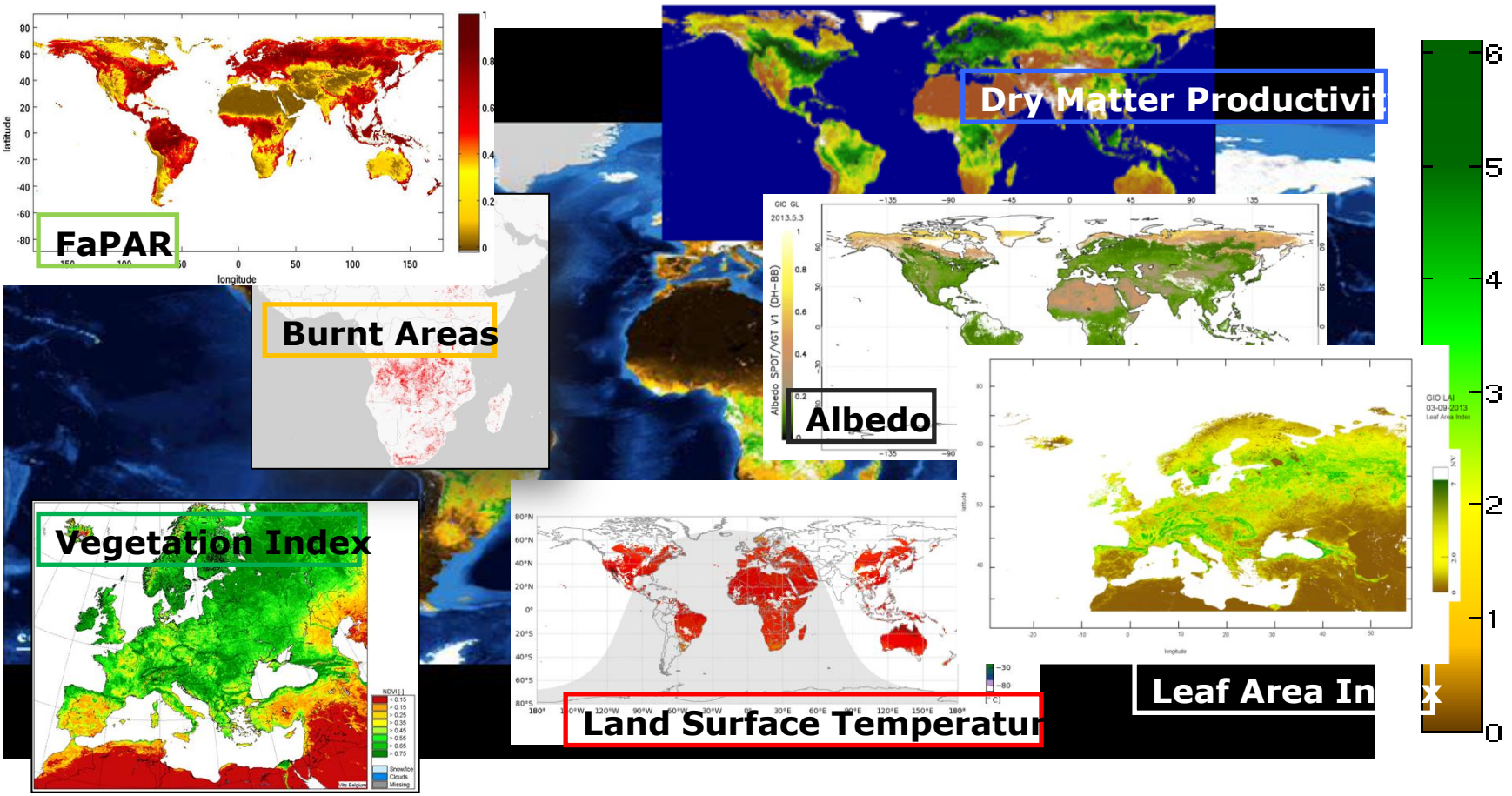


Floods in Marche, Italy, May 2014 – the town of Senigallia

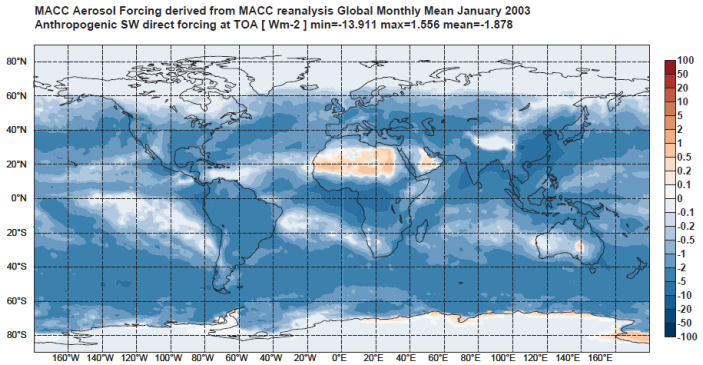
Land Monitoring Service – EU component



Land Monitoring Service – Global component



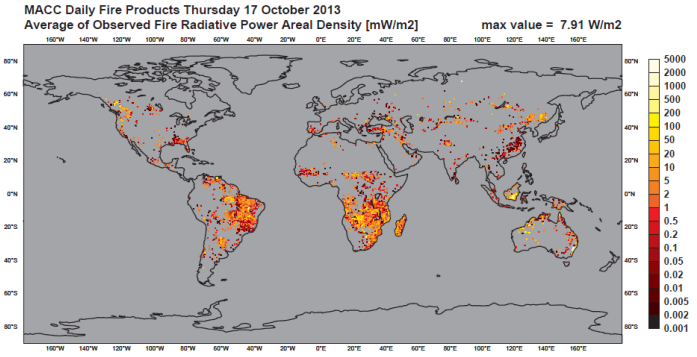
Atmosphere Monitoring Service



Goal:
deliver information on
- air quality (EU scale)
- atmospheric chemistry (globally)

Input for:
- national/local air quality monitoring systems
- monitoring of atmospheric chemistry climate vaiable

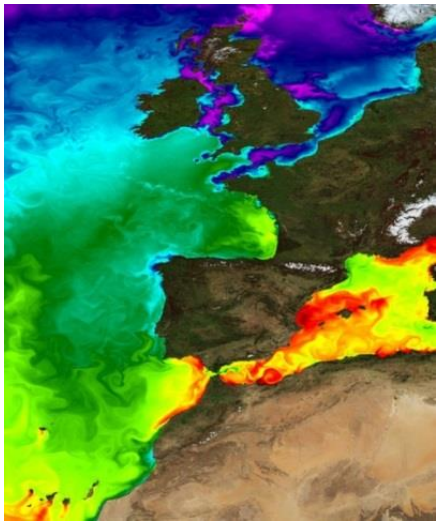
Service domains:
- Air quality and atmospheric composition
- Green house effect
- Global atmospheric ozone and UV
- Solar radiation
- Emissions and albedo

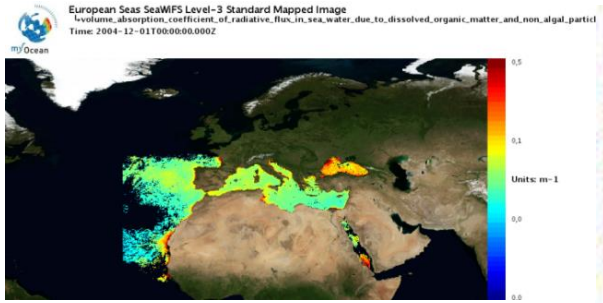


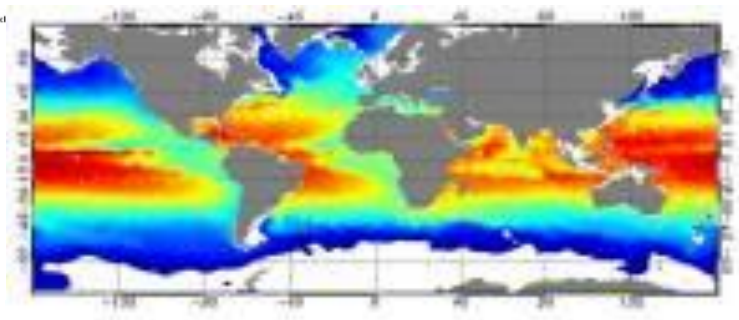
Marine Environment Monitoring Service

Goal:
- deliver global and EU-regional information on the state and dynamics of the physical oceans and marine eco-systems
- guarantee European capacity for monitoring, prediction and re-analyses

Service domains:
- Marine security
- Sea and coastal environment
- Marine resources
- Weather, seasonal forecasts, climate

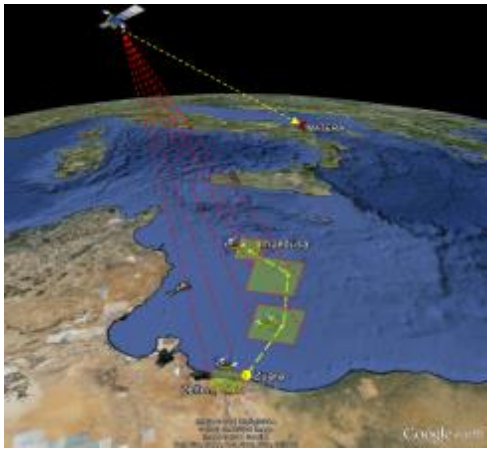


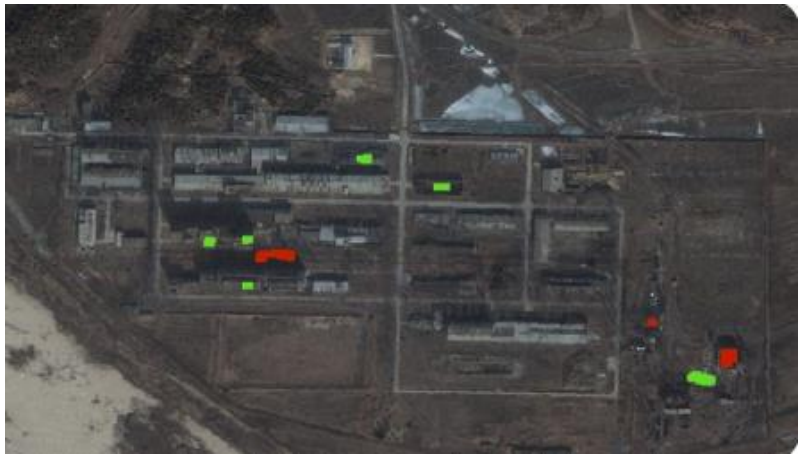




Security Service

Goal:
deliver information for:
- border security and control
- maritime surveillance
- support security actions outside Europe





Climate Change Service

ESA Climate variables (CCI+):

1.	Clouds	
2.	Fire	
3.	Land cover	
4.	Ocean colour	
5.	Ice sheets	
6.	Above Ground Biomass	New?
7.	Snow	New?
8.	High Resolution Land Cover	New?
9.	Land Surface Temperature	New?
10.	Precursors of Ozone en Aerosol	New?
11.	Long-lived Greenhouse Gases	New?
12.	Water Vapour	New?
13.	Ocean Salinity	New?
14.	Sea State / waves	New?
15.	Lakes	New?

From scientific

→

to operational

EC Climate variables (C3S):

1. Aerosol
2. CO2 en CH4
3. Glaciers
4. Ozone
5. Sea Level
6. Sea Surface Temperature
7. Soil Moisture
8. Sea Ice
9. Albedo, LAI en Fapar

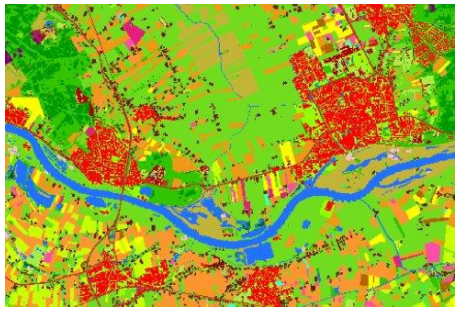
European Commission

Applications – agriculture

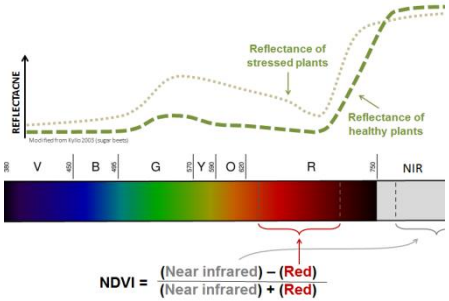
Subsidy control

Fauna damage assessment

Precision farming



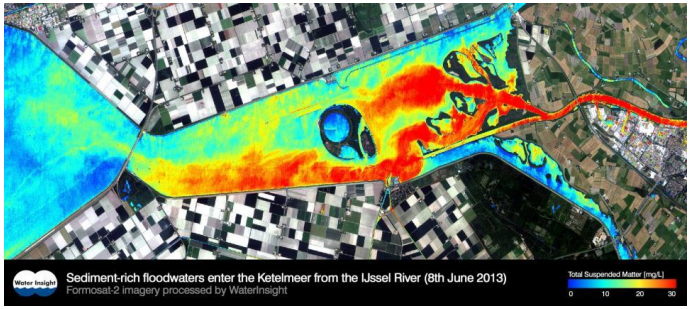
Administration, policy



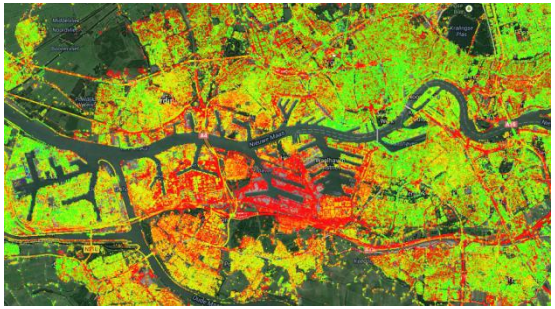
Research

Market forecasts

Other applications

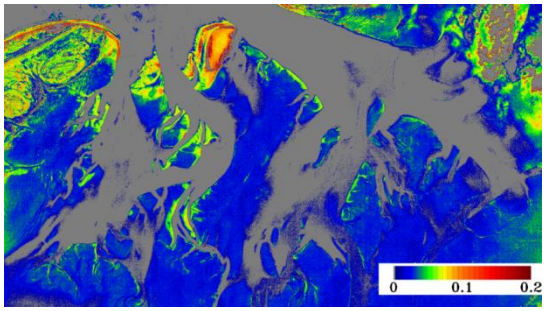


Quality inland waters



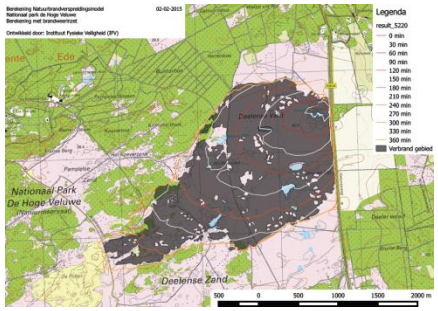
Deformation detection

Change detection



Waddenzee research

Water board districts



Fire control

Thank you
for your attention

www.spaceoffice.nl

Photo ‘the Netherlands by night’ taken by Dutch ESA astronaut André Kuipers from ISS with ‘night-pod system’ developed by cosine