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Εθνικό Δίκτυο Υποδομών Τεχνολογίας και Έρευνας Α.Ε.
ΕΔΥΤΕ - GRNET

Σύγχρονες Ψηφιακές Τεχνολογίες για τη Δημόσια Διοίκηση, την Εκπαίδευση, την Έρευνα, την Υγεία & τον Πολιτισμό

Tech Day: Earth Observation

Γνωριμία με την Τηλεπισκόπηση και την Παρατήρηση της Γης

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Ε.ΔΙ.Π. Α' - Ε.Μ.Π.
Ε.Δ.Υ.Τ.Ε. Α.Ε.

Πρόγραμμα

- Γνωριμία
  - Σκοπός του εργαστηρίου
  - Περιεχόμενα και δομή του
- Τηλεπισκόπηση και Παρατήρηση της Γης
- Δέκτες και δεδομένα
- Επεξεργασίες και δείκτες

Γνωριμία - Σκοπός

- Το σεμινάριο αυτό απευθύνεται κυρίως σε λειτουργούς του δημόσιου τομέα
- Περιλαμβάνει μια εισαγωγή στην Τηλεπισκόπηση και εστιάζει στην Παρατήρηση της Γης
- Εξοικειώνει με τους δέκτες, τα δεδομένα και τα χαρακτηριστικά τους
- Πρακτική άσκηση επισκόπησης και πρώτων επεξεργασιών σε ένα ΣΓΠ (GIS)

Γνωριμία - Δομή

- Τηλεπισκόπηση - Παρατήρηση της Γης
  - Ορισμοί
- Δέκτες και δεδομένα:
  - Είδη, κατηγορίες, χαρακτηριστικά και τεχνολογίες
- QGIS:
  - Απεικόνιση και επεξεργασίες
  - Πρακτική άσκηση

Συστήματα Γεωγραφικών Πληροφοριών (GIS)

«Τα Συστήματα Γεωγραφικών Πληροφοριών (Σ.Γ.Π.), γνωστά ευρέως και ως G.I.S. Geographic Information Systems, είναι ολοκληρωμένα συστήματα συλλογής, αποθήκευσης, διαχείρισης, ανάλυσης και απόδοσης πληροφορίας, σχετικής με φαινόμενα που εξελίσσονται στο χώρο (Goodchild, 1985).»

Πηγή: Βικιπαίδεια 03/07/2021

Σύστημα Γεωγραφικών Πληροφοριών

- Ολοκληρωμένο σύστημα διαχείρισης χωρικών δεδομένων και συσχετισμένων ιδιοτήτων
- «έχει» = ενσωματώνει, αποθηκεύει, προσαρμόζει, αναλύει και παρουσιάζει γεωγραφικά συσχετισμένες πληροφορίες
- ΣΓΠ = «έξυπνος χάρτης»

Σύστημα Γεωγραφικών Πληροφοριών

- Η αναπαράσταση των δεδομένων ενός ΣΓΠ γίνεται σε επίπεδα πληροφοριών
- Κάθε επίπεδο περιέχει ένα είδος χαρτογραφικών δεδομένων, τα χαρακτηριστικά τους καθώς και την χαρτογραφική απεικόνισή τους
- Τα επίπεδα αυτά μπορούν να είναι:
  - Διανυσματικά: σημεία, γραμμές ή πολύγωνα
  - Πινακοποιημένα: χάρτες, φωτογραφίες

Τηλεπισκόπηση

«***Τηλεπισκόπηση (Remote Sensing)***, *είναι η επιστήμη και τεχνική, που ασχολείται με τις αρχές, τις αναλογικές και ψηφιακές μεθόδους και τα όργανα, με τα οποία επιτυγχάνεται από μακρυά, η συλλογή, επεξεργασία και ανάλυση, πλήθους ποιοτικών και μετρητικών πληροφοριών, για τη γη, τους ωκεανούς, την ατμόσφαιρα και το φυσικό και το κοινωνικοοικονομικό περιβάλλον γενικότερα, (αλλά και για τις σχέσεις, τις αλληλεξαρτήσεις και τις αλληλεπιδράσεις τους και τις τάσεις μεταβολής τους δια μέσου του χρόνου), καθώς επίσης και για οποιοδήποτε αντικείμενο, φαινόμενο, γεγονός και συμβάν, ή και για οποιαδήποτε διαδικασία μεταβολής τους.»*

Πηγή: Ρόκος Δ., Φωτοερμηνεία-Τηλεπισκόπηση, Ε.Μ.Π, 1987, Αθήνα.

Παρατήρηση της Γης

*«Η **Παρατήρηση της Γης** είναι η συλλογή πληροφοριών σχετικά με τα φυσικά, χημικά και βιολογικά συστήματα του πλανήτη Γη μέσω τεχνολογιών τηλεπισκόπησης, που συνήθως περιλαμβάνουν δορυφόρους οι οποίοι μεταφέρουν συσκευές καταγραφής.*

Η Παρατήρηση της Γης χρησιμοποιείται για την παρακολούθηση και αξιολόγηση της κατάστασης και των αλλαγών στο φυσικό και ανθρωπογενές περιβάλλον.»

(συνεχίζεται)

Παρατήρηση της Γης

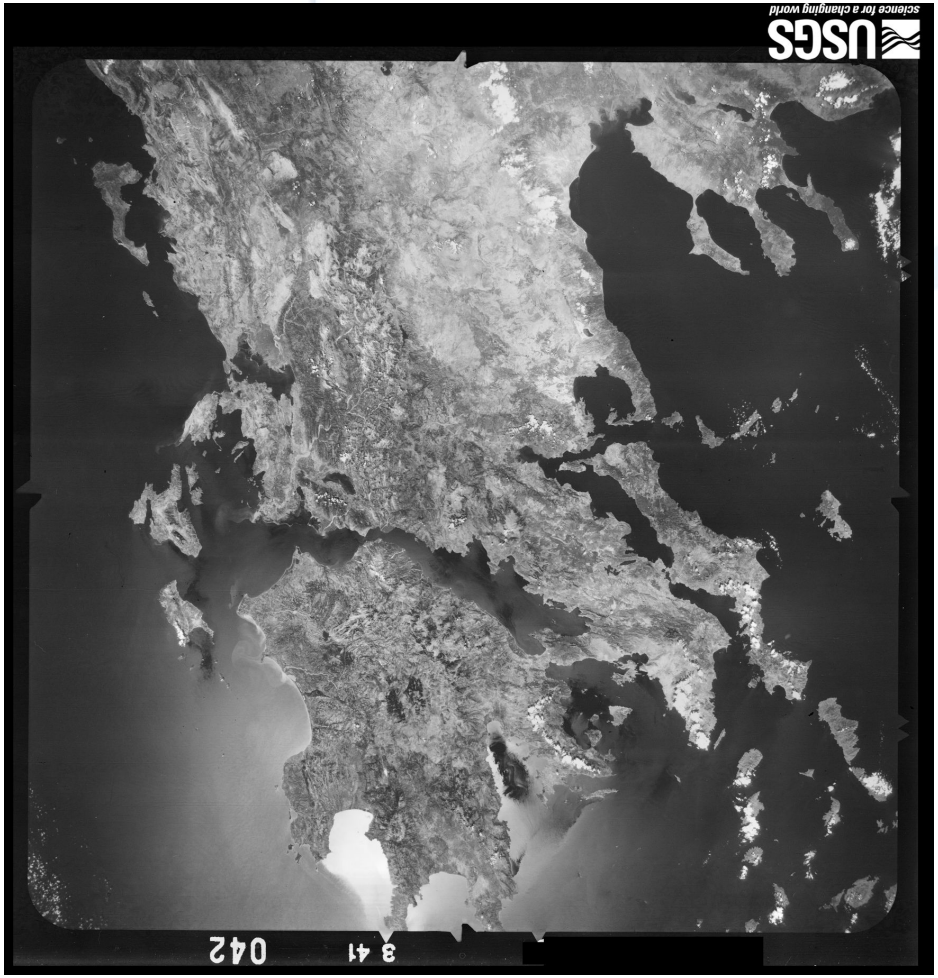
«Οι τηλεπισκοπικές διαστημικές τεχνολογίες παρέχουν αξιόπιστα σύνολα δεδομένων επαναλαμβανόμενης κάλυψης, τα οποία σε συνδυασμό με την έρευνα και την ανάπτυξη κατάλληλων μεθόδων, παρέχουν ένα μοναδικό μέσο για τη συλλογή πληροφοριών σχετικά με τον πλανήτη.

Παραδείγματα περιλαμβάνουν την παρακολούθηση της κατάστασης και της εξέλιξης του περιβάλλοντος μας, είτε πρόκειται για ξηρά, θάλασσα ή αέρα, και την ικανότητα γρήγορης εκτίμησης καταστάσεων κατά τη διάρκεια κρίσεων όπως ακραία καιρικά φαινόμενα ή σε περιόδους ανθρώπινης σύγκρουσης.»

Πηγή: European Commission > EU Science Hub > Research topic > Earth observation
3/7/2021

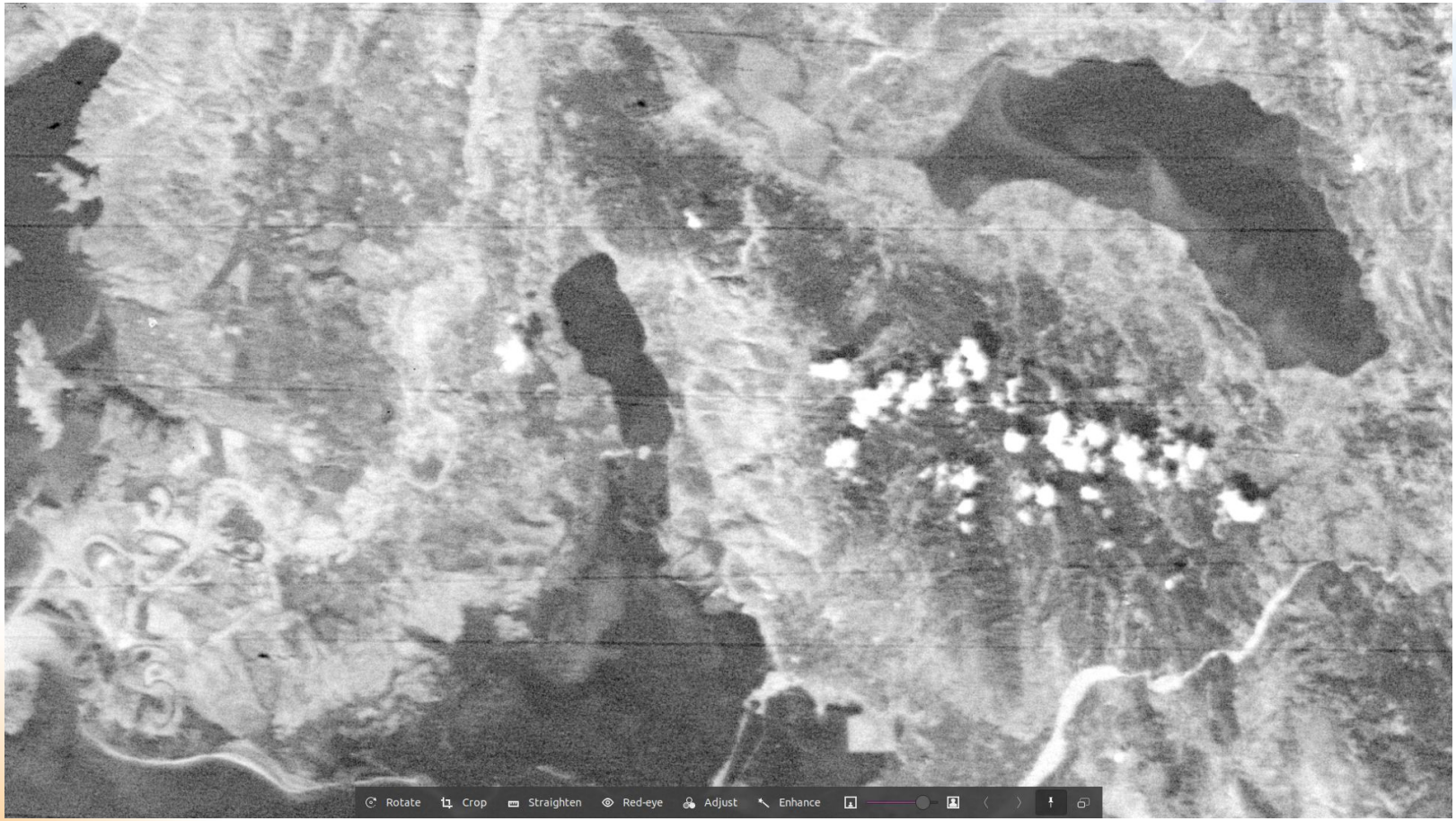
CORONA Satellite Photography

29/08/1963, KH-5 Argon, 5in Panchromatic film



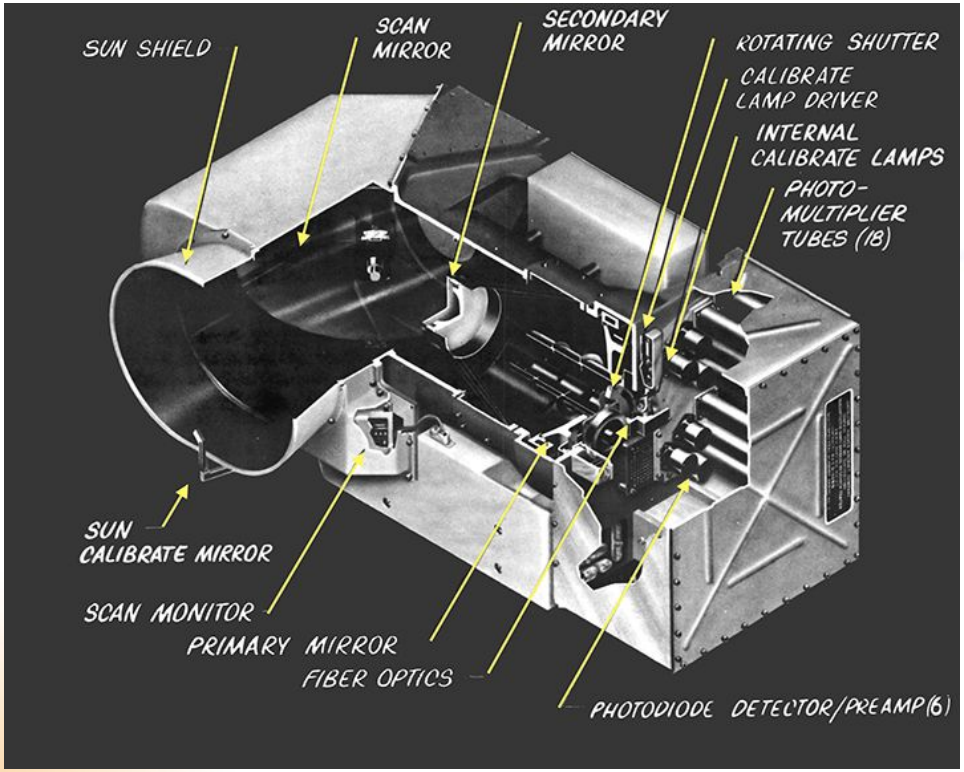
CORONA Satellite Photography

29/08/1963, KH-5 Argon, 5in Panchromatic film



Τηλεπισκοπικός Δέκτης

Virginia T. Norwood: [The Mother of Landsat]

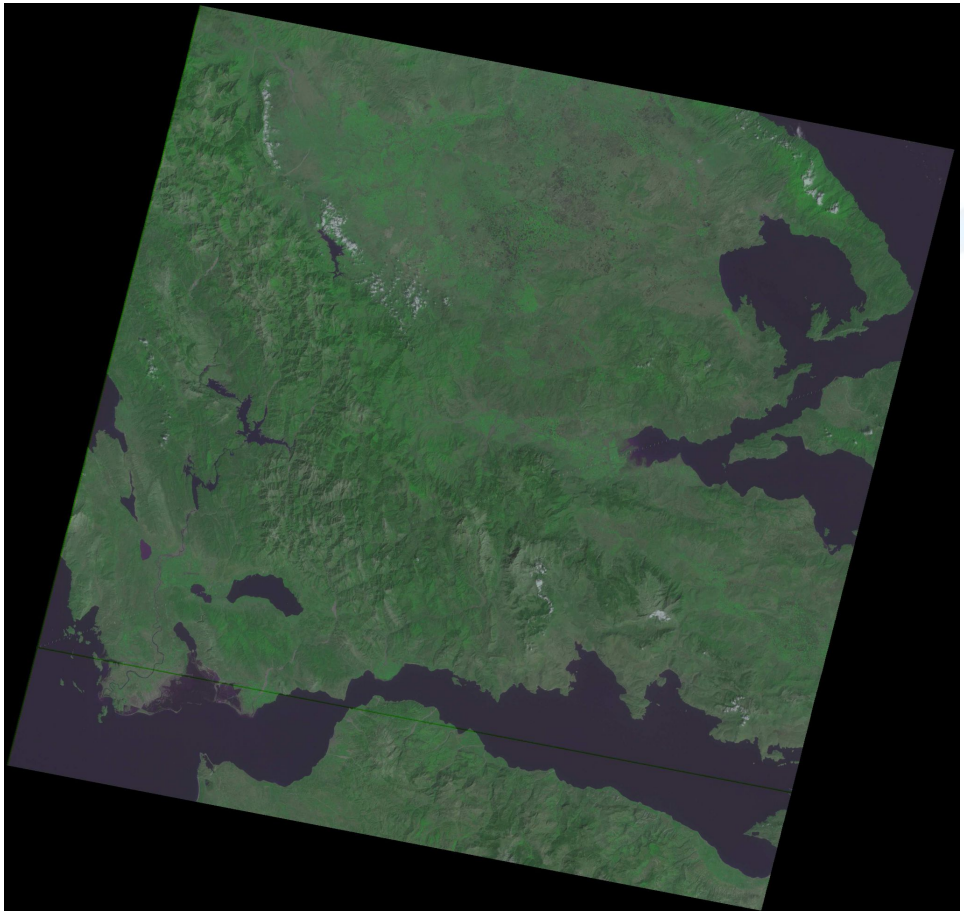


[Landsat 1]
23/07/1972 - 06/01/1978

[Multispectral Scanner System]

Landsat MSS

08/09/1972, 08:43:03.11-08:43:31.74 UTC, Natural Colour



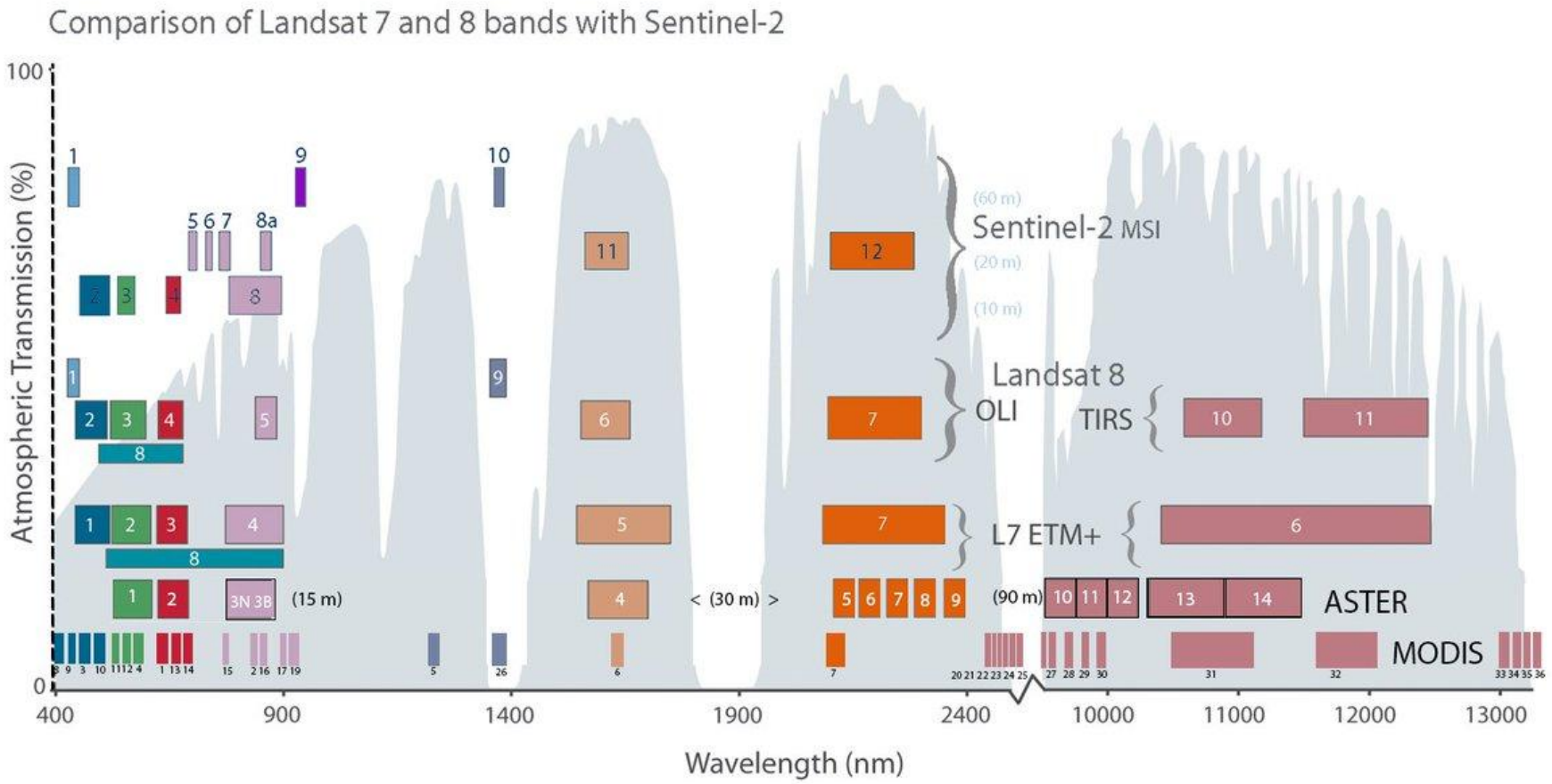
ESA's ERS-1

27/07/1991, Flevoland polder and Ijsselmeer, The Netherlands, SAR

Τηλεπισκοπικός Δέκτης

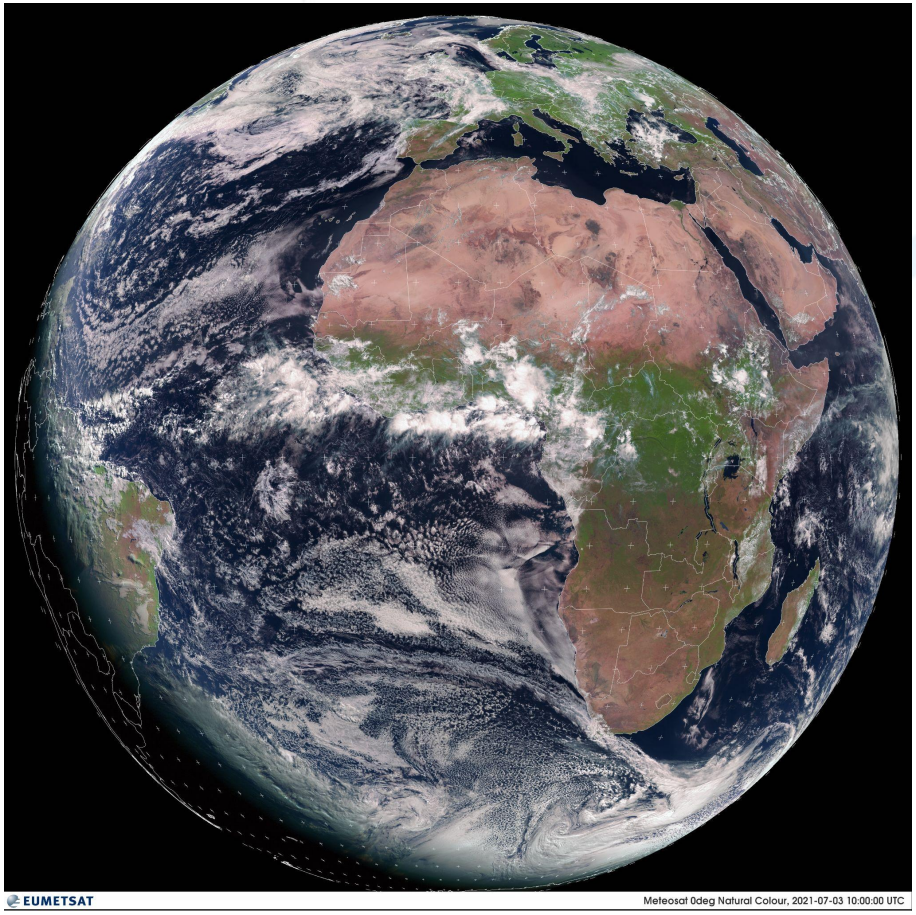
- Ενεργός ή Παθητικός
- Επίγειος, αερομεταφερόμενος ή δορυφορικός
- Δορυφορικός: γεωστατικός ή σε τροχιά
- Πολυφασματικός, υπερφασματικός, θερμικός, μικροκυματικός(radar), lidar(=laser+radar) κ.α.

Τηλεπισκοπικός Δέκτης



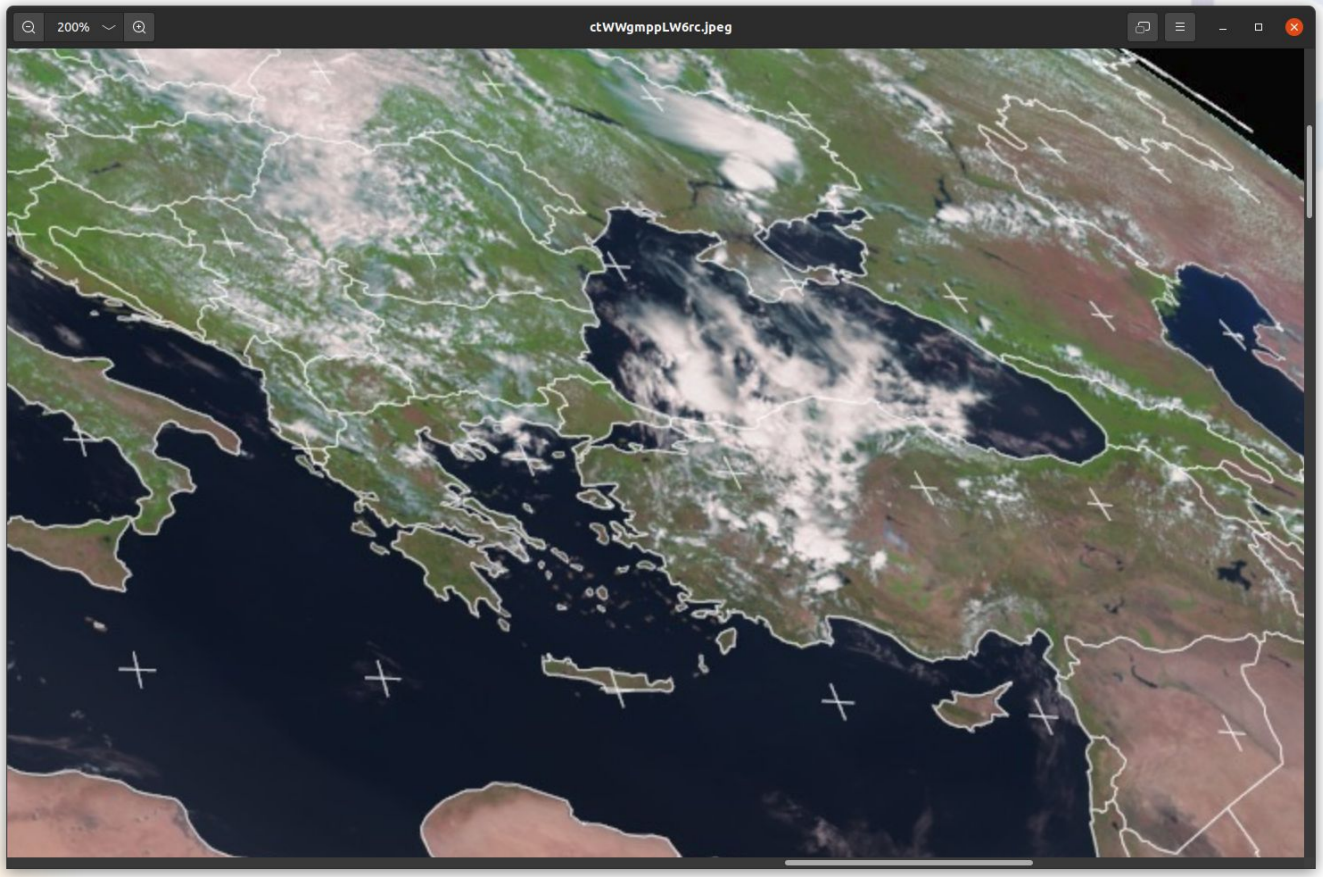
Meteosat SEVIRI

03/07/21 10:00 UTC , Natural Colour

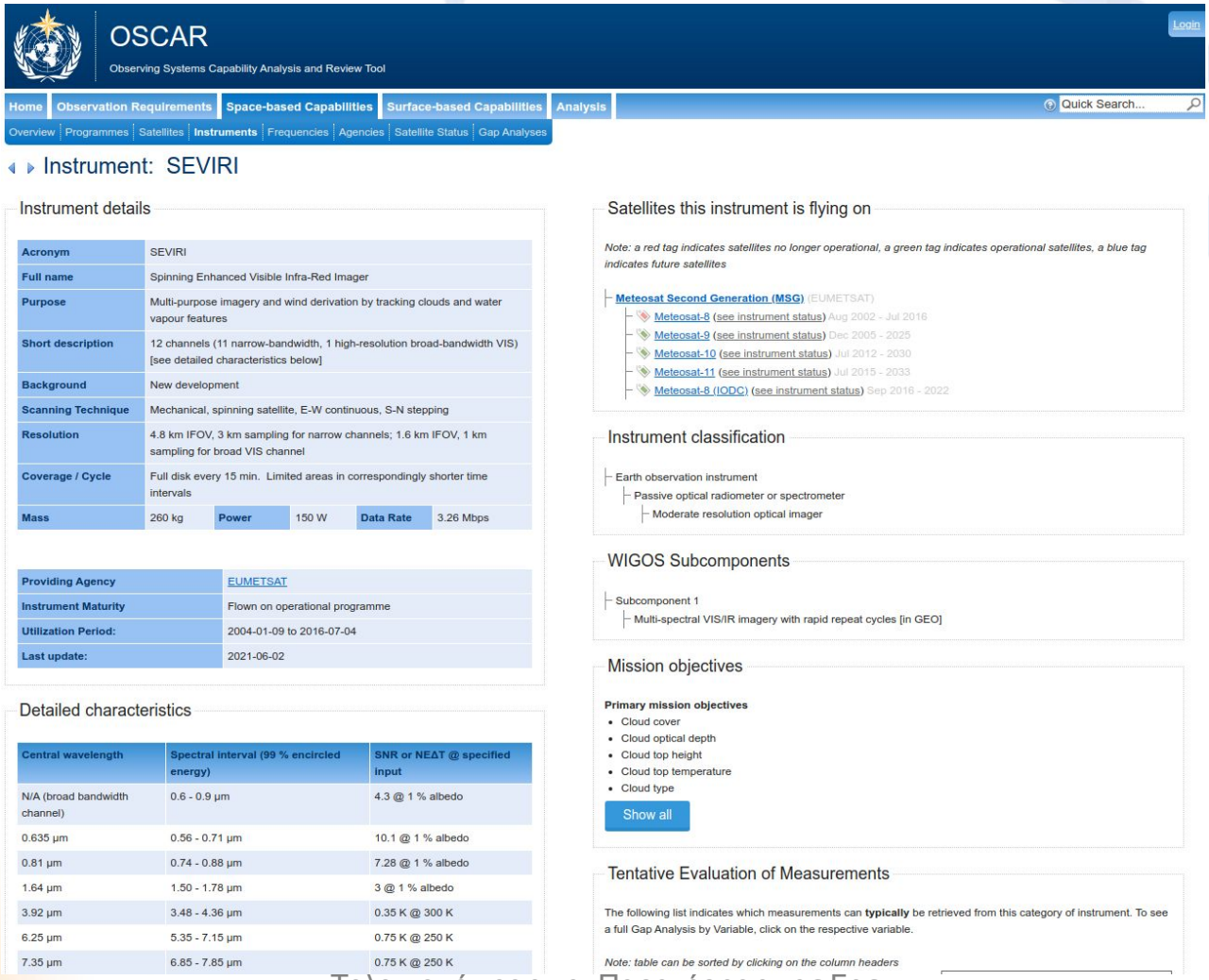


Meteosat SEVIRI

03/07/21 10:00 UTC , Natural Colour



Meteosat SEVIRI



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Instrument: SEVIRI

Instrument details

Acronym	SEVIRI				
Full name	Spinning Enhanced Visible Infra-Red Imager				
Purpose	Multi-purpose imagery and wind derivation by tracking clouds and water vapour features				
Short description	12 channels (11 narrow-bandwidth, 1 high-resolution broad-bandwidth VIS) [see detailed characteristics below]				
Background	New development				
Scanning Technique	Mechanical, spinning satellite, E-W continuous, S-N stepping				
Resolution	4.8 km IFOV, 3 km sampling for narrow channels; 1.6 km IFOV, 1 km sampling for broad VIS channel				
Coverage / Cycle	Full disk every 15 min. Limited areas in correspondingly shorter time intervals				
Mass	260 kg	Power	150 W	Data Rate	3.26 Mbps

Providing Agency	EUMETSAT
Instrument Maturity	Flown on operational programme
Utilization Period:	2004-01-09 to 2016-07-04
Last update:	2021-06-02

Detailed characteristics

Central wavelength	Spectral interval (99 % encircled energy)	SNR or NEΔT @ specified input
N/A (broad bandwidth channel)	0.6 - 0.9 µm	4.3 @ 1 % albedo
0.635 µm	0.56 - 0.71 µm	10.1 @ 1 % albedo
0.81 µm	0.74 - 0.88 µm	7.28 @ 1 % albedo
1.64 µm	1.50 - 1.78 µm	3 @ 1 % albedo
3.92 µm	3.48 - 4.36 µm	0.35 K @ 300 K
6.25 µm	5.35 - 7.15 µm	0.75 K @ 250 K
7.35 µm	6.85 - 7.85 µm	0.75 K @ 250 K

Satellites this instrument is flying on

Note: a red tag indicates satellites no longer operational, a green tag indicates operational satellites, a blue tag indicates future satellites

- Meteosat Second Generation (MSG) (EUMETSAT)
  - Meteosat-8 (see instrument status) Aug 2002 - Jul 2016
  - Meteosat-9 (see instrument status) Dec 2005 - 2025
  - Meteosat-10 (see instrument status) Jul 2012 - 2030
  - Meteosat-11 (see instrument status) Jul 2015 - 2033
  - Meteosat-8 (IODC) (see instrument status) Sep 2016 - 2022

Instrument classification

- Earth observation instrument
  - Passive optical radiometer or spectrometer
    - Moderate resolution optical imager

WIGOS Subcomponents

- Subcomponent 1
  - Multi-spectral VIS/IR imagery with rapid repeat cycles [in GEO]

Mission objectives

Primary mission objectives

- Cloud cover
- Cloud optical depth
- Cloud top height
- Cloud top temperature
- Cloud type

Show all

Tentative Evaluation of Measurements

The following list indicates which measurements can **typically** be retrieved from this category of instrument. To see a full Gap Analysis by Variable, click on the respective variable.

Note: table can be sorted by clicking on the column headers

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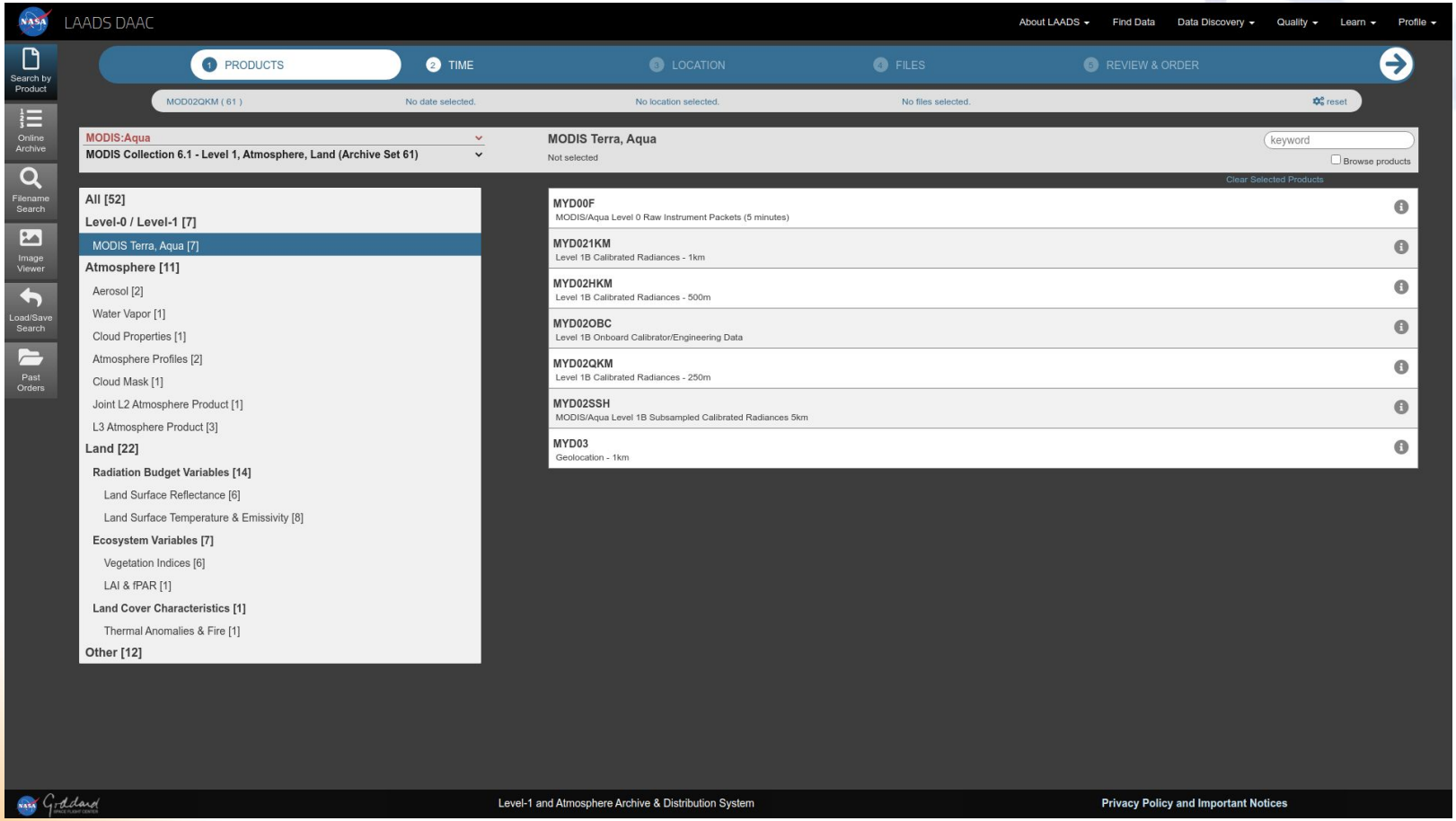
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1 PRODUCTS
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4 FILES
5 REVIEW & ORDER
MOD02QKM (61)
No date selected.
No location selected.
No files selected.
reset
MODIS:Aqua
MODIS Collection 6.1 - Level 1, Atmosphere, Land (Archive Set 61)
MODIS Terra, Aqua
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All [52]
Level-0 / Level-1 [7]
MODIS Terra, Aqua [7]
Atmosphere [11]
Aerosol [2]
Water Vapor [1]
Cloud Properties [1]
Atmosphere Profiles [2]
Cloud Mask [1]
Joint L2 Atmosphere Product [1]
L3 Atmosphere Product [3]
Land [22]
Radiation Budget Variables [14]
Land Surface Reflectance [6]
Land Surface Temperature & Emissivity [8]
Ecosystem Variables [7]
Vegetation Indices [6]
LAI & fPAR [1]
Land Cover Characteristics [1]
Thermal Anomalies & Fire [1]
Other [12]
MYD00F
MODIS/Aqua Level 0 Raw Instrument Packets (5 minutes)
MYD021KM
Level 1B Calibrated Radiances - 1km
MYD02HKM
Level 1B Calibrated Radiances - 500m
MYD02OBC
Level 1B Onboard Calibrator/Engineering Data
MYD02QKM
Level 1B Calibrated Radiances - 250m
MYD02SSH
MODIS/Aqua Level 1B Subsampled Calibrated Radiances 5km
MYD03
Geolocation - 1km
Goddard
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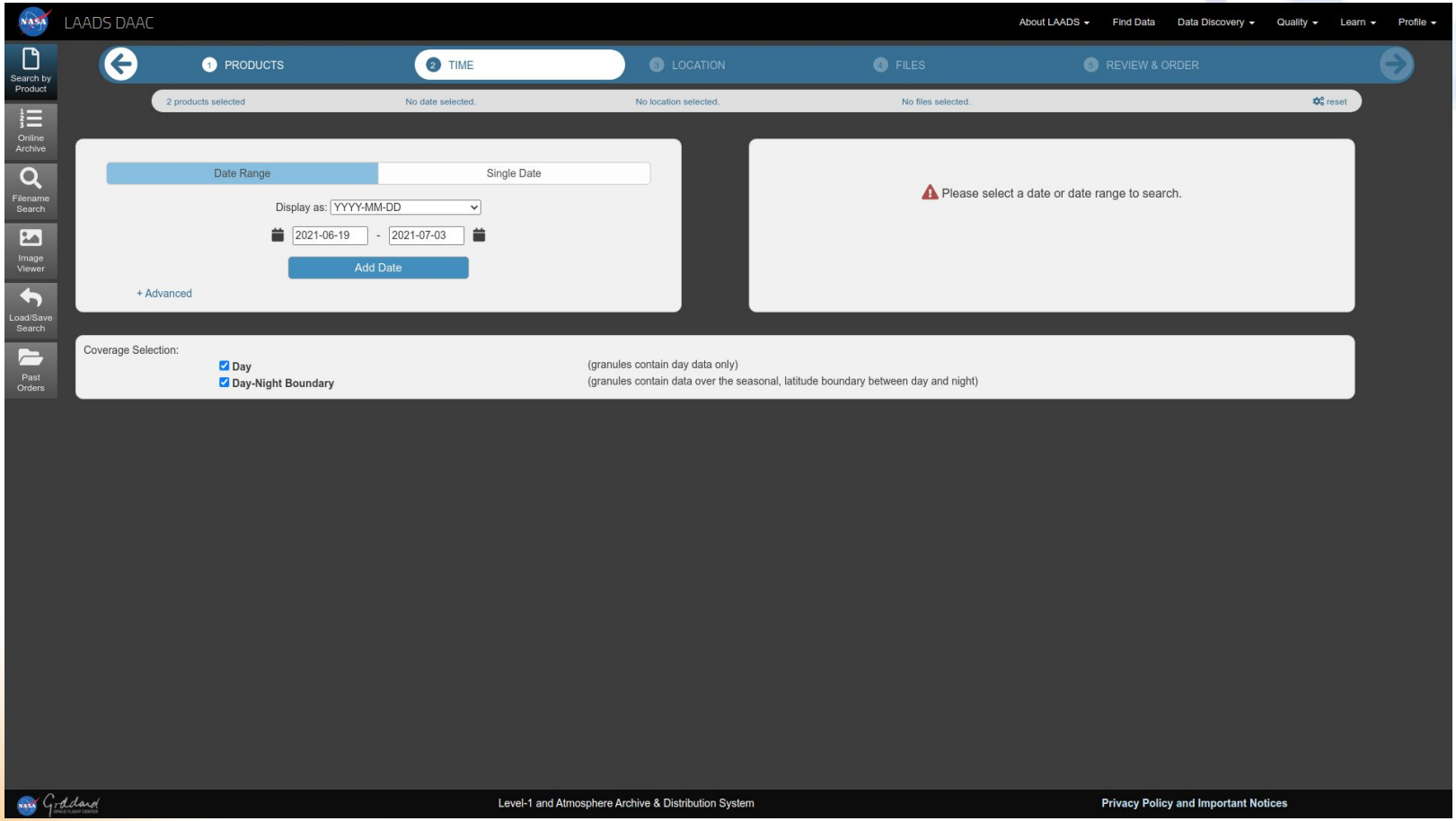
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Date Range
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Display as: YYYY-MM-DD
2021-06-19
2021-07-03
Add Date
+ Advanced
Please select a date or date range to search.
Coverage Selection:
Day
(granules contain day data only)
Day-Night Boundary
(granules contain data over the seasonal, latitude boundary between day and night)
Level-1 and Atmosphere Archive & Distribution System
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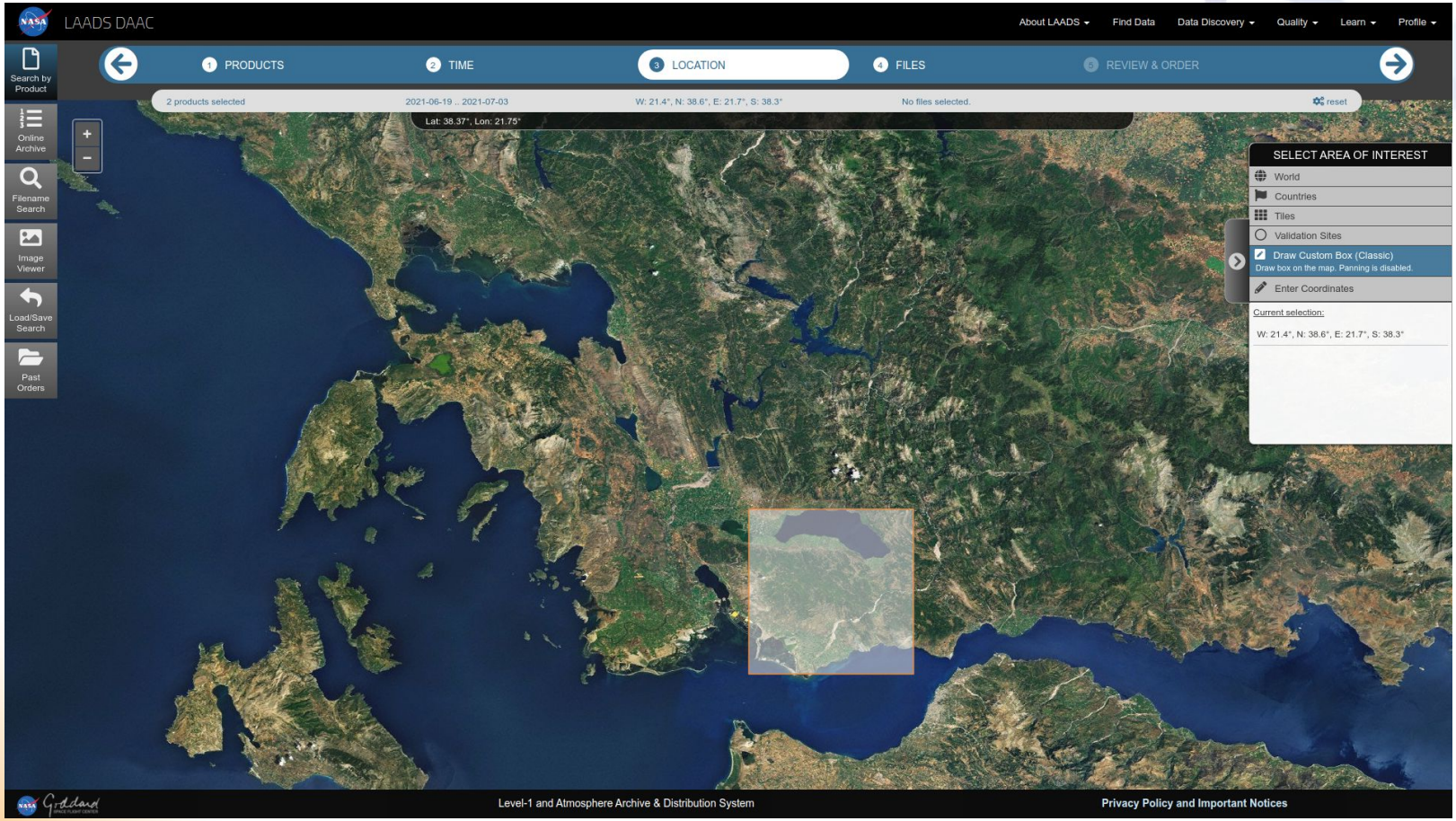
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2 products selected
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W: 21.4°, N: 38.6°, E: 21.7°, S: 38.3°
No files selected.
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Lat: 38.37°, Lon: 21.75°
SELECT AREA OF INTEREST
World
Countries
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Validation Sites
Draw Custom Box (Classic)
Draw box on the map. Panning is disabled.
Enter Coordinates
Current selection:
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Level-1 and Atmosphere Archive & Distribution System
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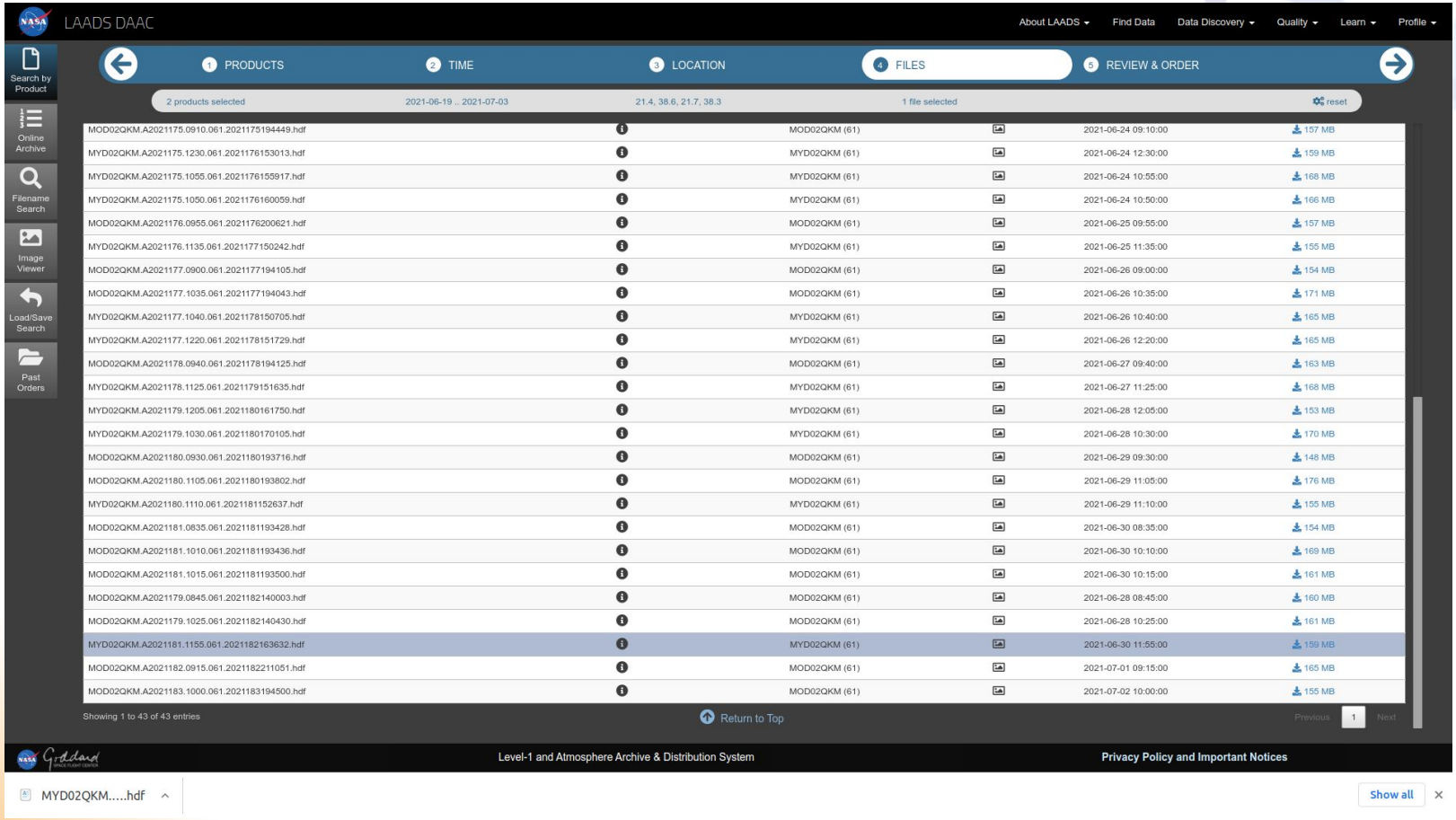
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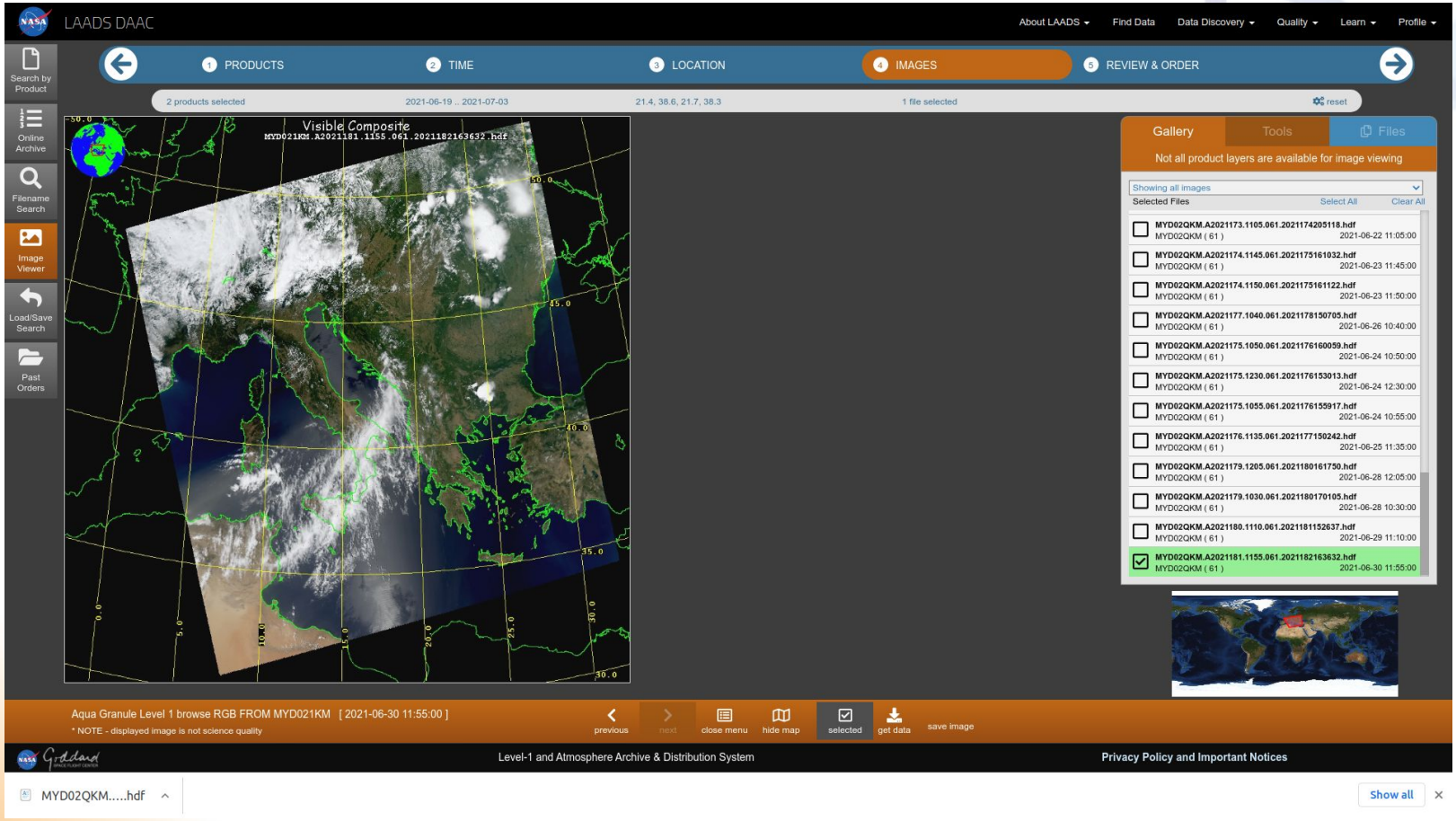
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21.4, 38.6, 21.7, 38.3
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MYD02QKM.A2021180.1110.061.2021181152637.hdf
MYD02QKM.A2021181.1155.061.2021182163632.hdf
Aqua Granule Level 1 browse RGB FROM MYD021KM [2021-06-30 11:55:00]
* NOTE - displayed image is not science quality
previous
next
close menu
hide map
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save image
Goddard
Level-1 and Atmosphere Archive & Distribution System
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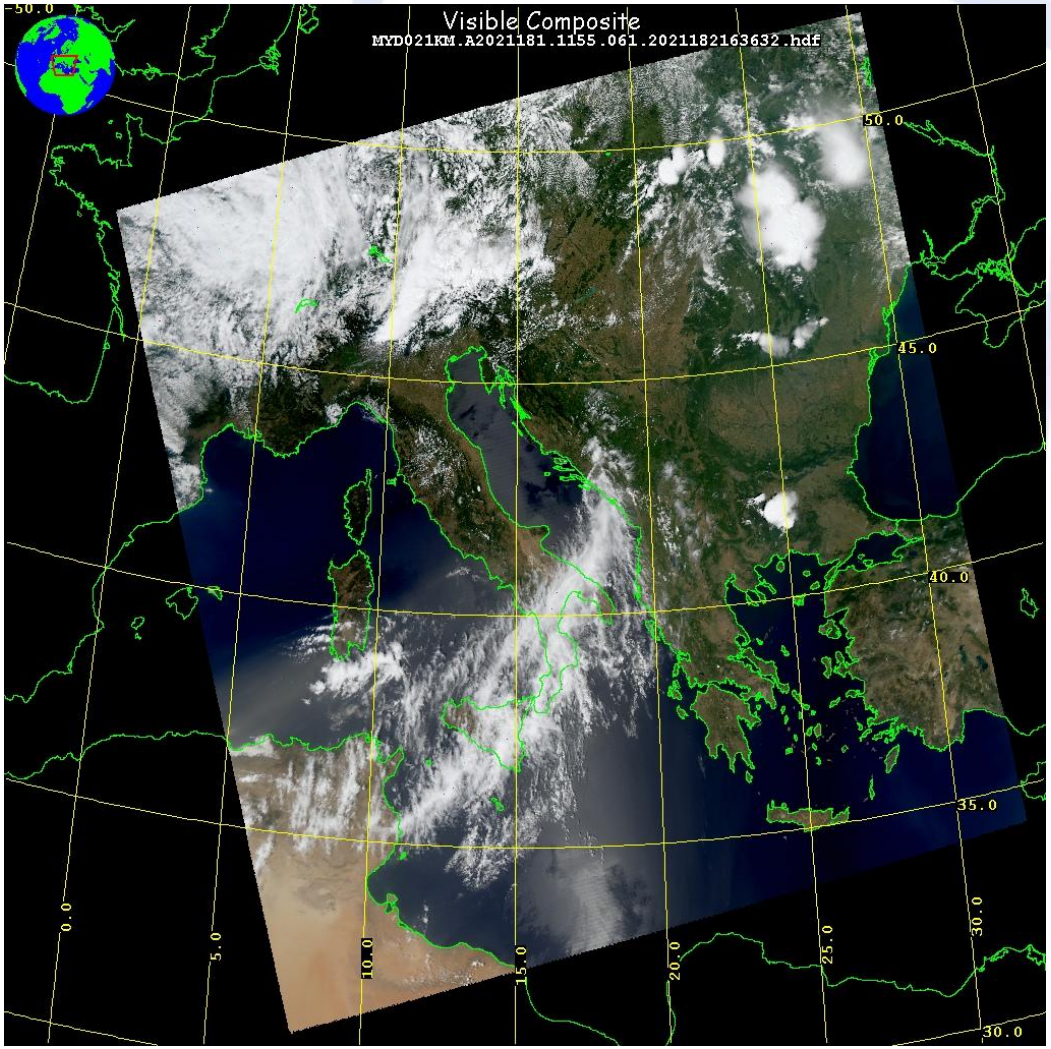
MYD02QKM.....hdf
Show all

MODIS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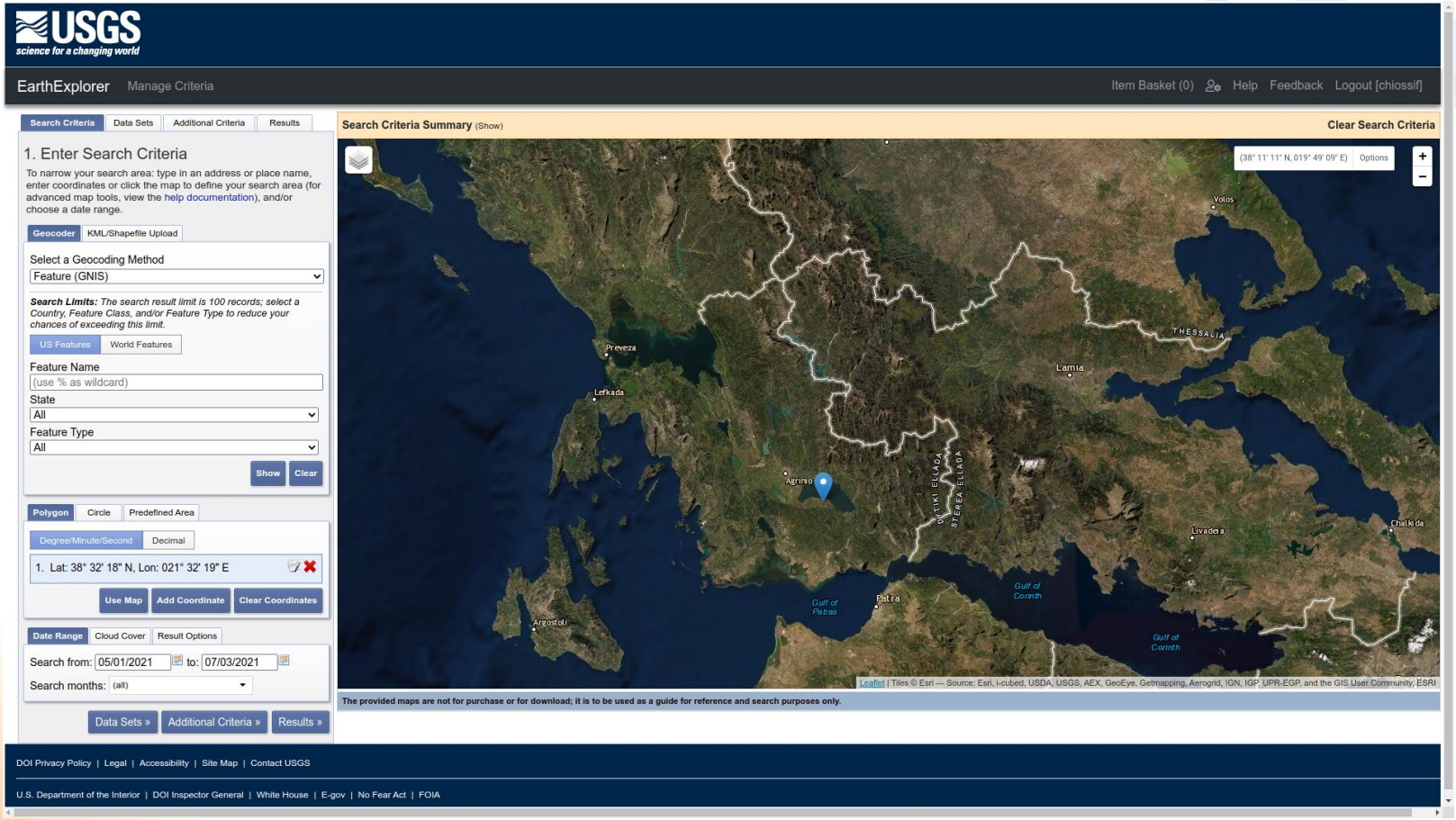
Landsat


USGS
science for a changing world
EarthExplorer
Manage Criteria
Item Basket (0)
Help
Feedback
Logout [chiossif]
Search Criteria
Data Sets
Additional Criteria
Results
1. Enter Search Criteria
To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the help documentation), and/or choose a date range.
Geocoder
KML/Shapefile Upload
Select a Geocoding Method
Feature (GNIS)
Search Limits: The search result limit is 100 records; select a Country, Feature Class, and/or Feature Type to reduce your chances of exceeding this limit.
US Features
World Features
Feature Name
(use % as wildcard)
State
All
Feature Type
All
Show
Clear
Polygon
Circle
Predefined Area
Degree/Minute/Second
Decimal
1. Lat: 38° 32' 18" N, Lon: 021° 32' 19" E
Use Map
Add Coordinate
Clear Coordinates
Date Range
Cloud Cover
Result Options
Search from: 05/01/2021 to: 07/03/2021
Search months: (all)
Data Sets »
Additional Criteria »
Results »
Search Criteria Summary (Show)
Clear Search Criteria
(38° 11' 11" N, 019° 49' 09" E)
Options
Volos
Preveza
Lefkada
Lamia
THESSALIA
Agrinio
DYTIKI ELLADA
STEREA ELLADA
Livadeia
Chalkida
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Patra
Gulf of Corinth
Argostoli
Leaflet | Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community, ESRI
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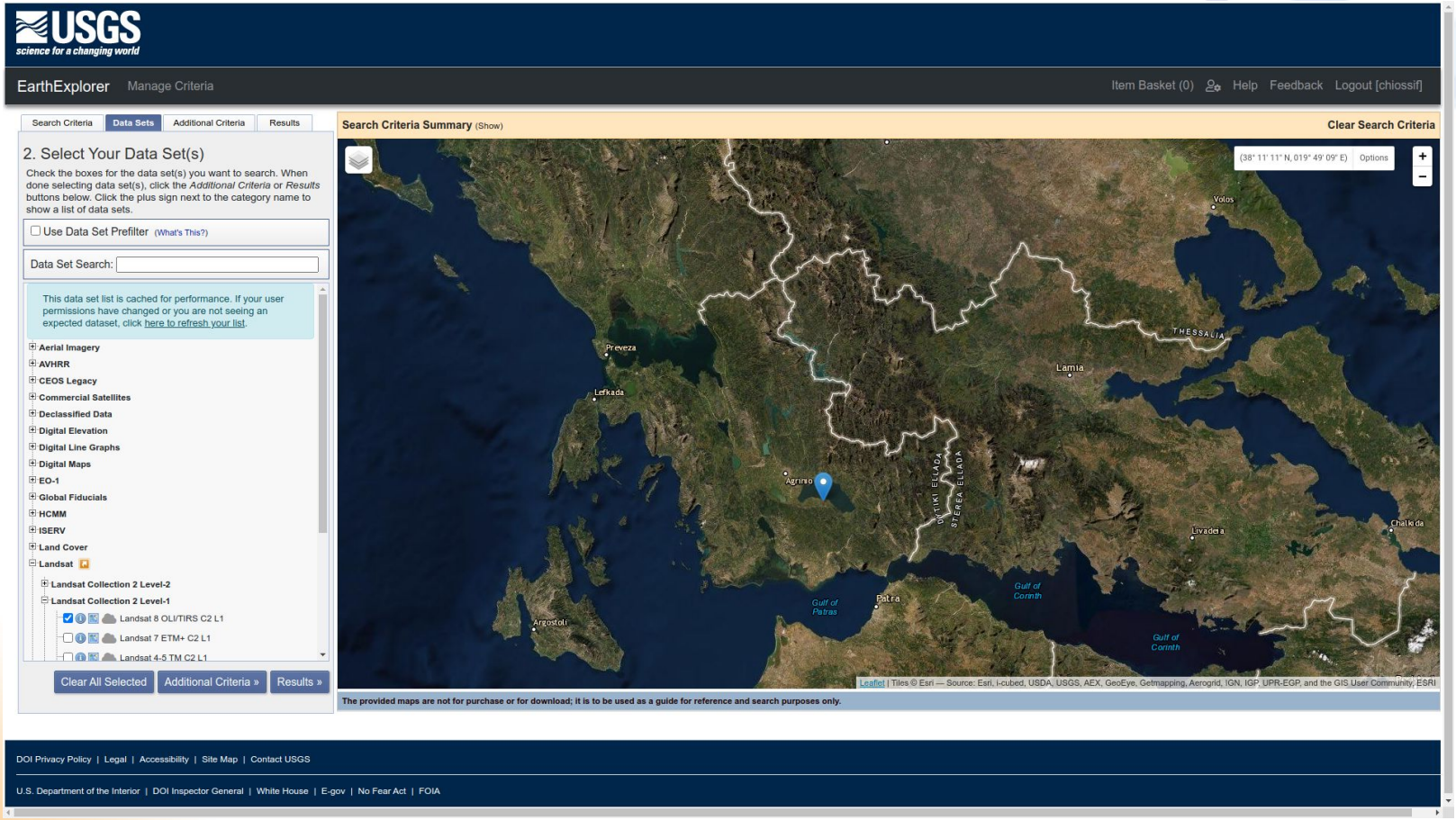
Landsat


USGS
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EarthExplorer
Manage Criteria
Item Basket (0)
Help
Feedback
Logout [chiossif]
Search Criteria
Data Sets
Additional Criteria
Results
2. Select Your Data Set(s)
Check the boxes for the data set(s) you want to search. When done selecting data set(s), click the Additional Criteria or Results buttons below. Click the plus sign next to the category name to show a list of data sets.
Use Data Set Prefilter (What's This?)
Data Set Search:
This data set list is cached for performance. If your user permissions have changed or you are not seeing an expected dataset, click here to refresh your list.
Aerial Imagery
AVHRR
CEOS Legacy
Commercial Satellites
Declassified Data
Digital Elevation
Digital Line Graphs
Digital Maps
EO-1
Global Fiducials
HCMM
ISERV
Land Cover
Landsat
Landsat Collection 2 Level-2
Landsat Collection 2 Level-1
Landsat 8 OLI/TIRS C2 L1
Landsat 7 ETM+ C2 L1
Landsat 4-5 TM C2 L1
Clear All Selected
Additional Criteria »
Results »
Search Criteria Summary (Show)
Clear Search Criteria
(38° 11' 11" N, 019° 49' 09" E)
Options
Volos
THESSALIA
Preveza
Lamia
Lefkada
Agrinio
DYTIKI ELLADA
STEREA ELLADA
Livadeia
Chalkida
Gulf of Patras
Patra
Gulf of Corinth
Argostoli
Leaflet | Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community, ESRI
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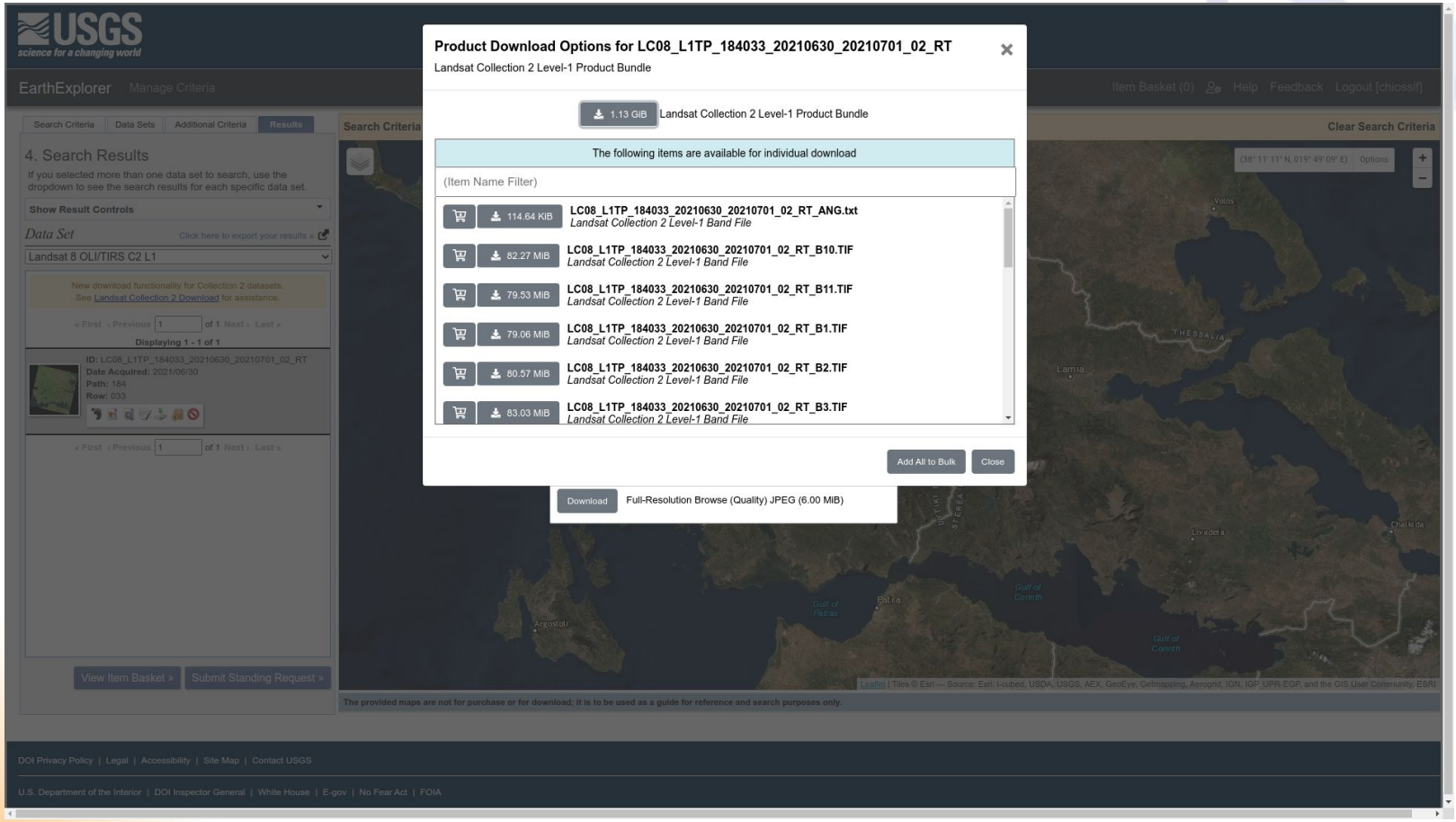
Landsat


USGS
science for a changing world
EarthExplorer
Manage Criteria
Item Basket (0)
Help
Feedback
Logout [chiossif]
Search Criteria
Data Sets
Additional Criteria
Results
4. Search Results
If you selected more than one data set to search, use the dropdown to see the search results for each specific data set.
Show Result Controls
Data Set
Click here to export your results
Landsat 8 OLI/TIRS C2 L1
New download functionality for Collection 2 datasets.
See Landsat Collection 2 Download for assistance.
Displaying 1 - 1 of 1
ID: LC08_L1TP_184033_20210630_20210701_02_RT
Date Acquired: 2021/06/30
Path: 184
Row: 033
View Item Basket »
Submit Standing Request »
Clear Search Criteria
Product Download Options for LC08_L1TP_184033_20210630_20210701_02_RT
Landsat Collection 2 Level-1 Product Bundle
1.13 GiB
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The following items are available for individual download
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114.64 KiB
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Landsat Collection 2 Level-1 Band File
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Landsat Collection 2 Level-1 Band File
79.53 MiB
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83.03 MiB
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Landsat Collection 2 Level-1 Band File
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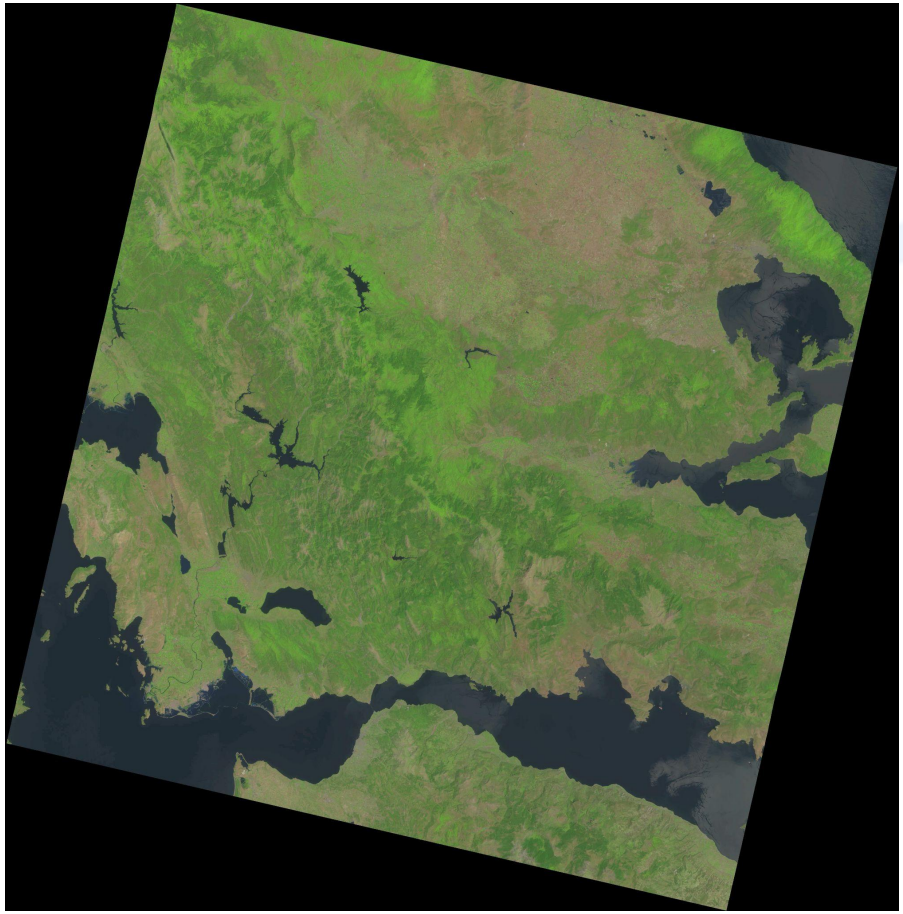
Landsat OLI

30/06/21 09:10:48.4970080 UTC , Natural Colour



Landsat TIRS

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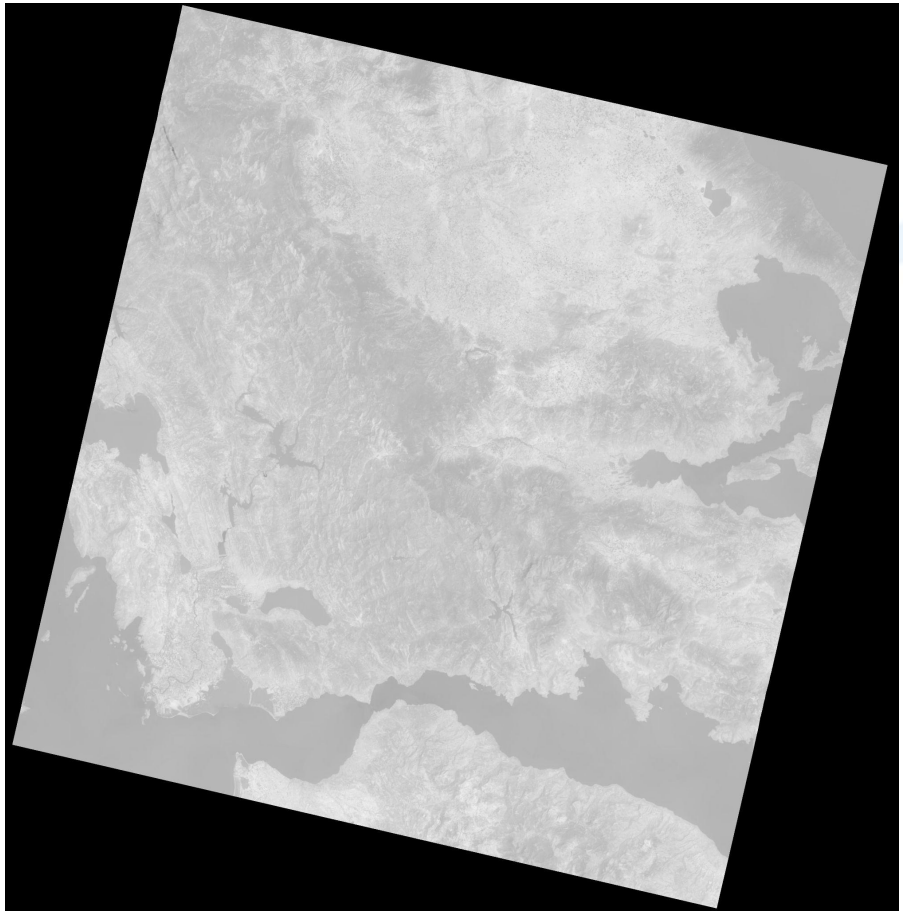
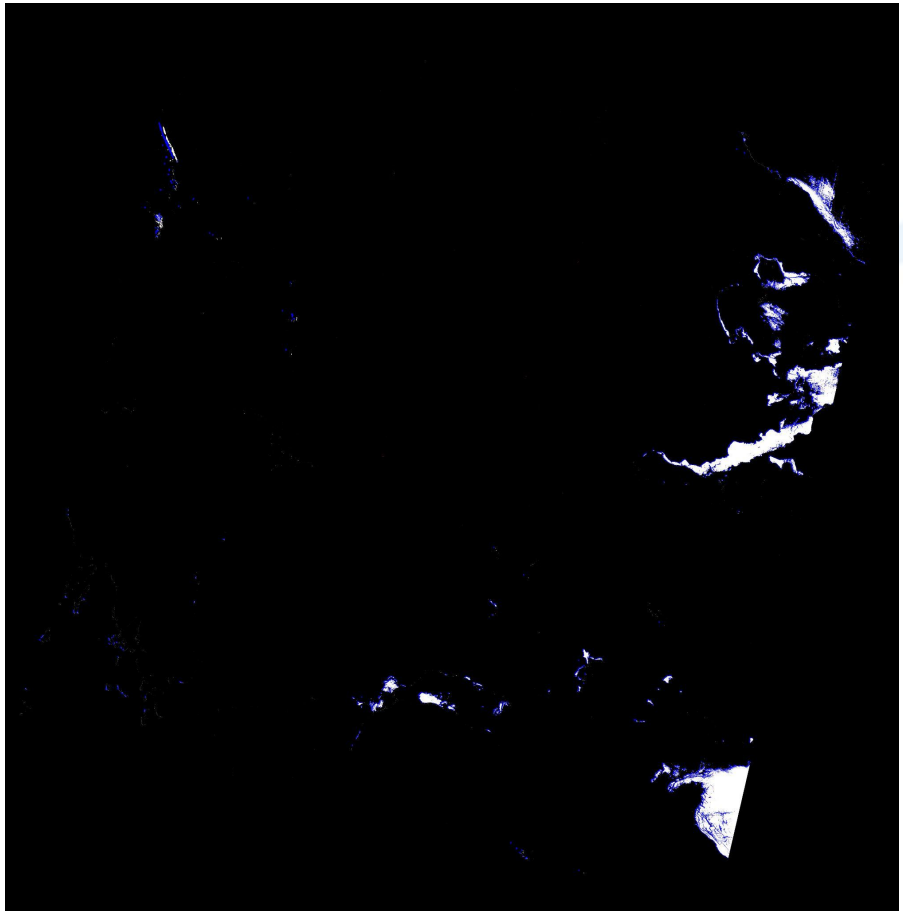


Landsat

30/06/21 09:10:48.4970080 UTC , Quality band



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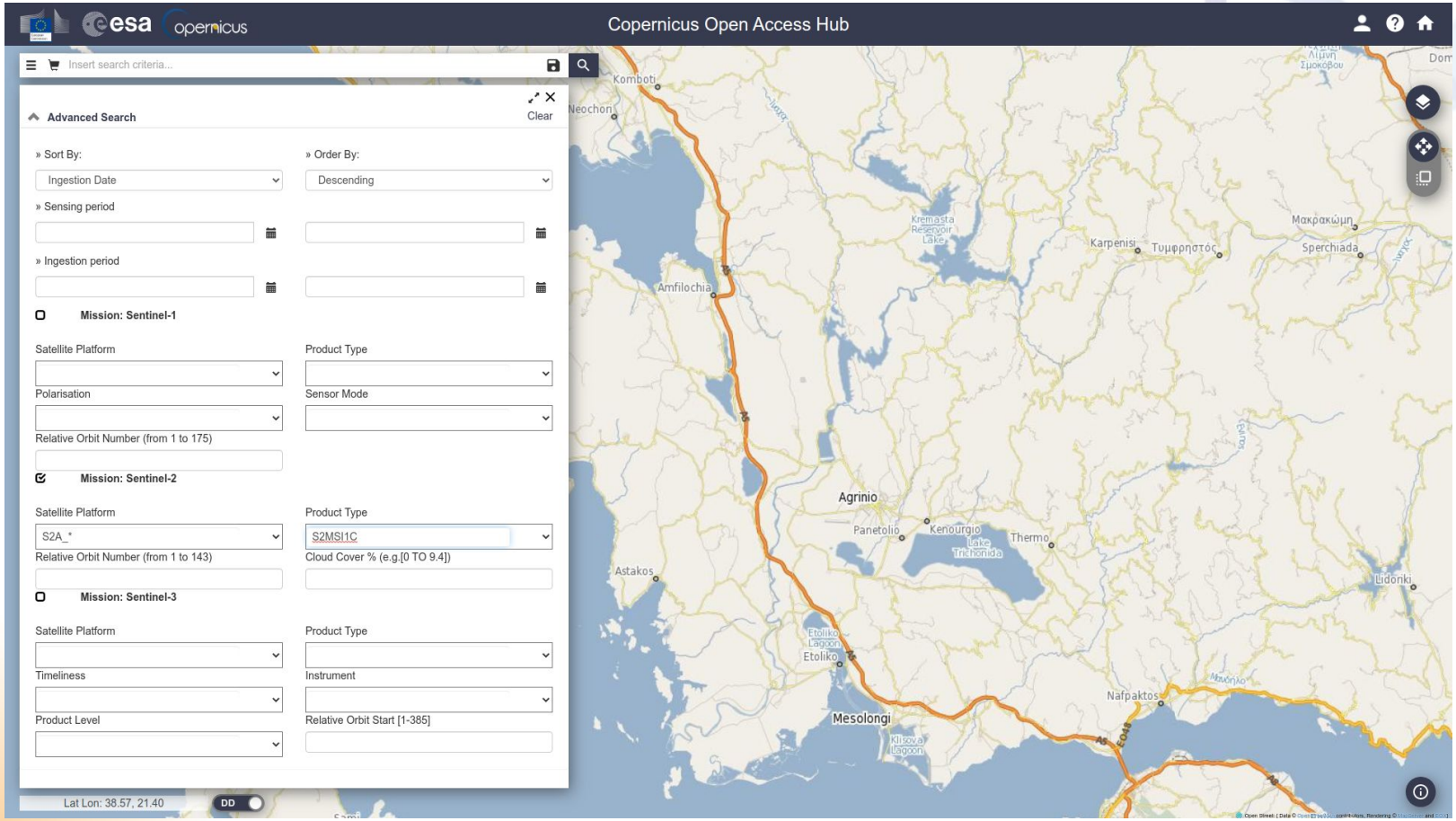
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» Order By:
Descending
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Product Type
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Relative Orbit Number (from 1 to 175)
Mission: Sentinel-2
Satellite Platform
S2A_*
Product Type
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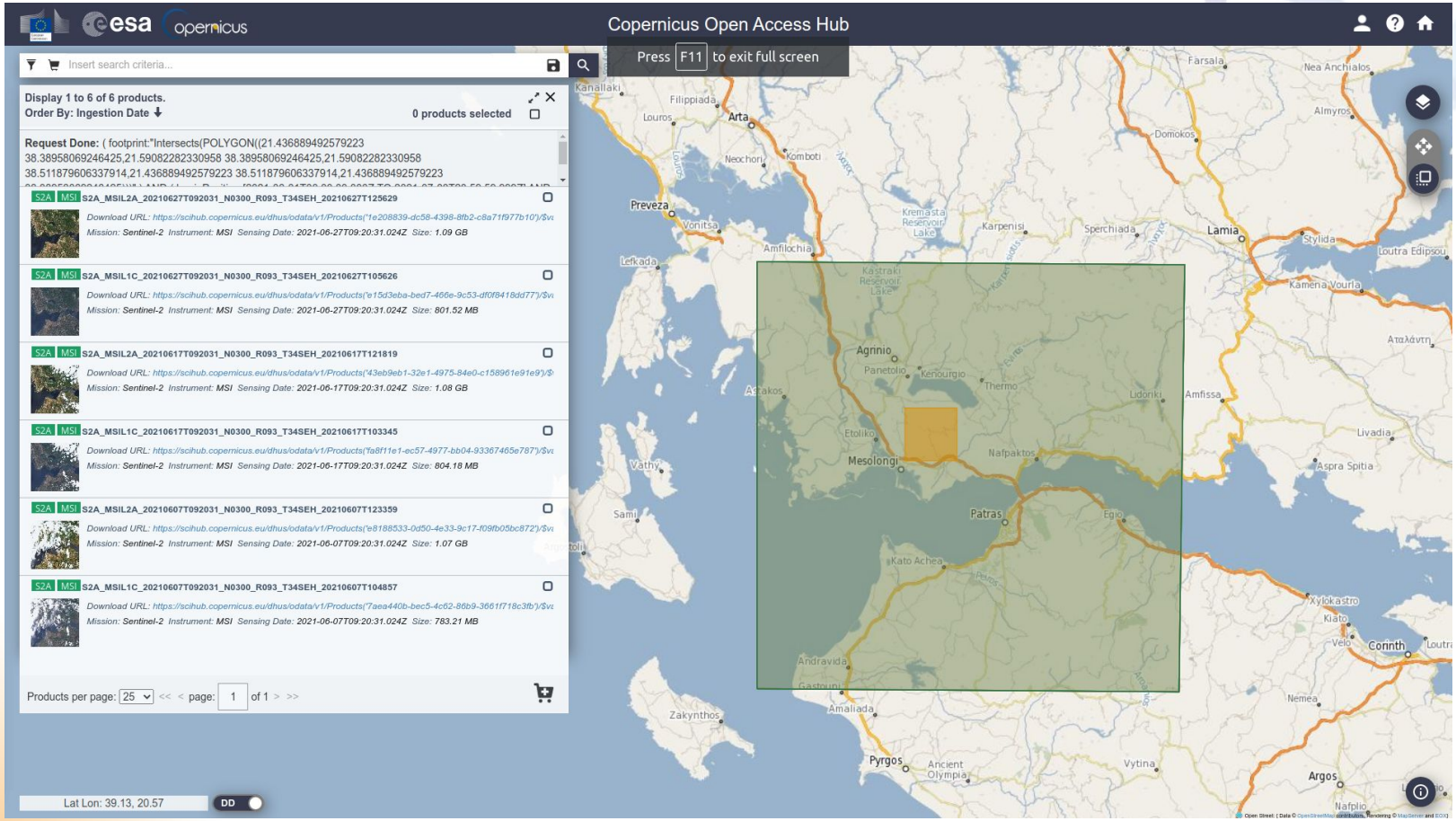
Relative Orbit Number (from 1 to 143)
Cloud Cover % (e.g.[0 TO 9.4])
Mission: Sentinel-3
Satellite Platform
Product Type
Timeliness
Instrument
Product Level
Relative Orbit Start [1-385]
Lat Lon: 38.57, 21.40
DD
Komboti
Neochori
Amfilochia
Agrinio
Panetolio
Kenourgio
Thermo
Astakos
Etoliko
Mesolongi
Nafpaktos
Karpenisi
Sperchiada
Lidoriki

Sentinel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Insert search criteria...
Display 1 to 6 of 6 products.
Order By: Ingestion Date
0 products selected
Request Done: (footprint:"Intersects(POLYGON((21.436889492579223 38.38958069246425,21.59082282330958 38.38958069246425,21.59082282330958 38.5118796063379 14,21.436889492579223 38.5118796063379 14,21.436889492579223
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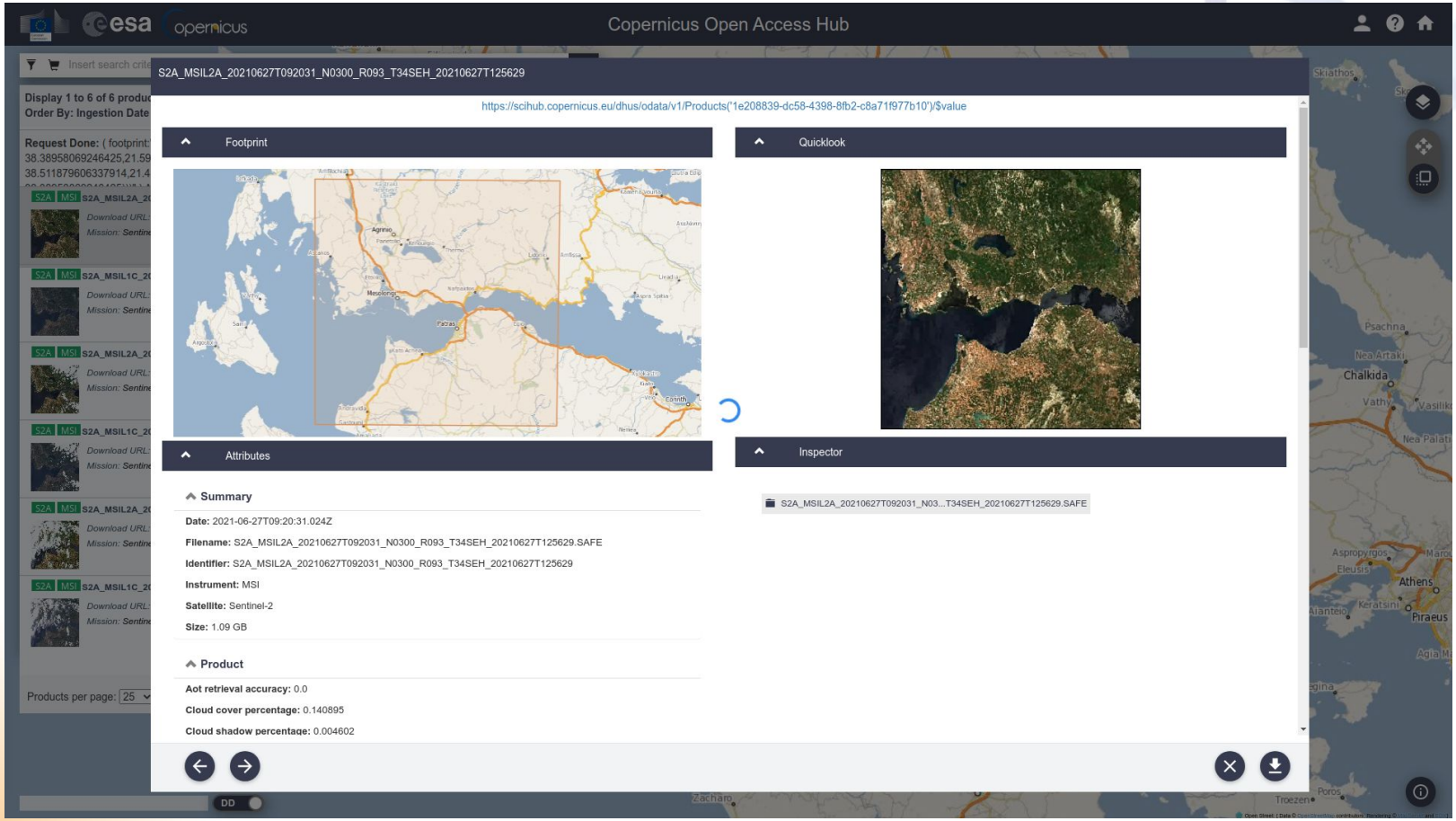
S2A_MSIL1C_20210607T092031_N0300_R093_T34SEH_20210607T104857
Products per page: 25 page: 1 of 1
Lat Lon: 39.13, 20.57
DD
Preveza
Arta
Lefkada
Agrinio
Mesolongi
Patras
Amfissa
Lamia
Corinth
Argos
Pyrgos
Zakynthos

Sentinel

27/06/21 09:20:31.024 UTC , Natural Colour



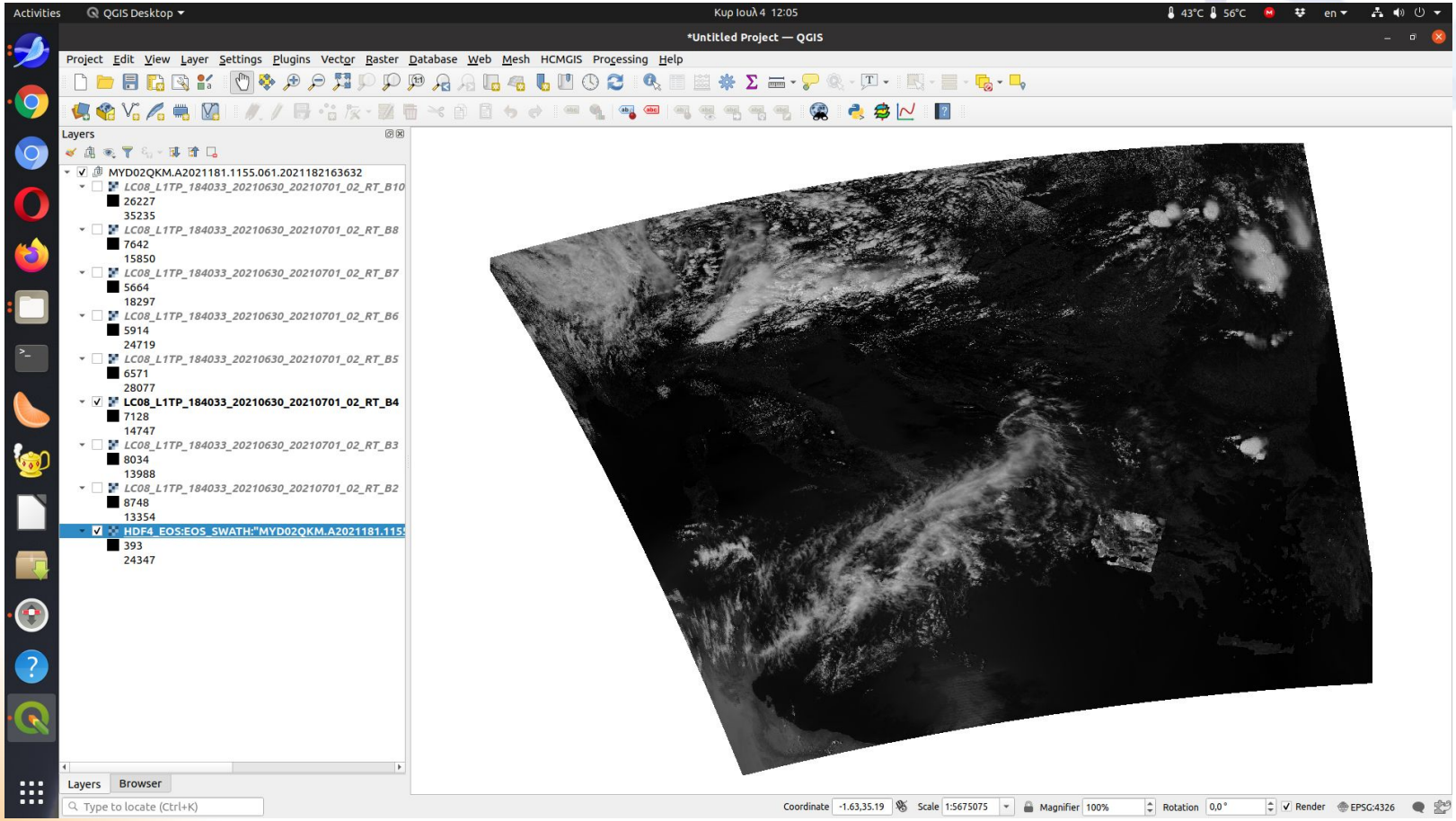
Πρακτική άσκηση

- Πλοηγηθείτε σε ένα από τα αποθετήρια τηλεπισκοπικών δεδομένων
- Επιλέξτε δέκτη και μελετήστε τα τεχνικά χαρακτηριστικά του
- Επιλέξτε χρονικό διάστημα και περιοχή ενδιαφέροντος
- Μεταφορτώστε τοπικά τα τηλεπισκοπικά δεδομένα της επιλογής σας
- Δείτε τα τηλεπισκοπικά δεδομένα με το QGIS ή άλλο σχετικό λογισμικό της επιλογής σας

Εφαρμογή σε QGIS

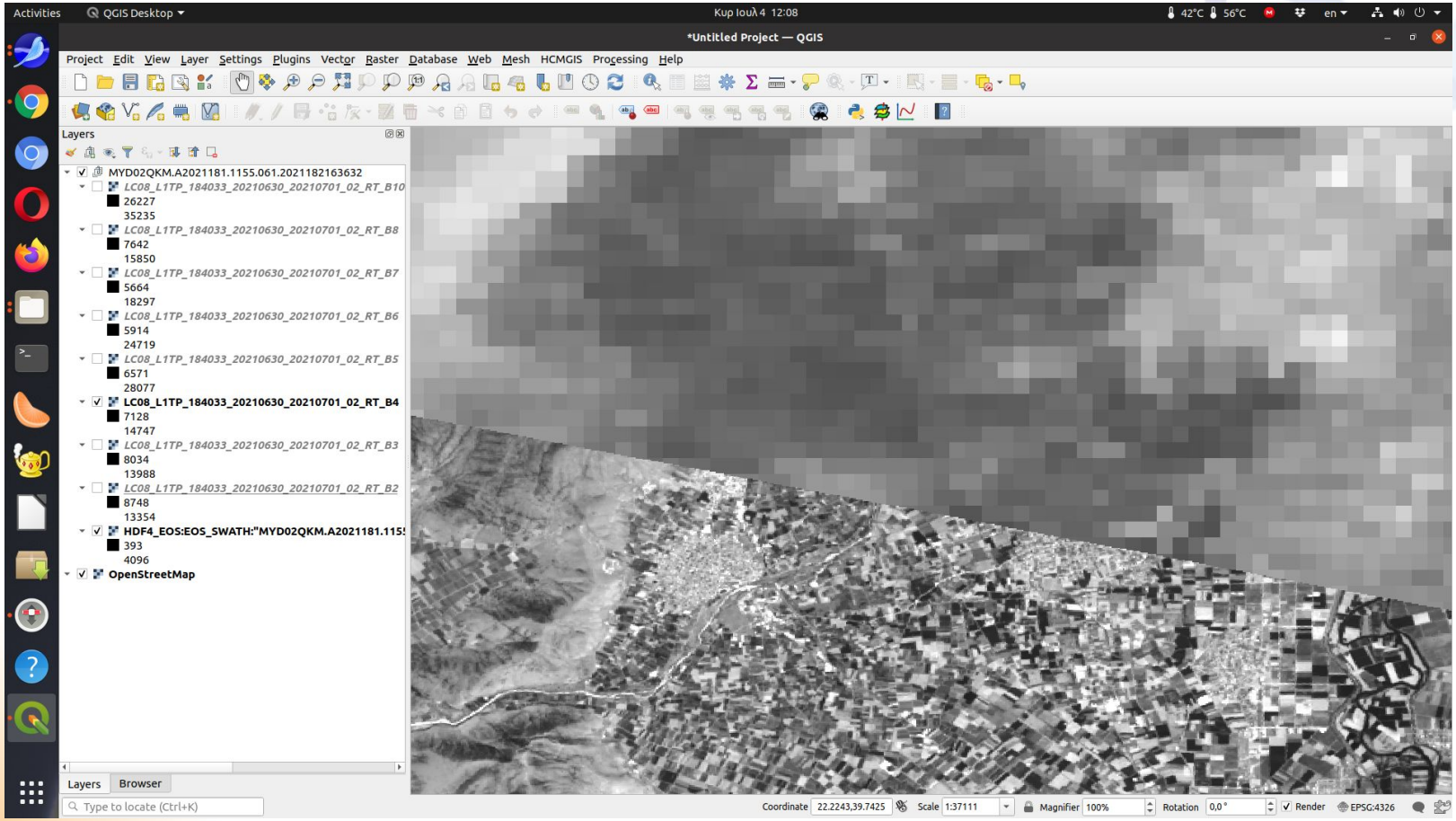
MODIS and Landsat OLI

2021181 (30/6/2021) and 30/06/21, Green band



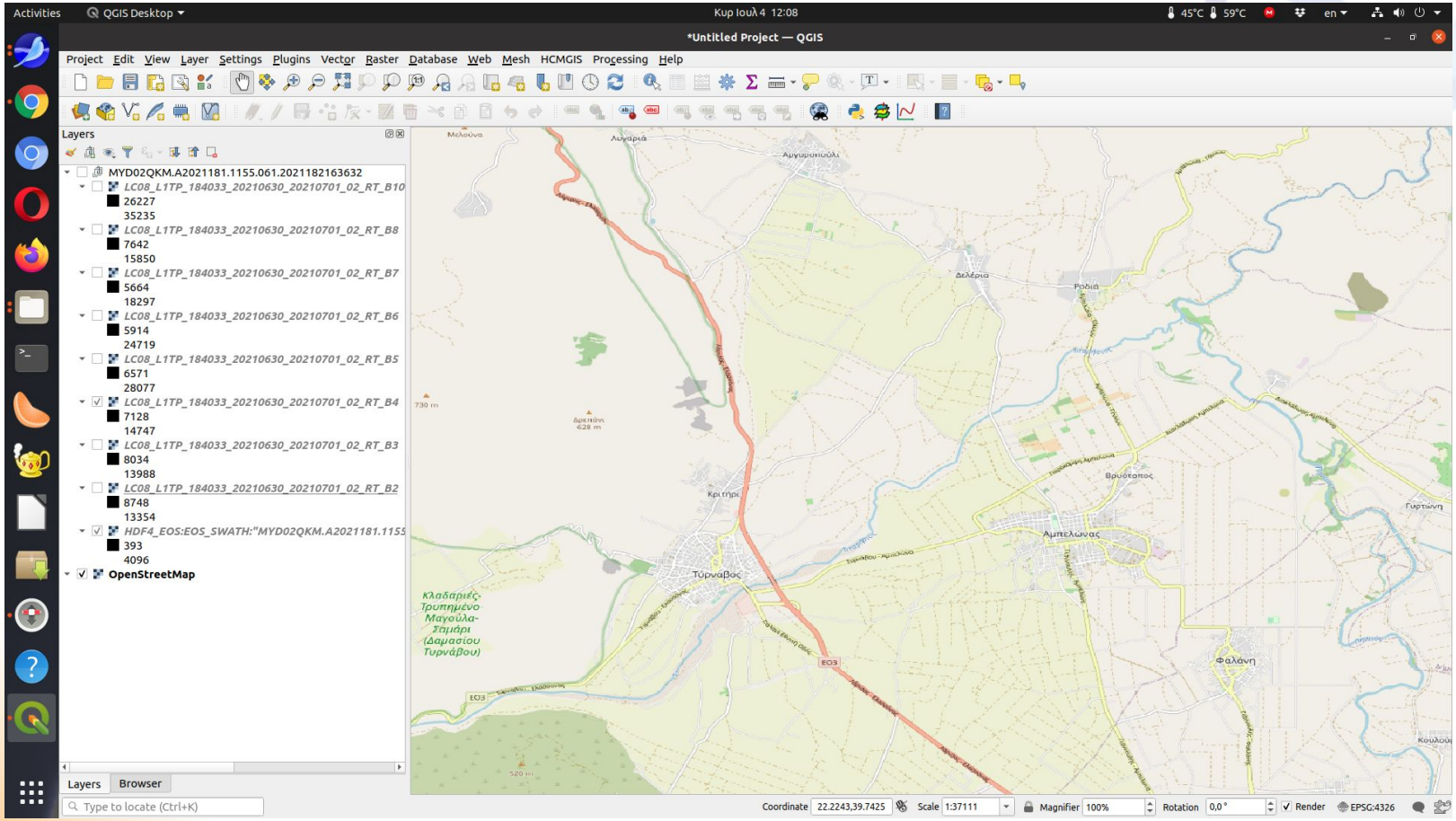
MODIS and Landsat OLI

2021181 (30/6/2021) and 30/06/21, Green band



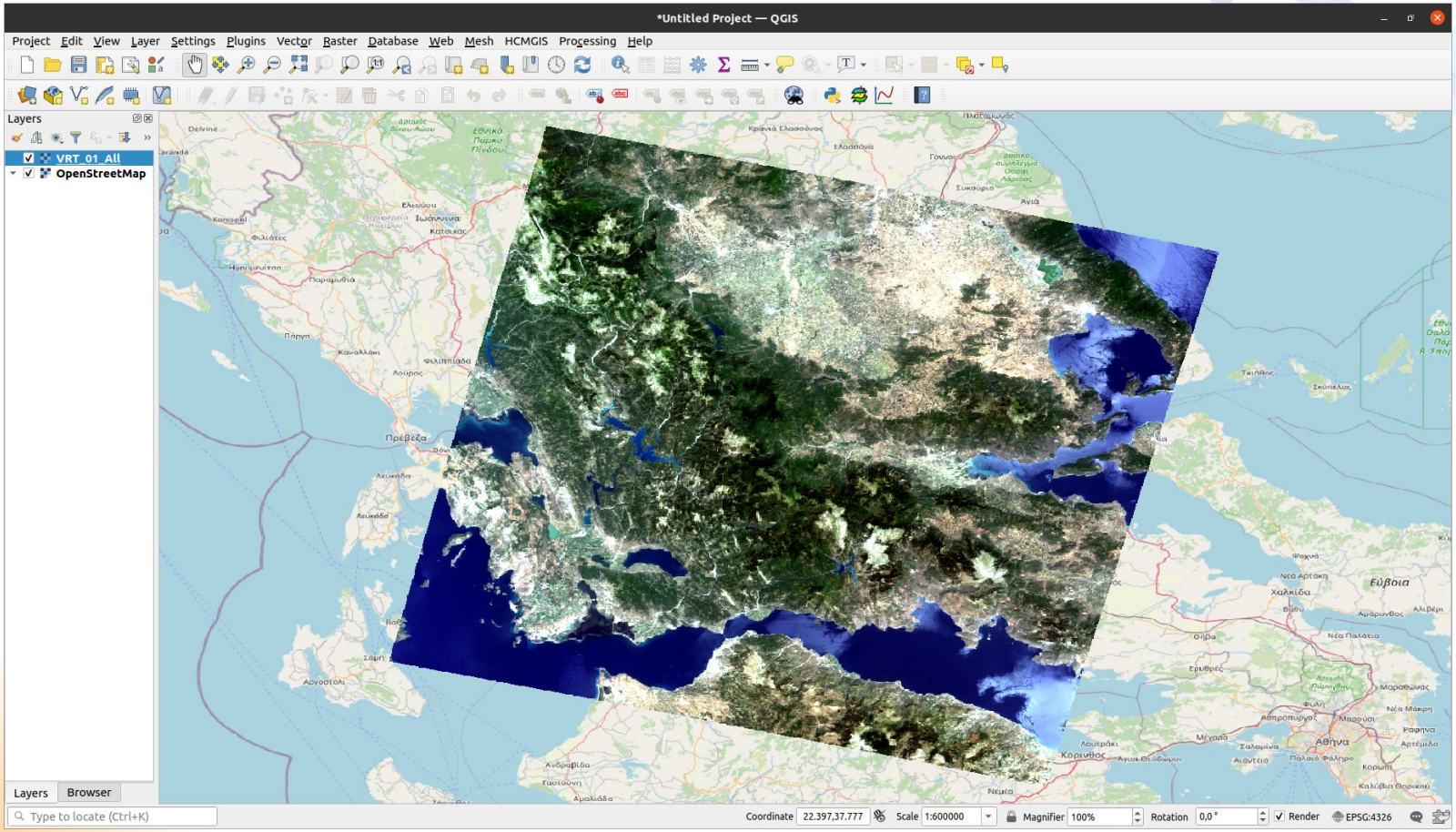
MODIS and Landsat OLI

2021181 (30/6/2021) and 30/06/21, (OpenStreetMap)



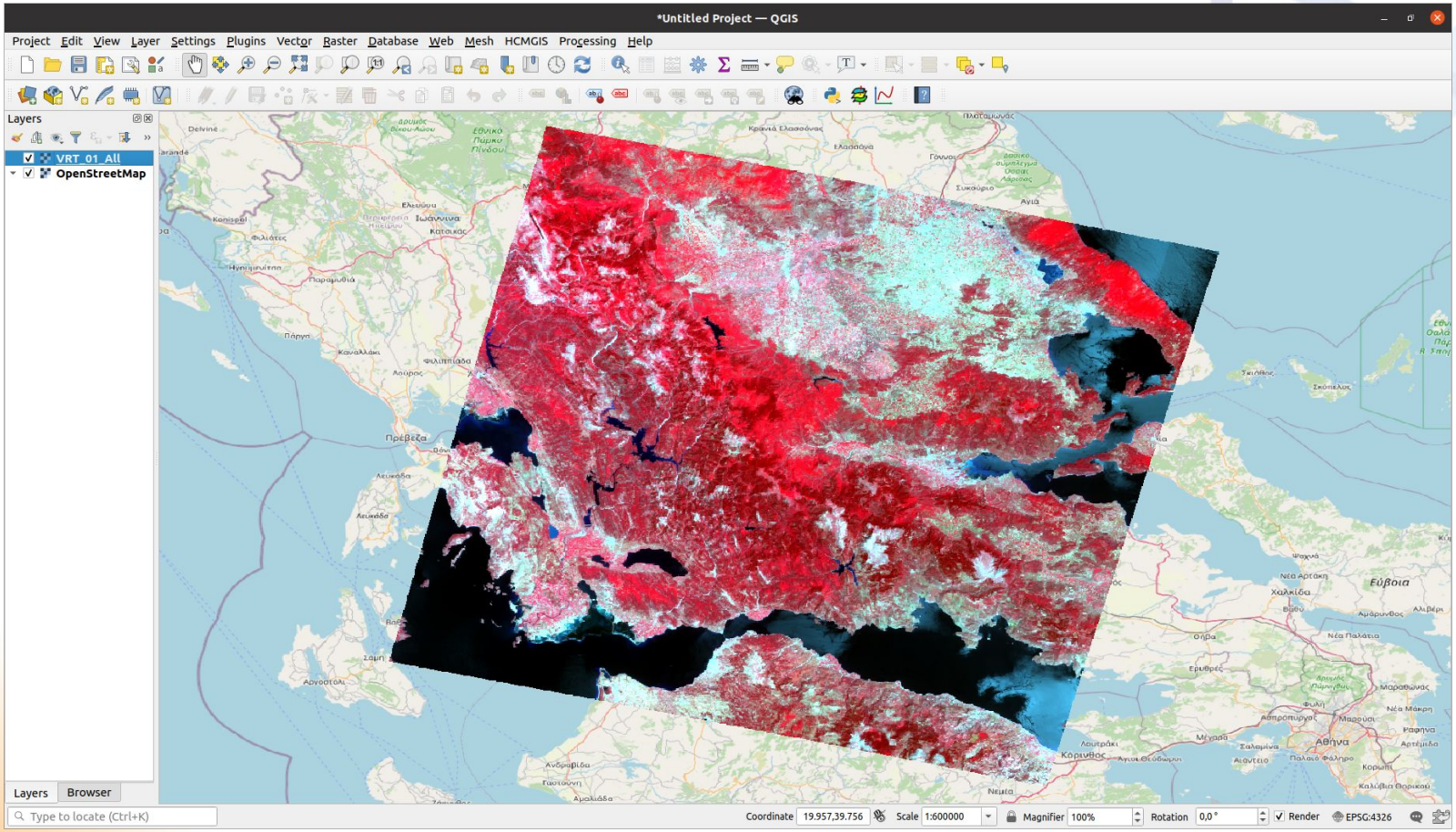
Landsat OLI

30/06/21, Natural Color (432RGB)



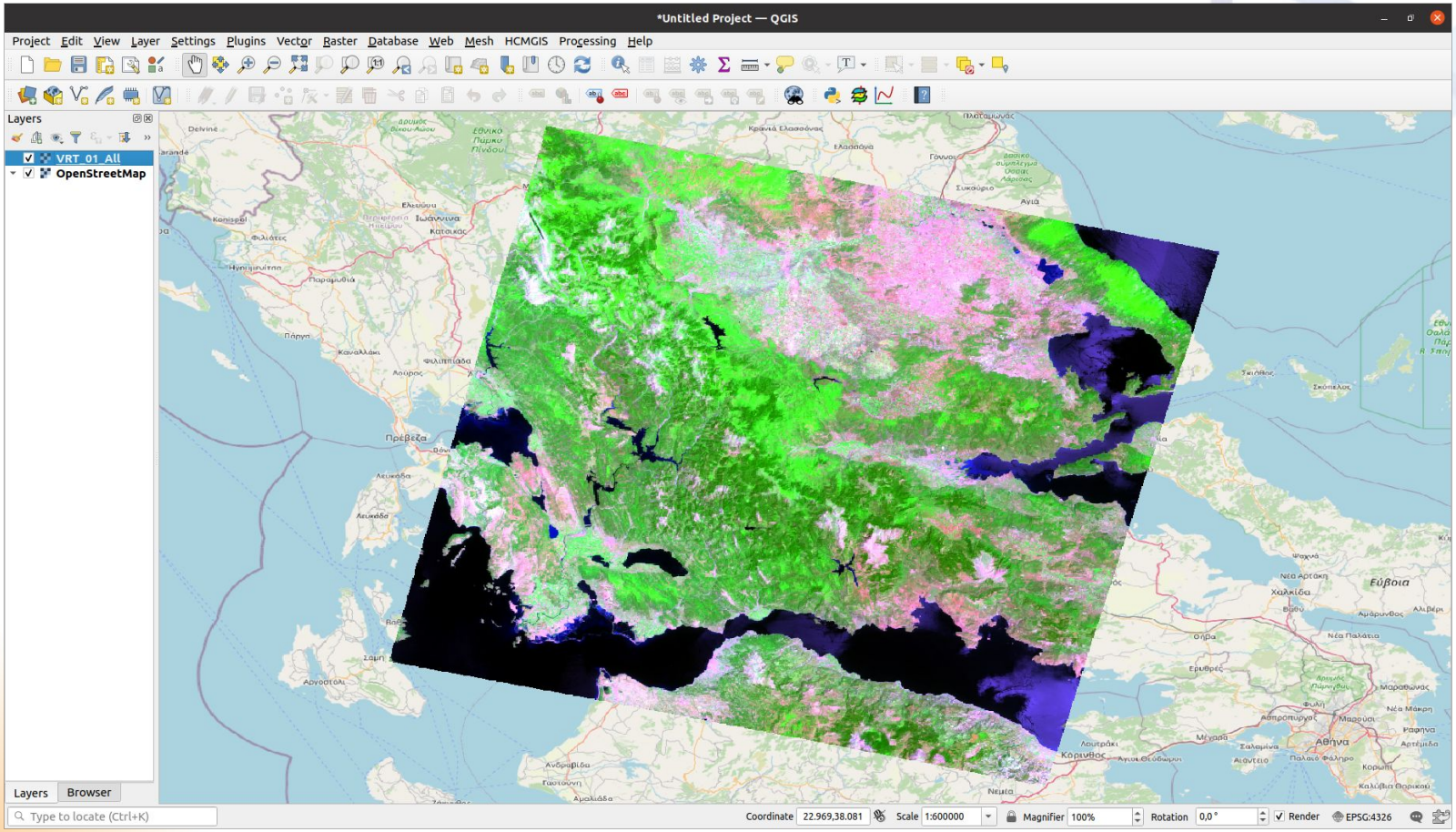
Landsat OLI

30/06/21, False Color (543RGB)



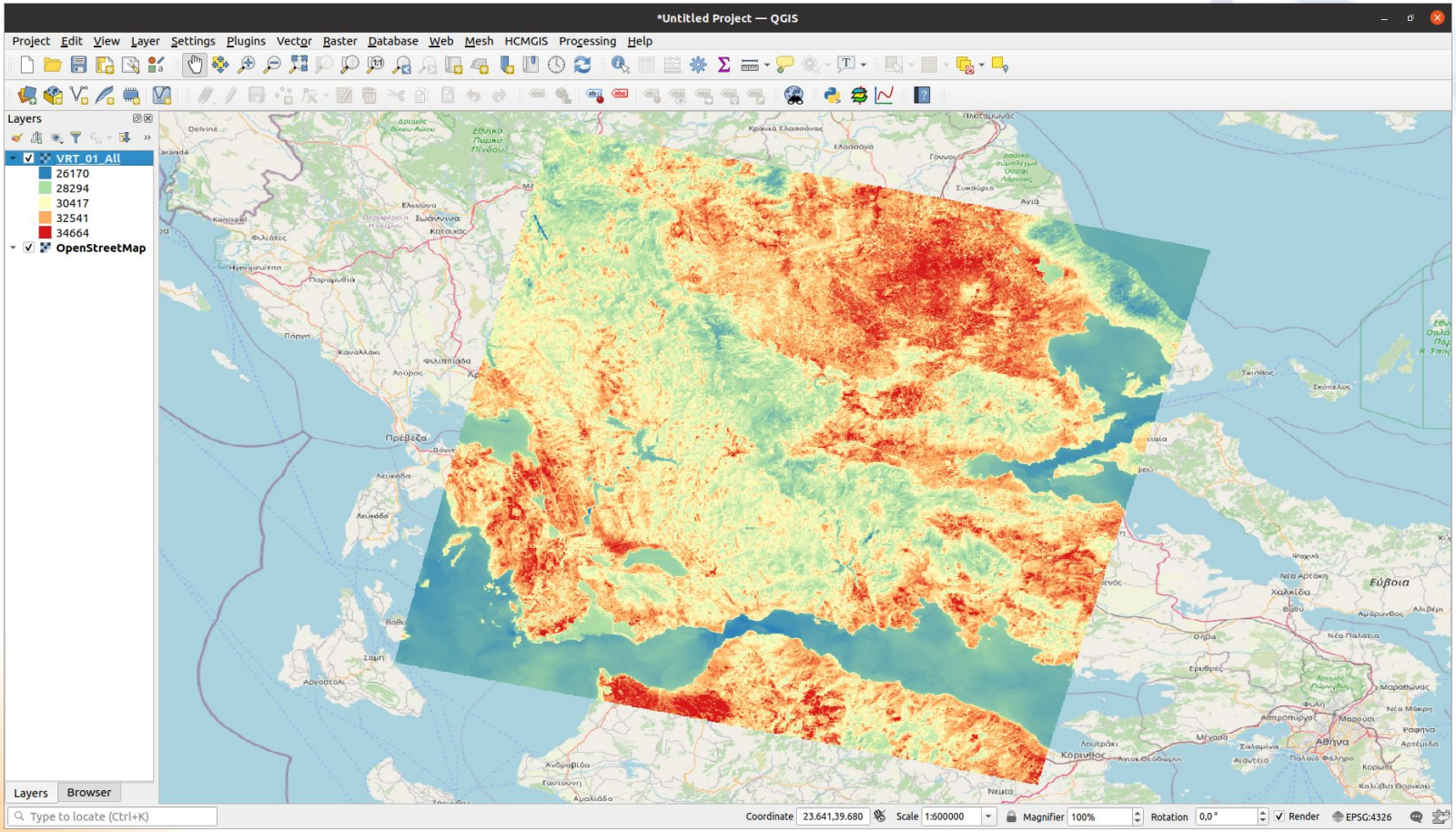
Landsat OLI

30/06/21, False Color (743RGB)

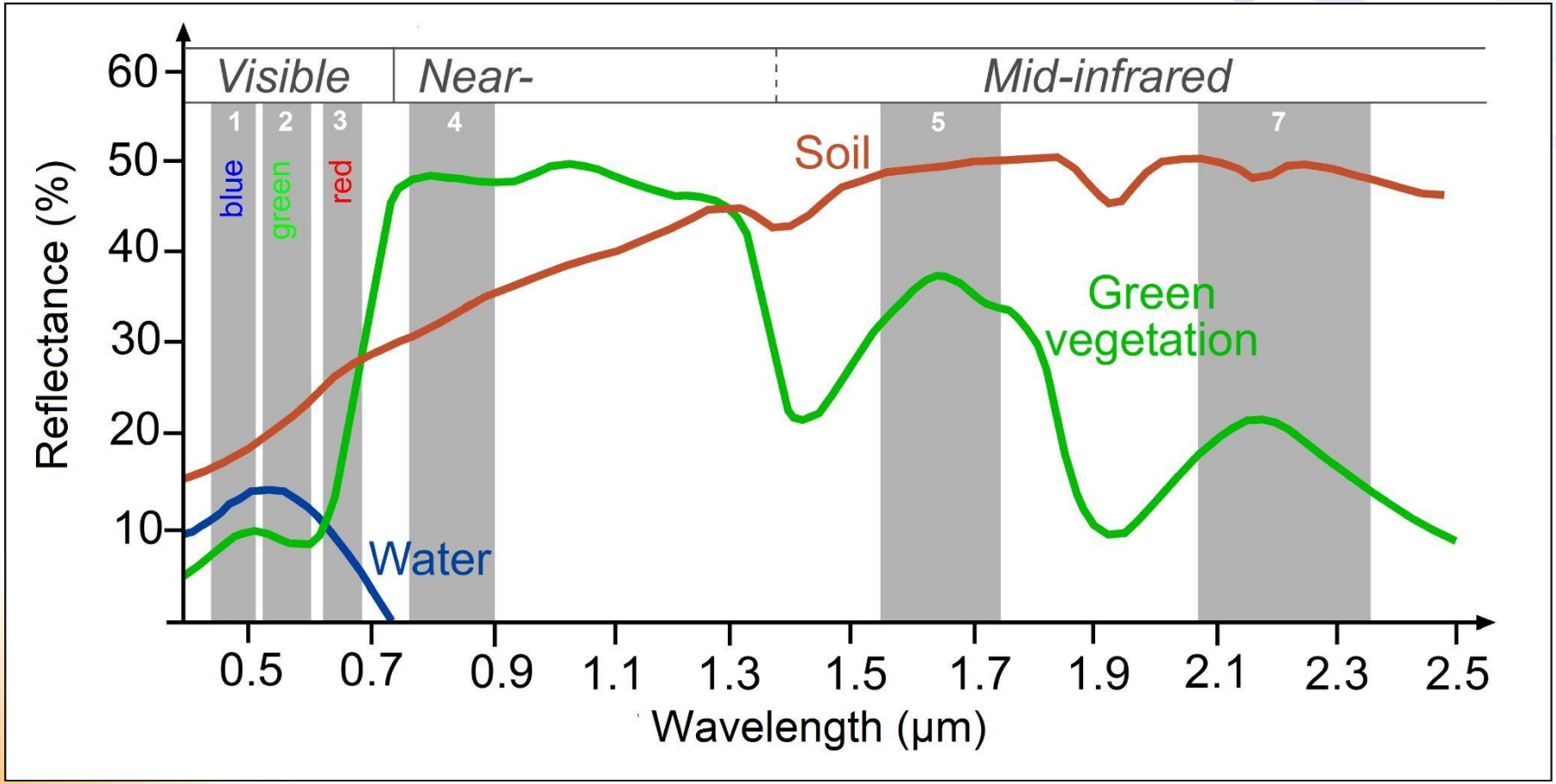


Landsat OLI

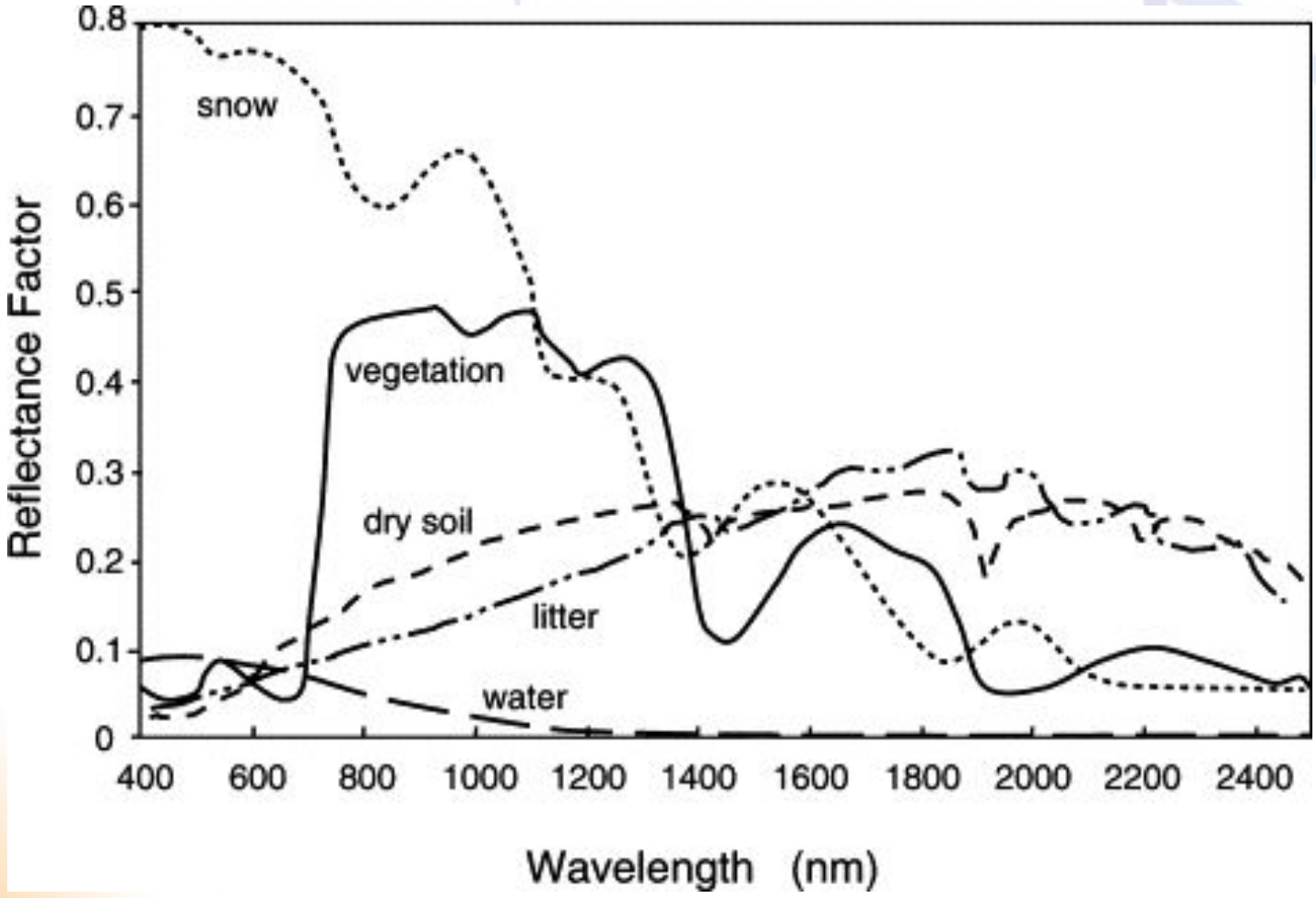
30/06/21, Thermal Band 10 pseudocolor



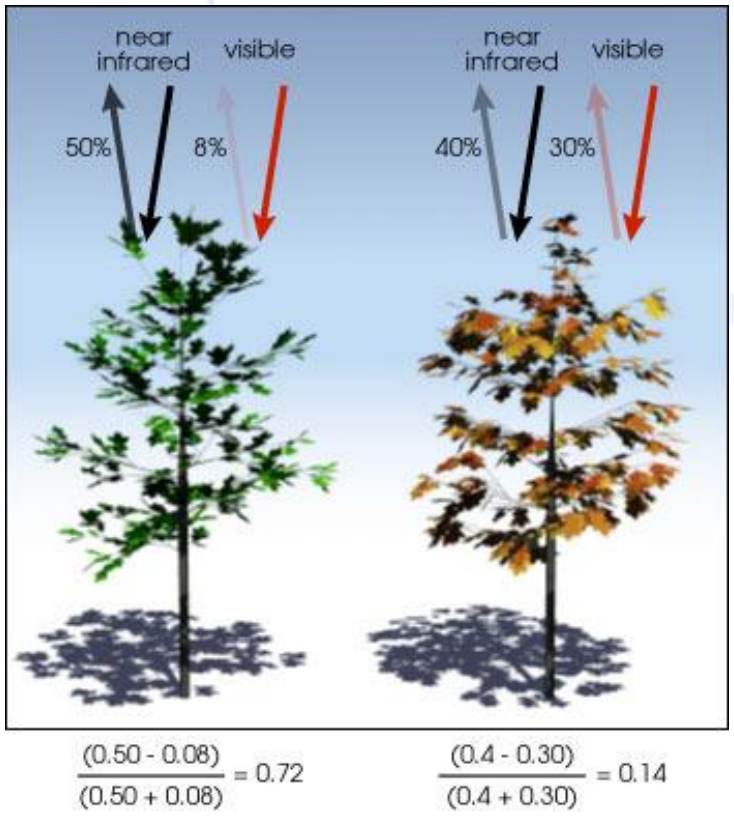
Reflectance of water, soil and vegetation (Landsat TM)



Reflectance of water, litter, dry soil, vegetation and snow

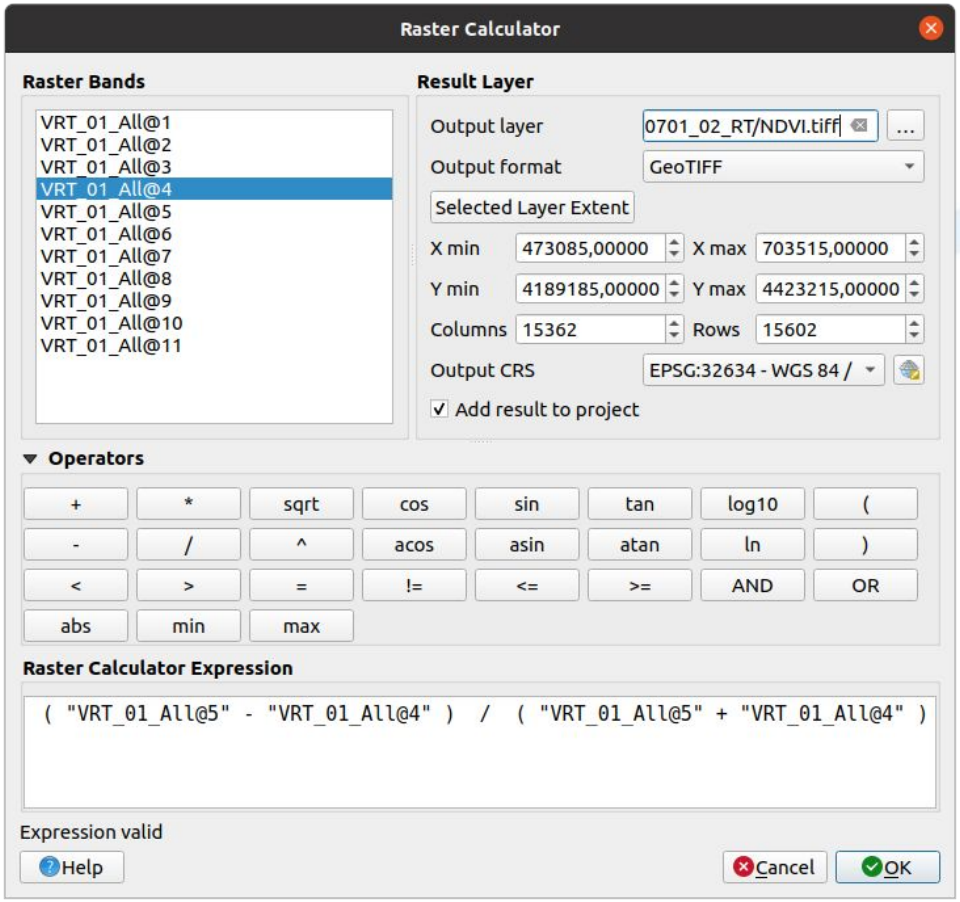


NDVI
Normalized Difference Vegetation Index



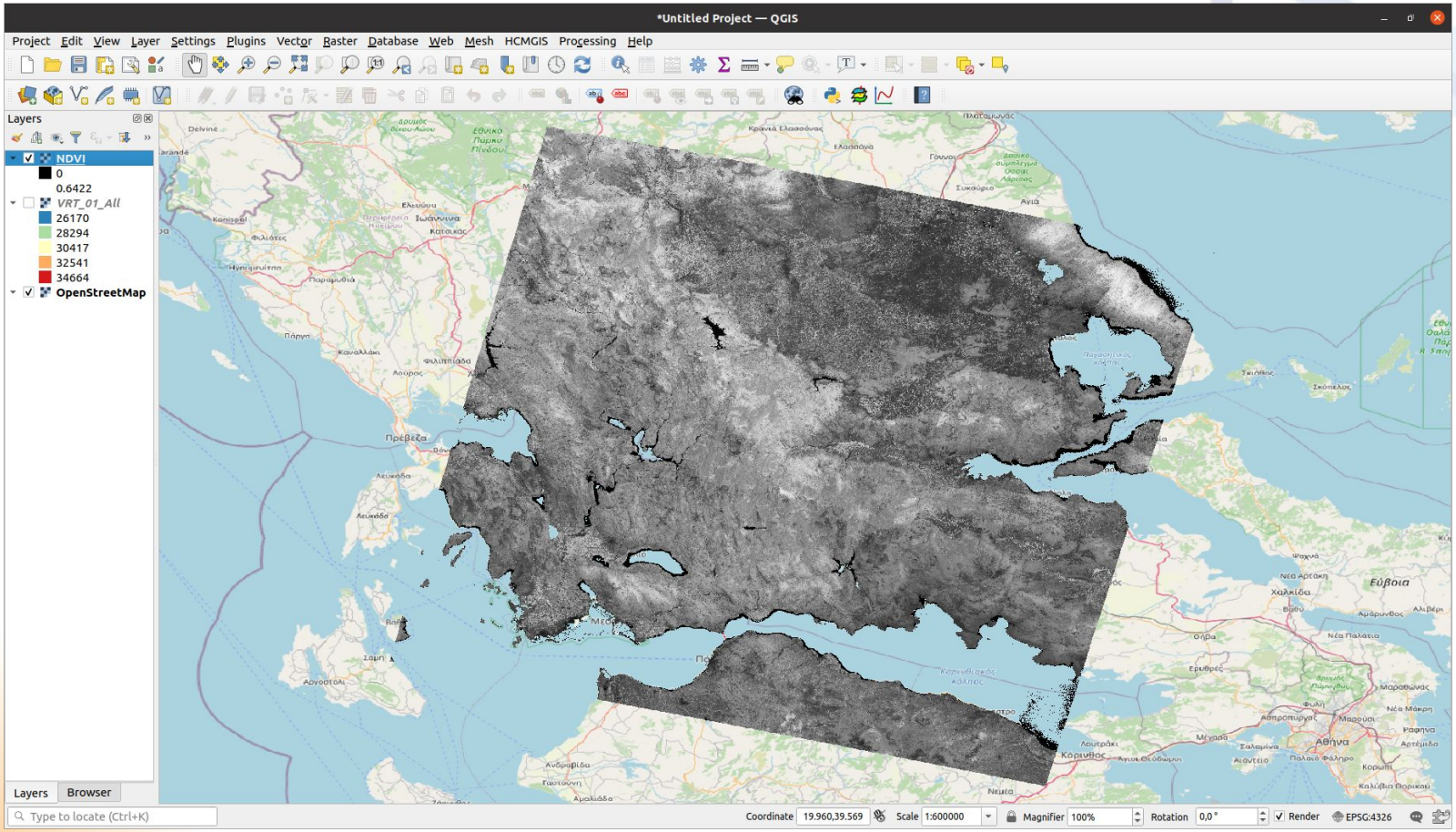
NDVI = (NIR - Red) / (NIR + Red)

Landsat OLI
30/06/21, NDVI formula



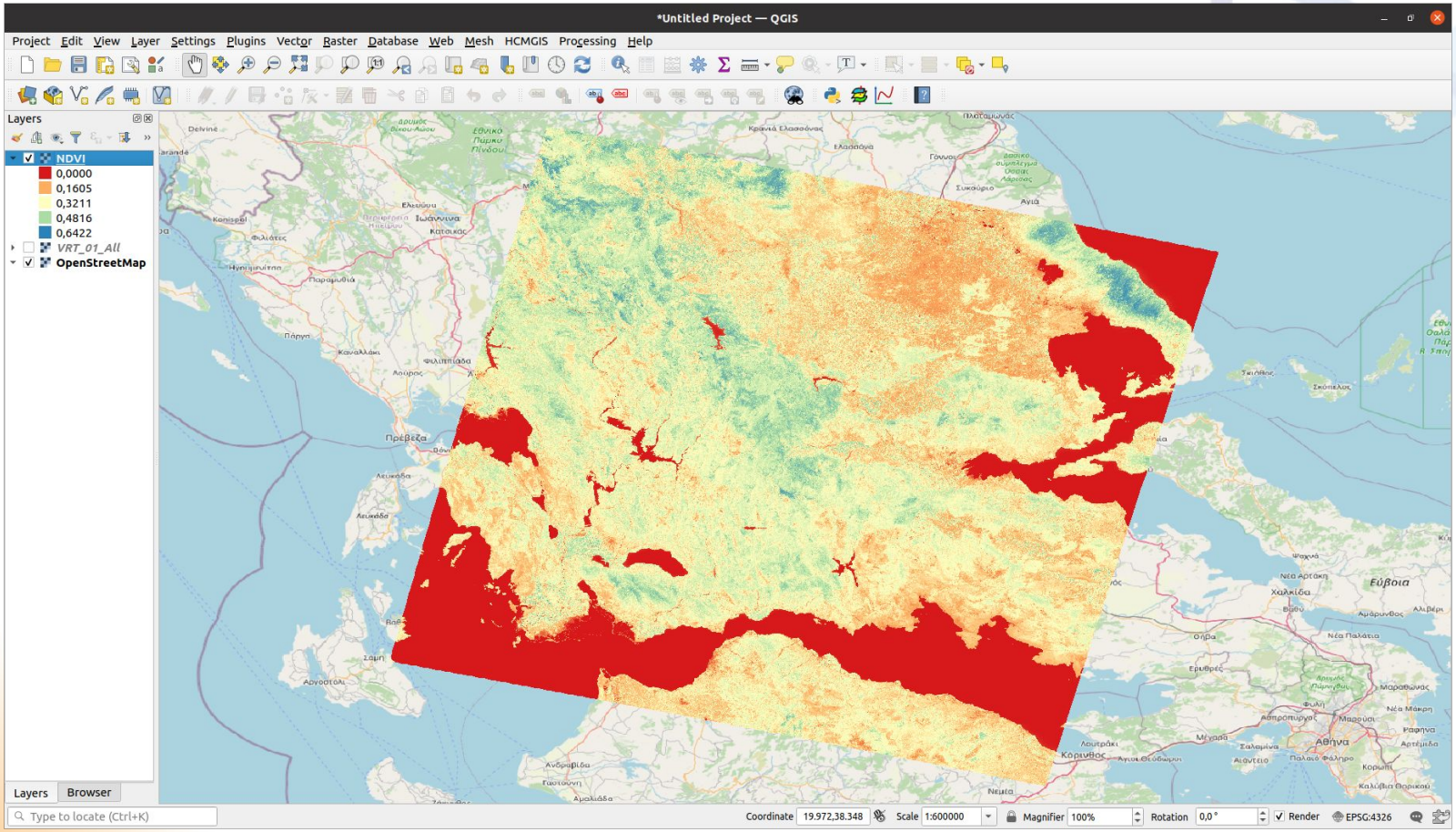
Landsat OLI

30/06/21, NDVI greyscale



Landsat OLI

30/06/21, NDVI pseudocolor



Πρακτική άσκηση

Στο QGIS ή άλλο σχετικό λογισμικό της επιλογής σας:

- Εμφανίστε τα κανάλια του δέκτη σε τόνους του γκρι και ψευδέγχρωμες παλέττες
- Εμφανίστε έγχρωμα σύνθετα με φυσικό ή όχι χρώμα
- Μελετήστε το διάγραμμα ανακλαστικότητας και εντοπίστε δείκτες ανάδειξης φασματικών κατηγοριών
- Υπολογίστε και εμφανίστε τον δείκτη της επιλογής σας

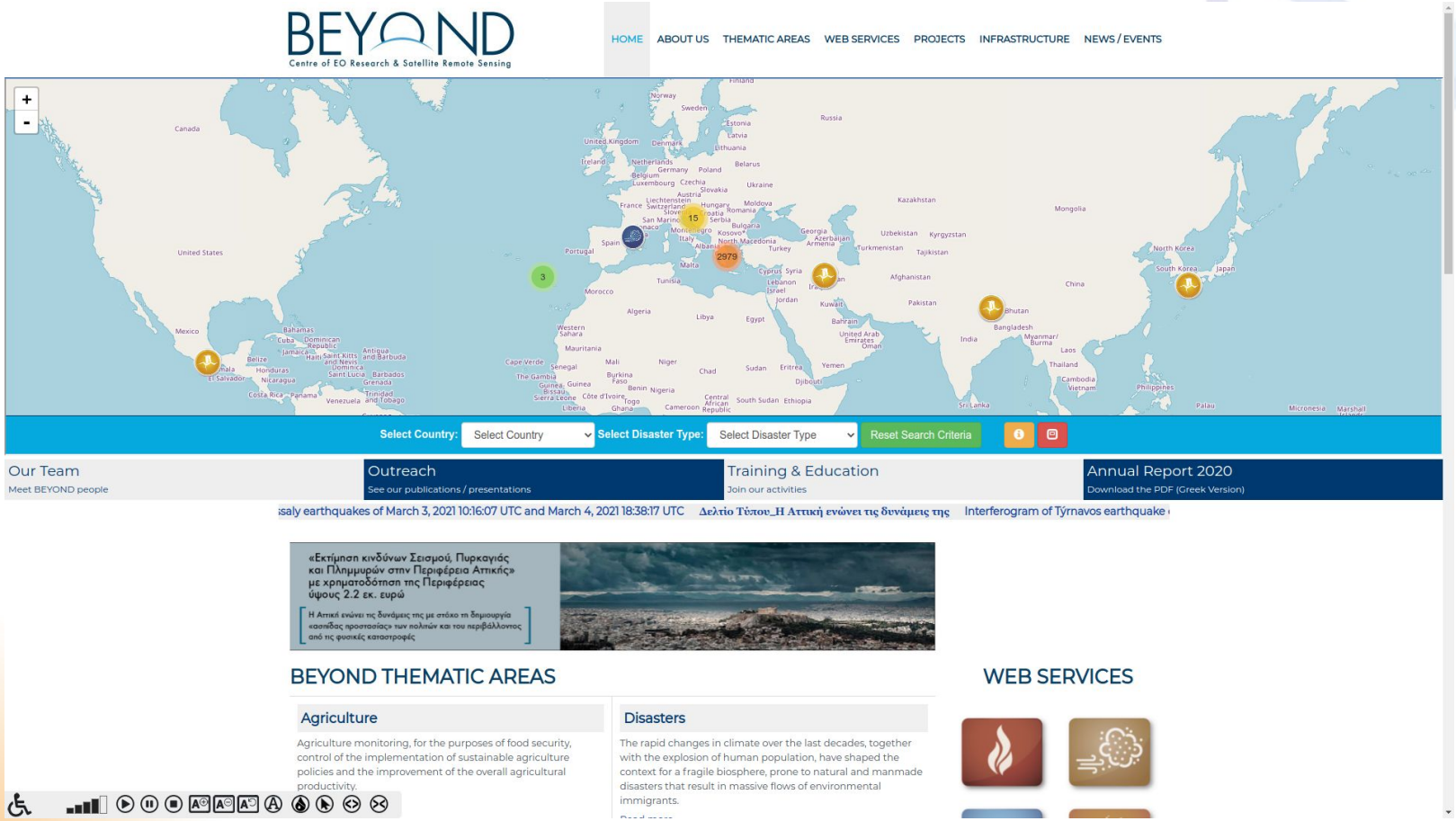
Χρήσιμοι σύνδεσμοι

BEYOND

NOA & GRNET operate the Copernicus International Hub

BEYOND

Centre of EO Research & Satellite Remote Sensing



BEYOND

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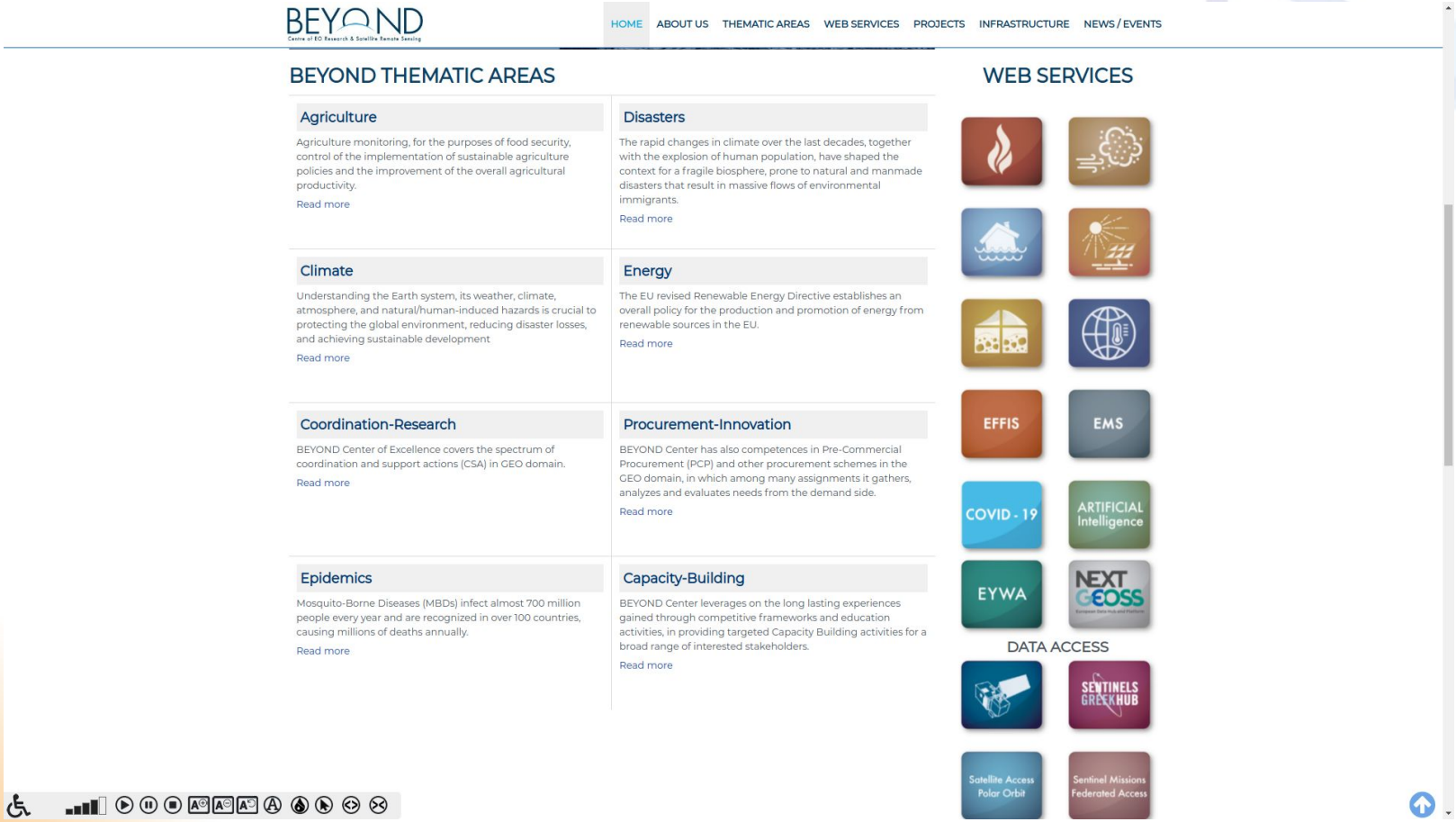

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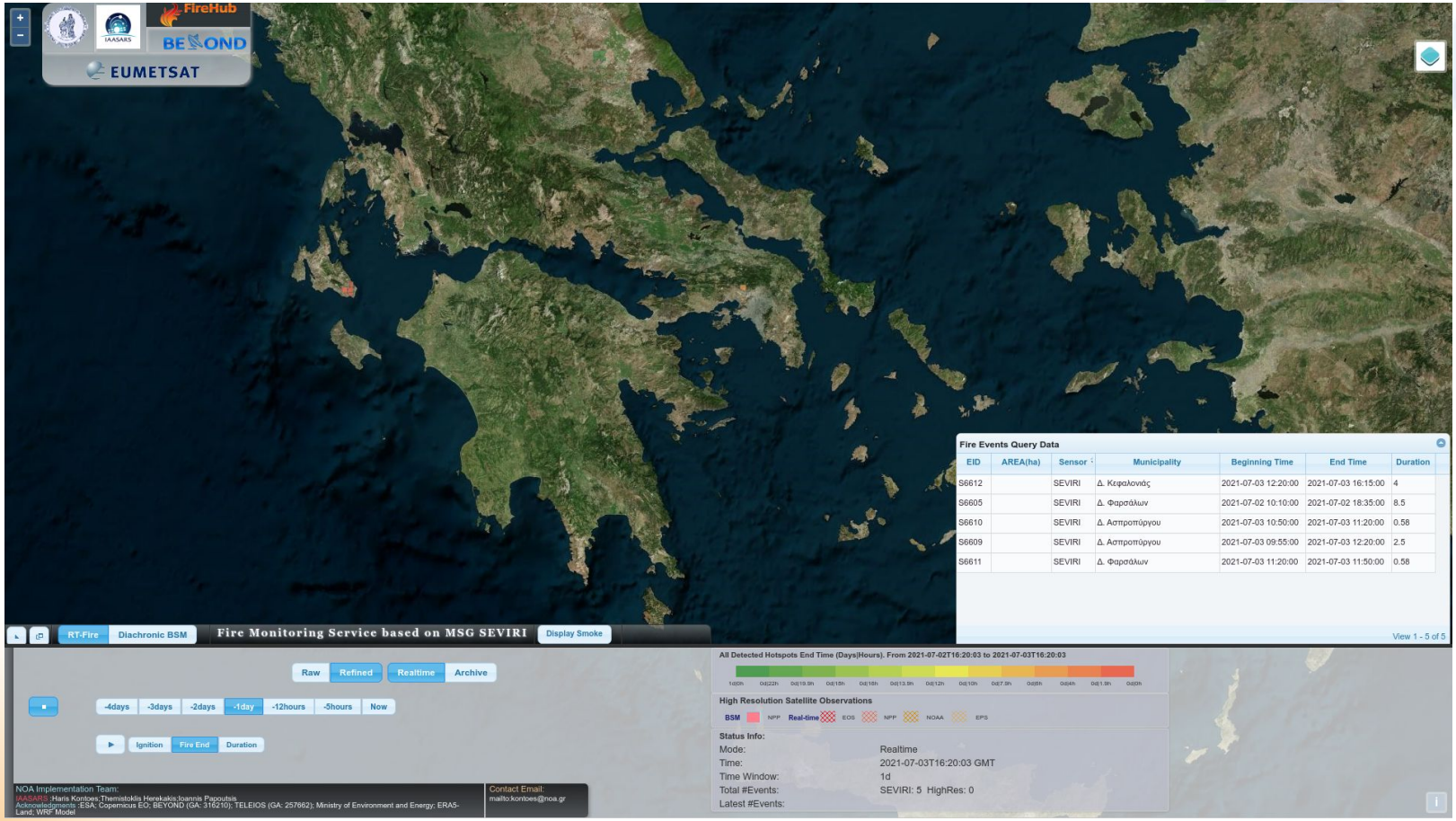
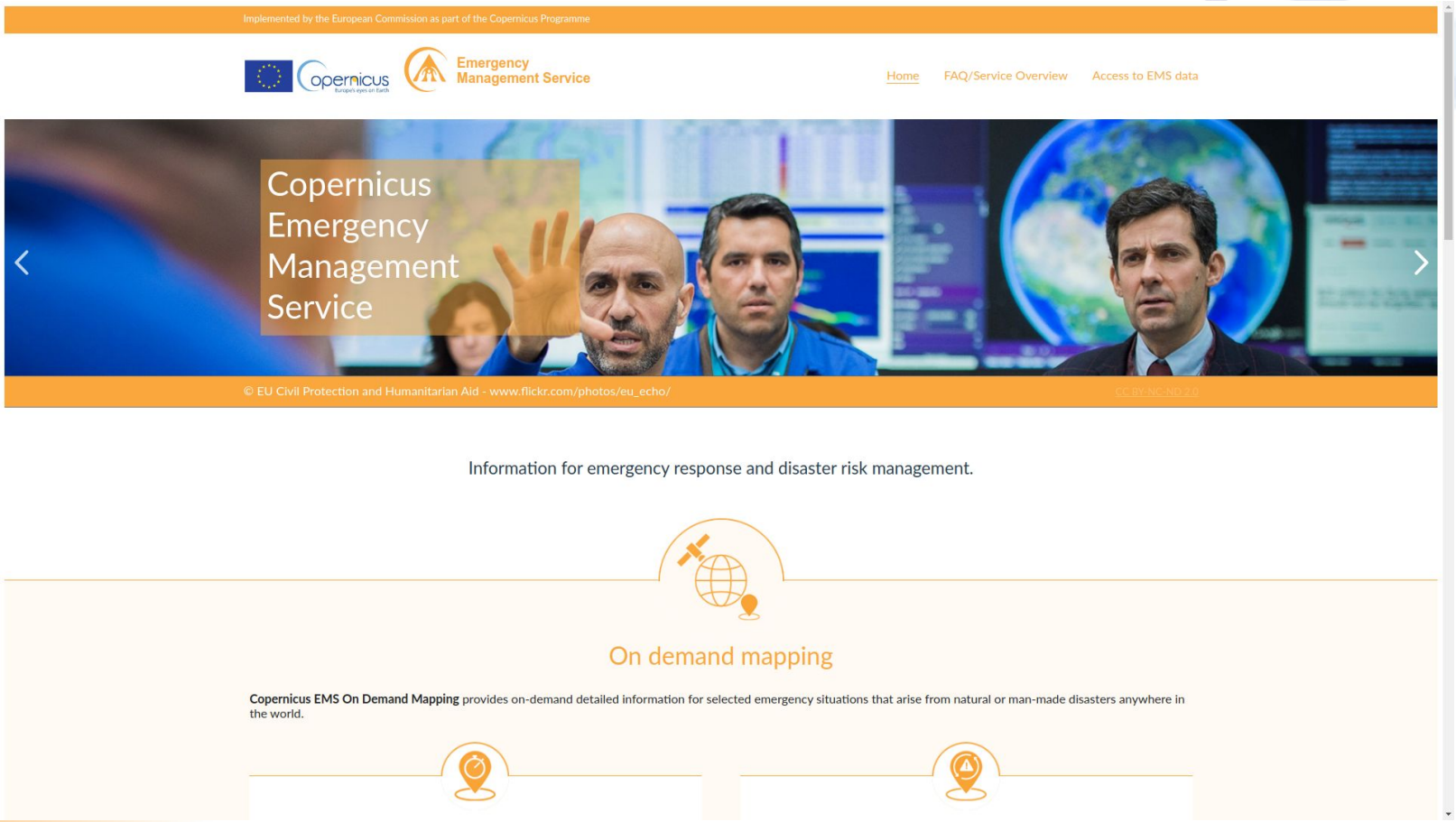
FireHub - Fire Monitoring Service



Copernicus Emergency Management Service (CEMS)

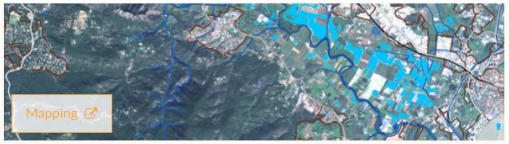
Copernicus EMS On Demand Mapping



Copernicus Emergency Management Service (CEMS)

Flood Wildfires Drought

Rapid Mapping provides geospatial information within hours or days of a service request in order to support emergency management activities in the immediate aftermath of a disaster.



Risk & Recovery Mapping supplies geospatial information in support of Disaster Management activities including prevention, preparedness, risk reduction and recovery phases.

Early Warning & Monitoring

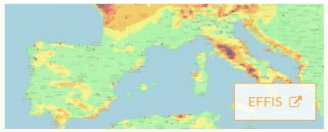
Copernicus EMS Early Warning and Monitoring offers critical geospatial information at European and global level through continuous observations and forecasts for floods, droughts and forest fires.

Floods

The **European Flood Awareness Systems (EFAS)** and **Global Flood Awareness Systems (GloFAS)** provide complementary flood forecast information to relevant stakeholders that support flood risk management at the national, regional and global level.

Fires

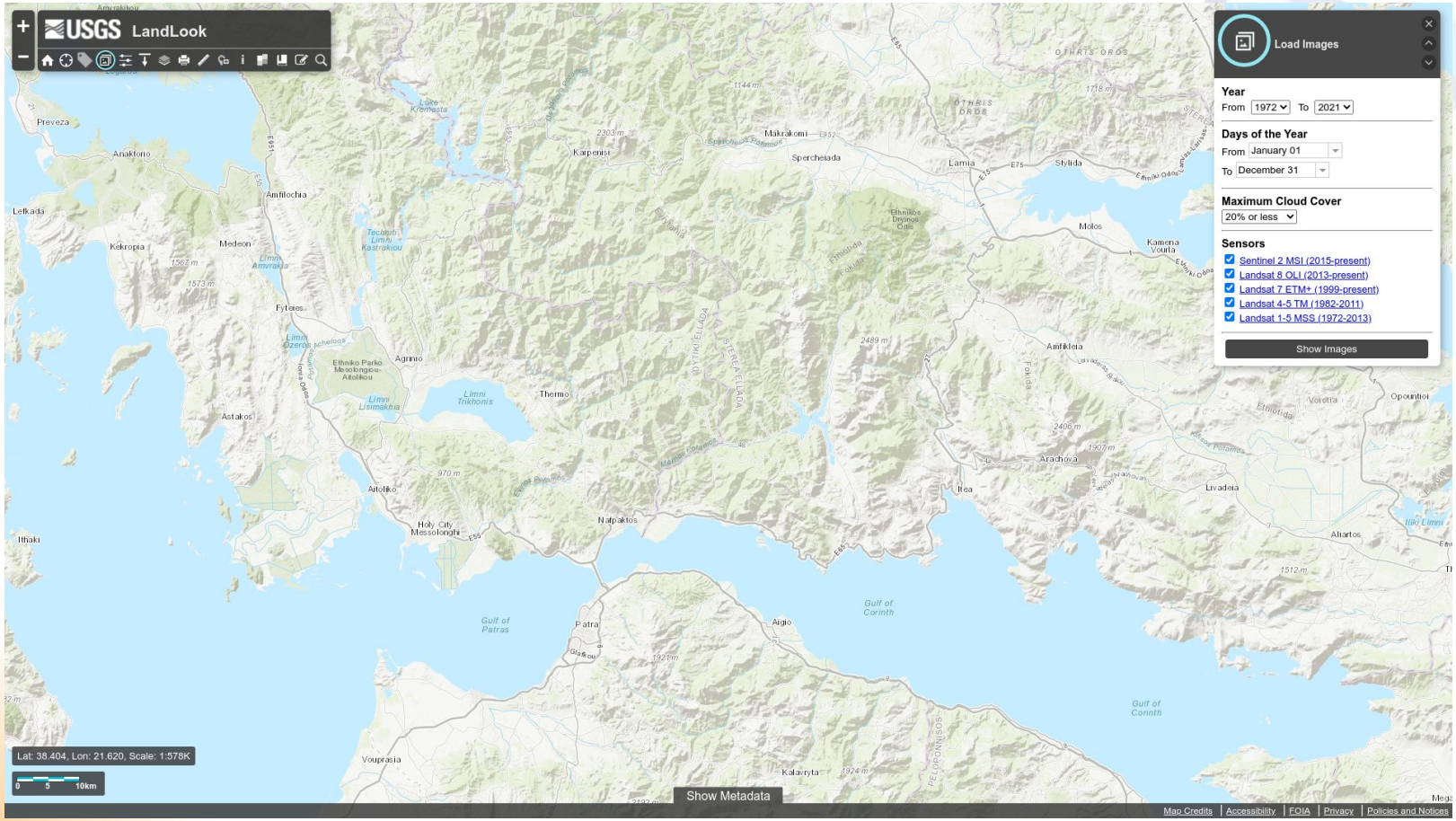
The **European Forest Fire Information System (EFFIS)** monitors forest fire activity in near-real time. EFFIS supports wildfire management at the national and regional level for EU member states and across the Middle East and North Africa.



Droughts

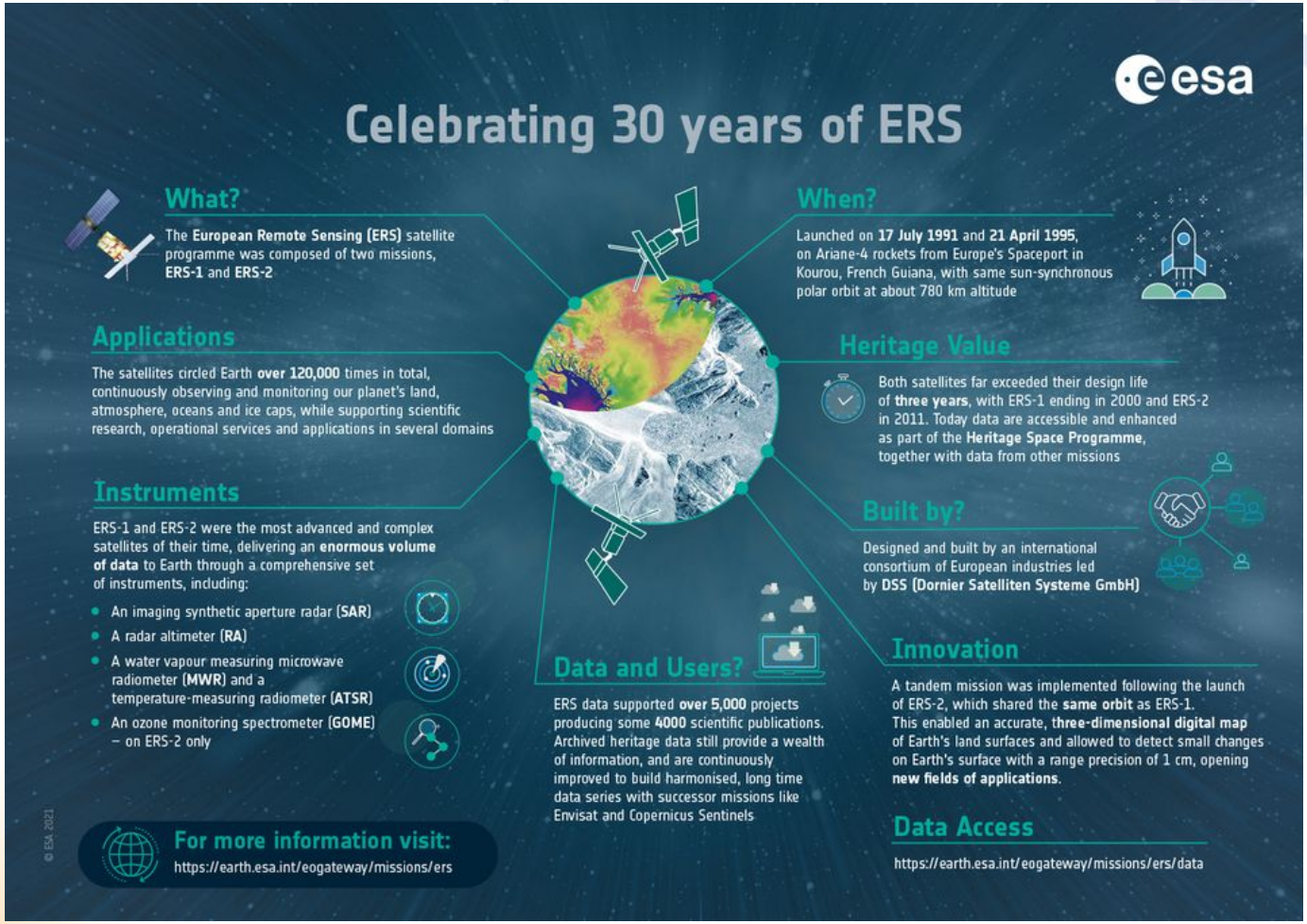
The **Drought Observatory (DO)** provides drought-relevant information and early-warnings for **Europe (EDO)** and **globally (GDO)**. The service publishes short analytical reports (Drought News) in anticipation of an imminent drought.

USGS - LandsatLook 2.0

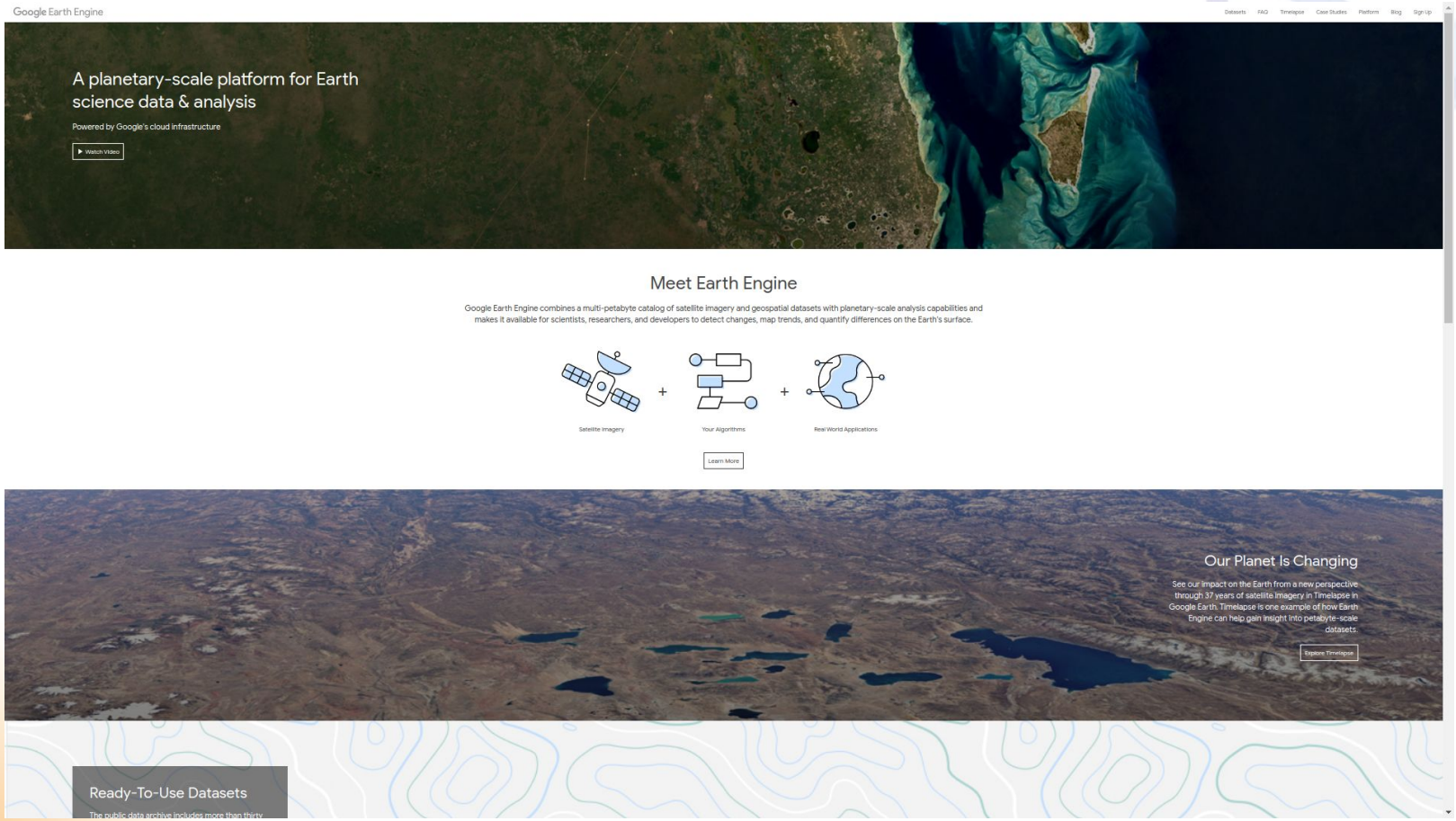


ESA's ERS-1: 17 July 1991

30 years of outstanding achievements



Google Earth Engine



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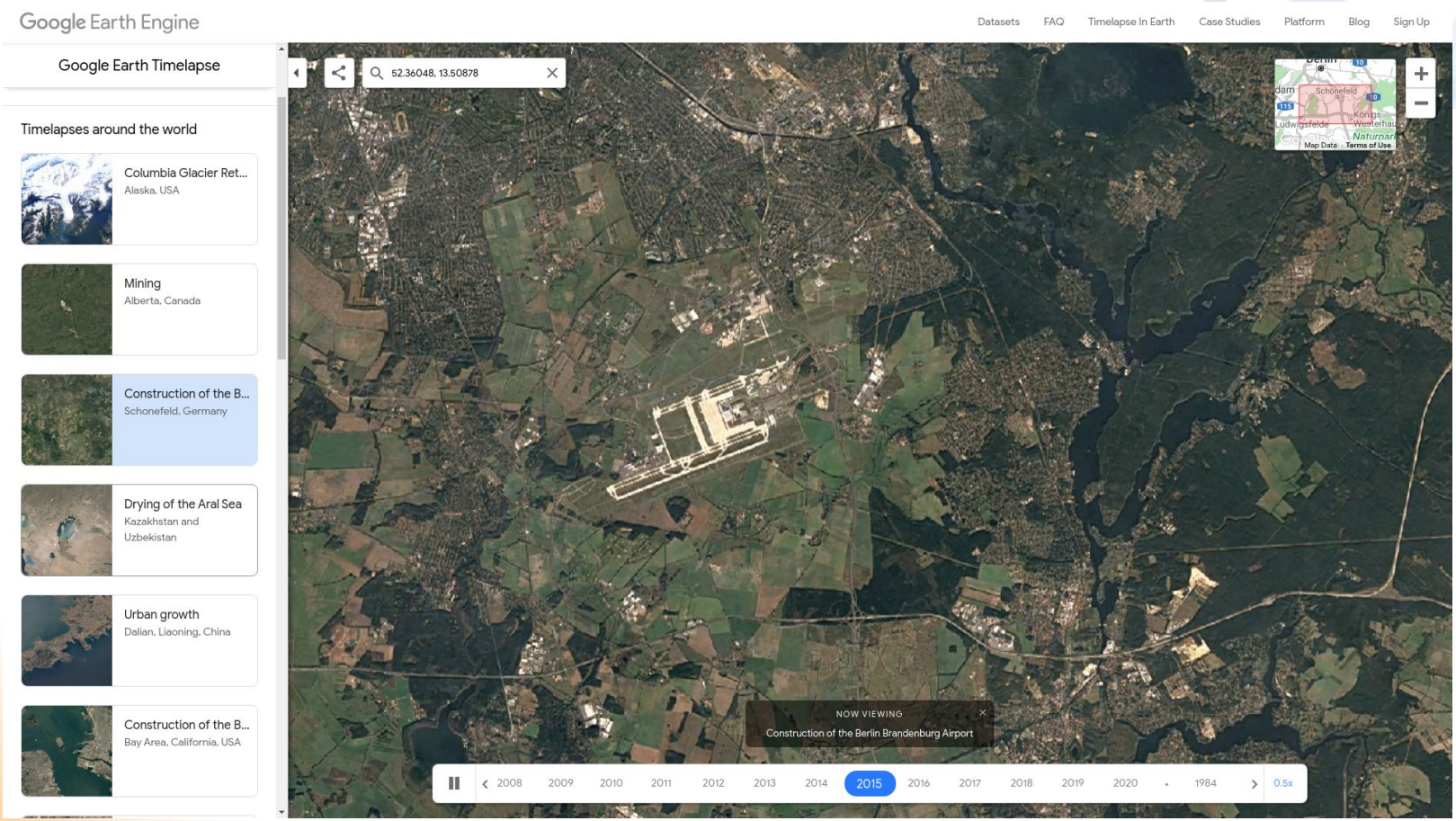

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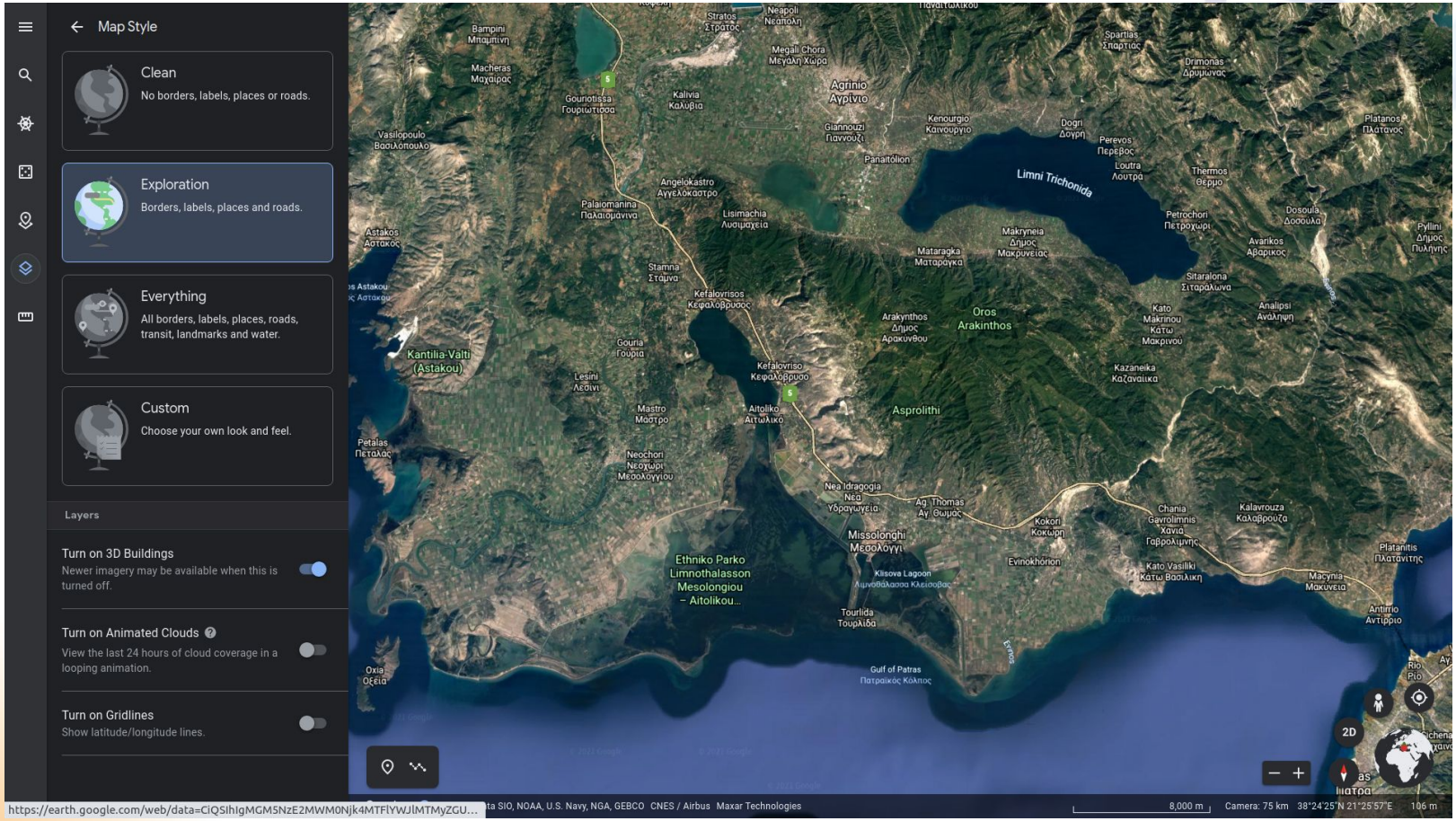
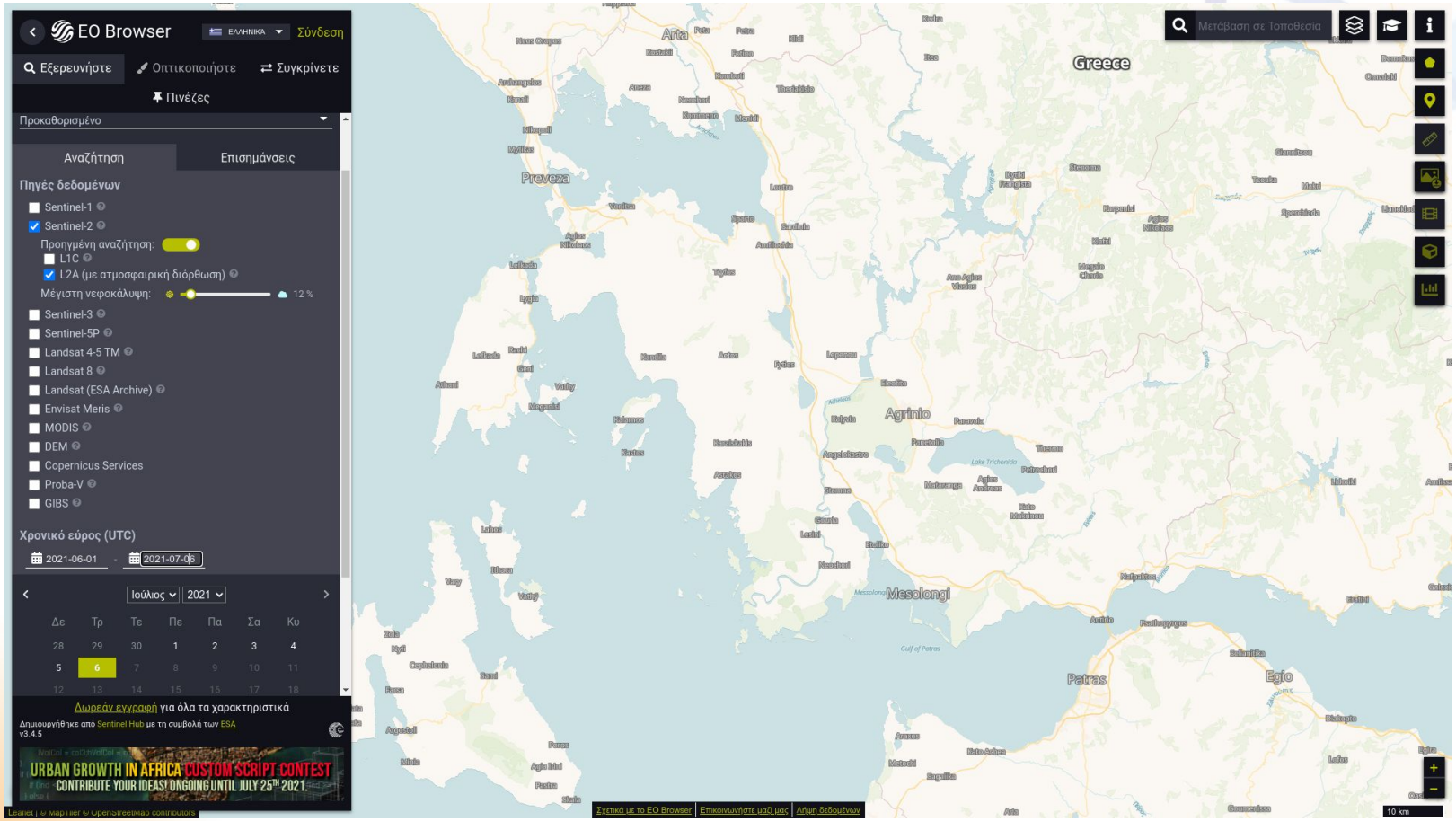


Sinergise EO Browser

DragonHack - Best Earth Observation Hack challenge



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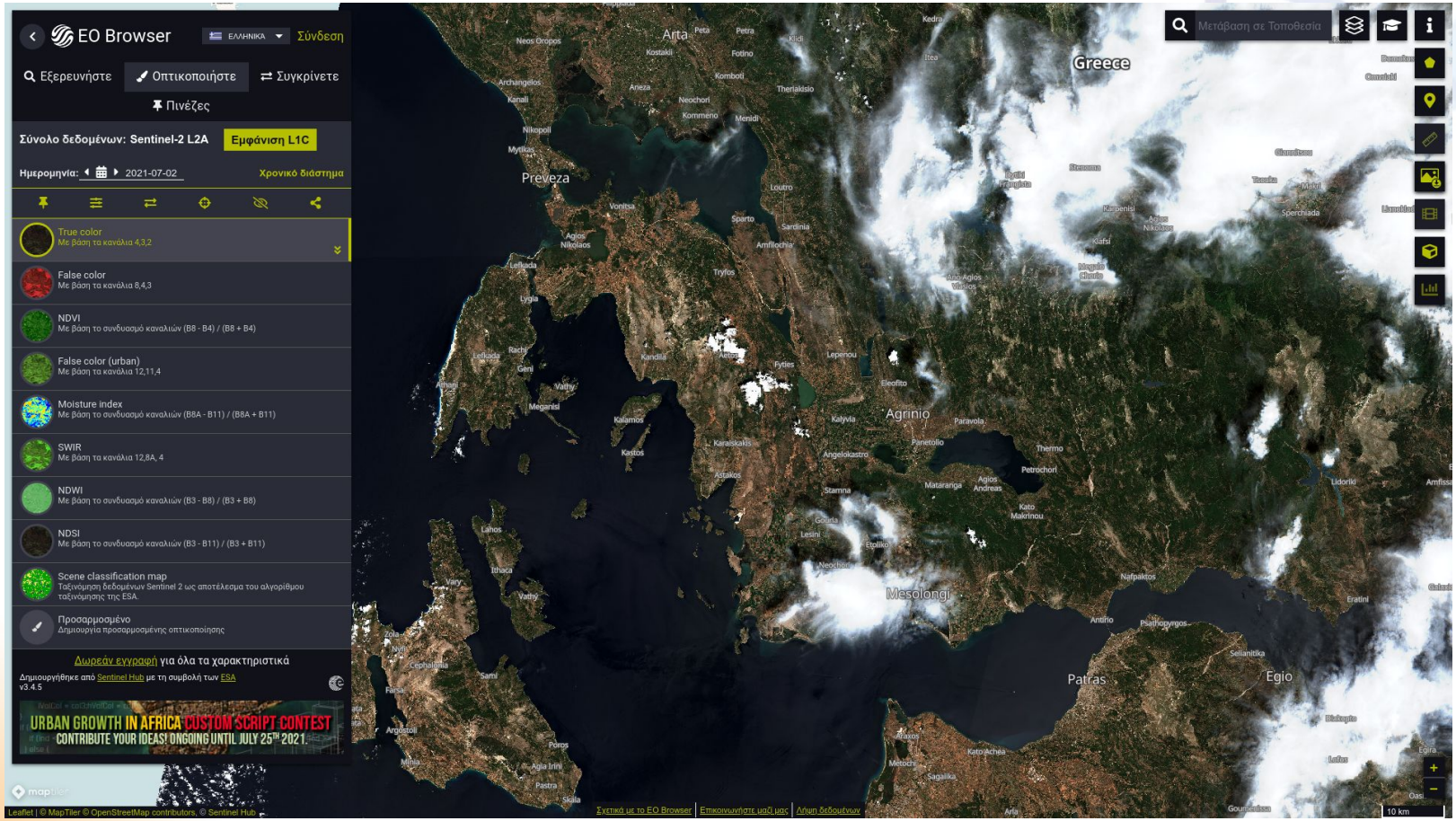
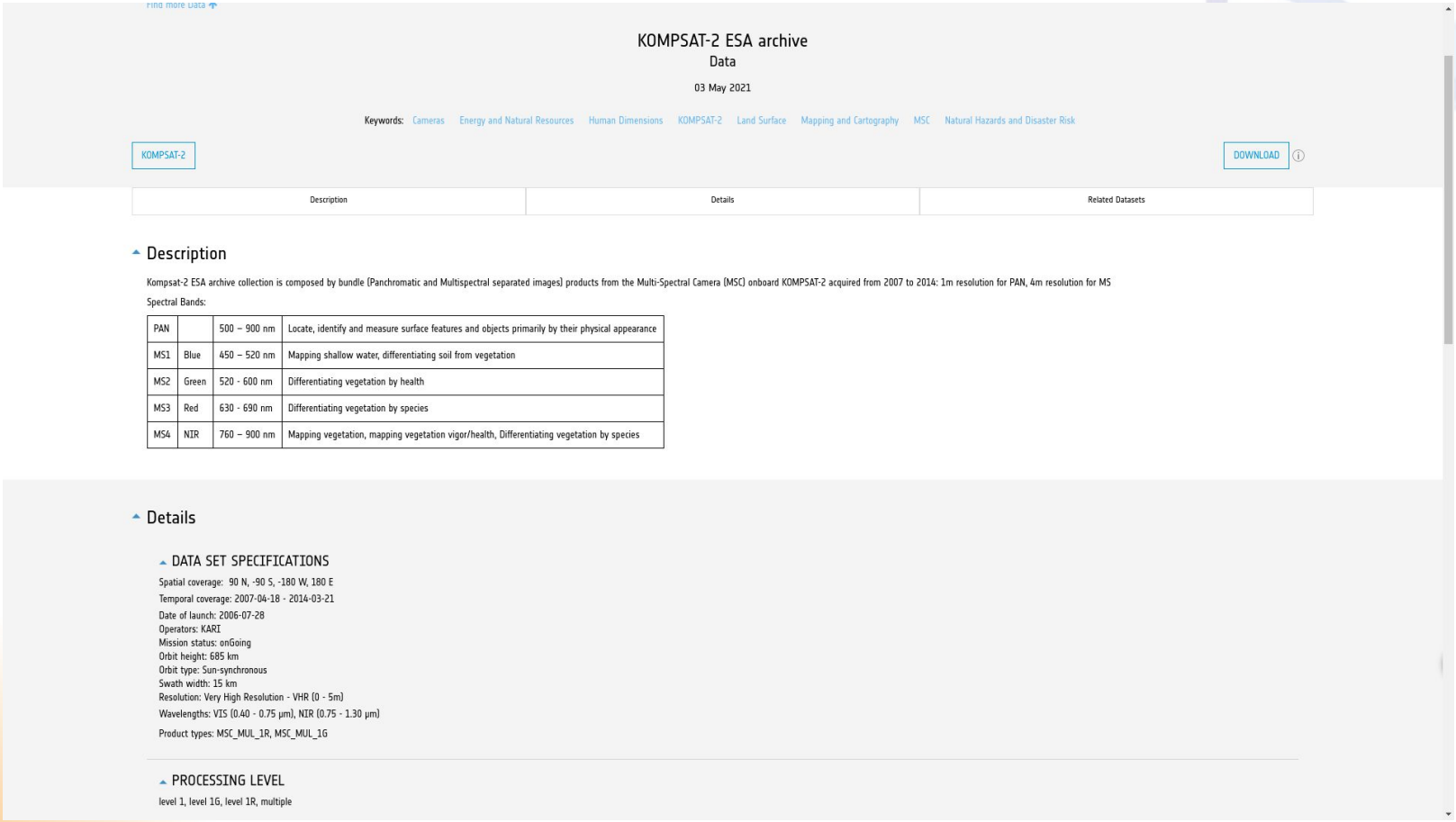
DragonHack - Best Earth Observation Hack challenge



KOMPSAT-2

Korean EO satellite launched on July 28th, 2006



Find more Data

KOMPSAT-2 ESA archive

Data

03 May 2021

Keywords: Cameras Energy and Natural Resources Human Dimensions KOMPSAT-2 Land Surface Mapping and Cartography MSC Natural Hazards and Disaster Risk

KOMPSAT-2

DOWNLOAD

Description | Details | Related Datasets

Description

Kompsat-2 ESA archive collection is composed by bundle (Panchromatic and Multispectral separated images) products from the Multi-Spectral Camera (MSC) onboard KOMPSAT-2 acquired from 2007 to 2014: 1m resolution for PAN, 4m resolution for MS

Spectral Bands:

PAN		500 – 900 nm	Locate, identify and measure surface features and objects primarily by their physical appearance
MS1	Blue	450 – 520 nm	Mapping shallow water, differentiating soil from vegetation
MS2	Green	520 - 600 nm	Differentiating vegetation by health
MS3	Red	630 - 690 nm	Differentiating vegetation by species
MS4	NIR	760 – 900 nm	Mapping vegetation, mapping vegetation vigor/health, Differentiating vegetation by species

Details

DATA SET SPECIFICATIONS

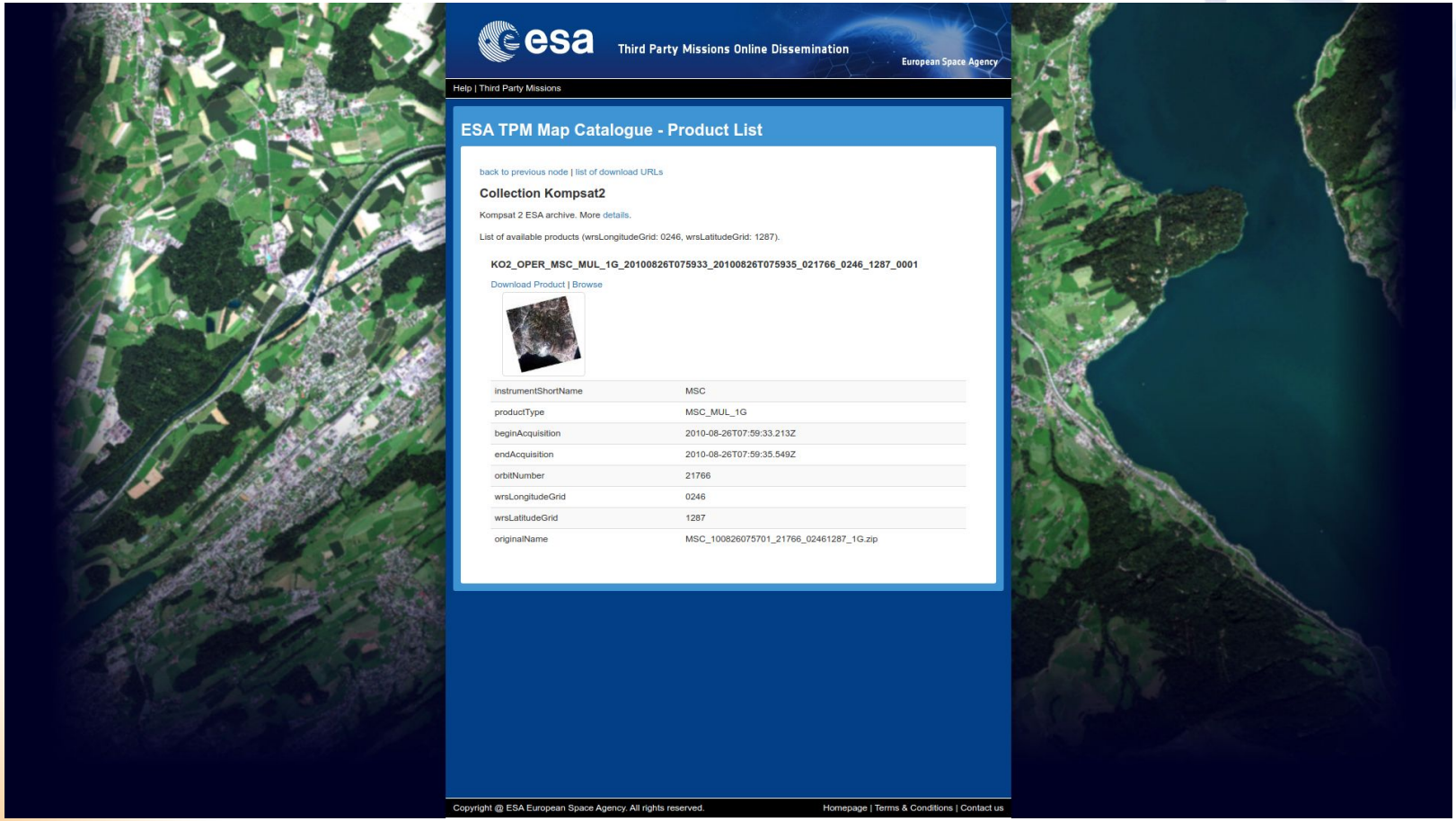
Spatial coverage: 90 N, -90 S, -180 W, 180 E
Temporal coverage: 2007-04-18 - 2014-03-21
Date of launch: 2006-07-28
Operators: KARI
Mission status: onGoing
Orbit height: 685 km
Orbit type: Sun-synchronous
Swath width: 15 km
Resolution: Very High Resolution - VHR (0 - 5m)
Wavelengths: VIS (0.40 - 0.75 µm), NIR (0.75 - 1.30 µm)
Product types: MSC_MUL_1R, MSC_MUL_1G

PROCESSING LEVEL

level 1, level 1G, level 1R, multiple

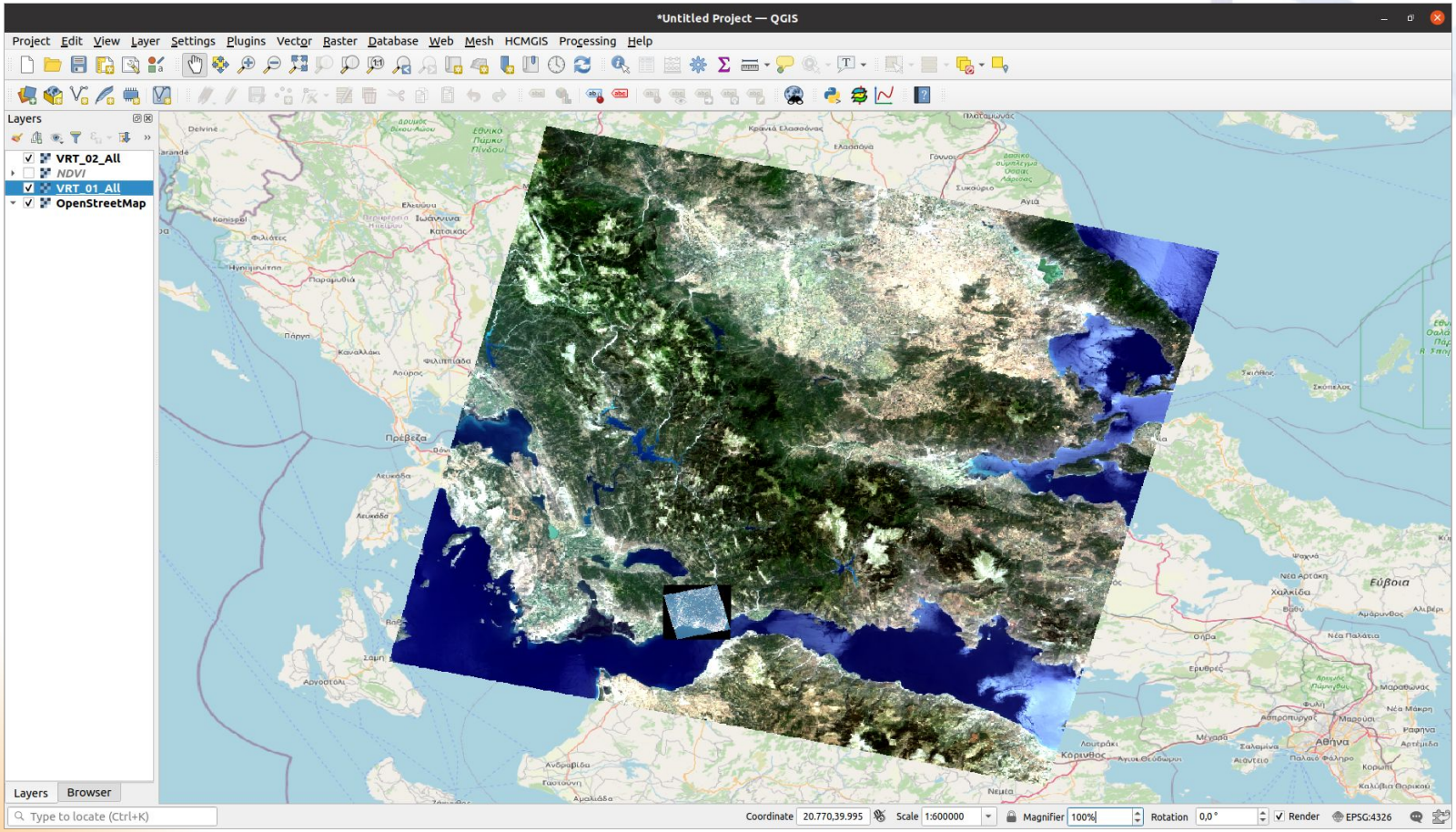
KOMPSAT-2

2010-08-26 07:59:33.213 - 07:59:35.549 UTC



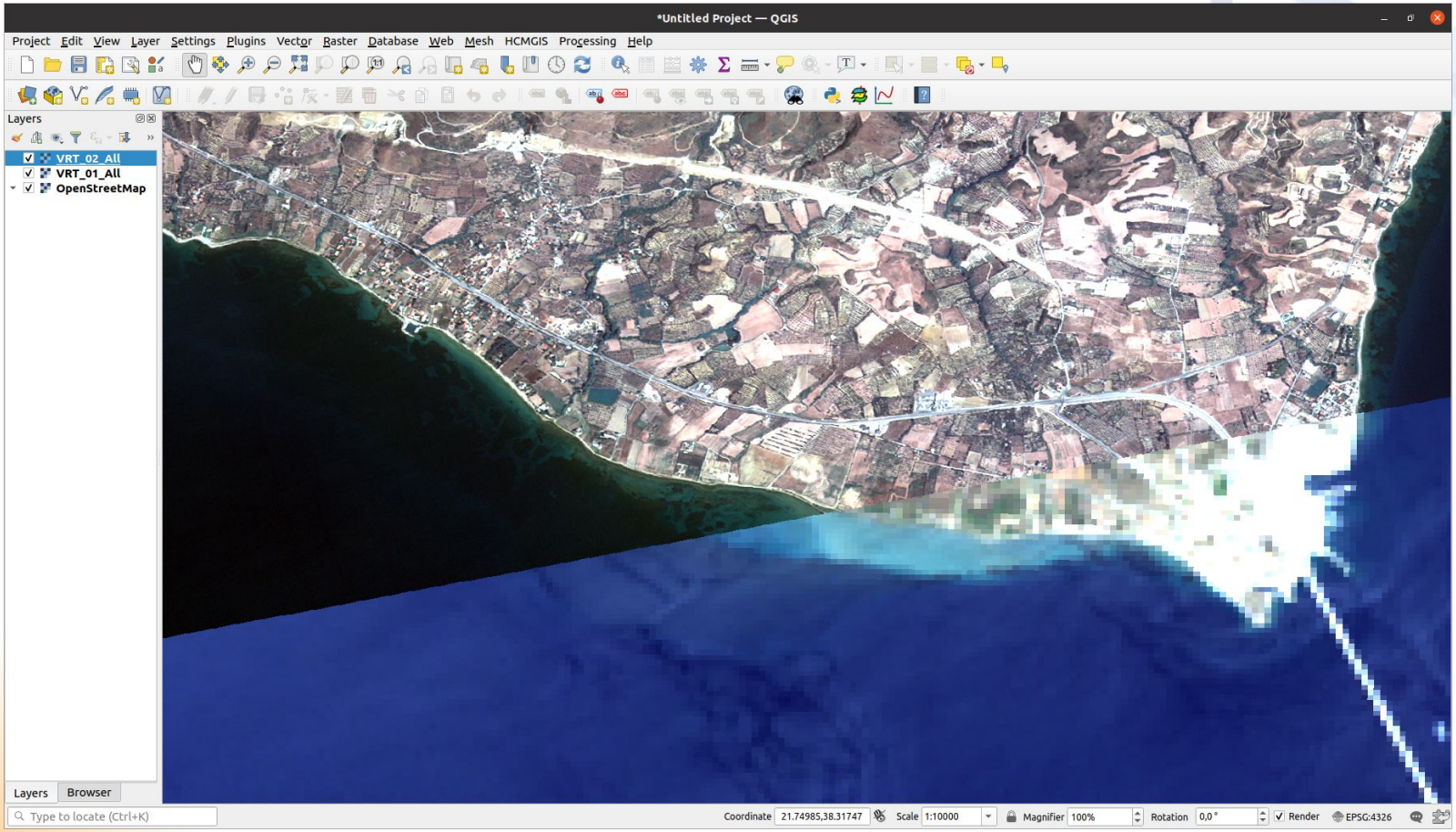
Landsat vs KOMPSAT-2

30/06/21 vs 26/08/2010, Natural colors



Landsat vs KOMPSAT-2

30/06/21 vs 26/08/2010, Natural colors



WorldView - 2 , 3

DATA SHEET

INFORMATION PRODUCTS

DigitalGlobe

Standard Imagery

DigitalGlobe's Standard Imagery products are designed for users with knowledge of remote sensing applications and image processing tools that require data of modest absolute geometric accuracy and/or large area coverage. They use DigitalGlobe's constellation of satellites, which include QuickBird (archive only), GeoEye-1, WorldView-1, WorldView-2, and WorldView-3. Choose from our expansive archive or submit a new collection request. Standard Imagery products are available in two varieties: Standard and Ortho Ready Standard.

Features

- Georeferenced to a cartographic projection
  - Industry standard projections and datums
- High resolution
  - 30 cm, 40 cm, 50 cm and 60 cm panchromatic, natural color, color infrared, or 4-band pan sharpened
  - 1.6 m – 2.4 m multispectral
- Large image swath collection size
  - 16.4 km – 18.0 km width at nadir
- Small minimum order size
  - 25 sq km—archive
  - 100 sq km—tasking
- Superior image classification and analysis
  - 11-bit digitization (up to 2,048 levels of gray scale)
  - Discrete non-overlapping spectral bands
- Open systems
  - Compatible with commercial software providers
  - Popular image file formats

Benefits

- Locate features in map coordinate space
- Identify features, create maps, and detect changes from recent global imagery at the highest resolution possible from commercial imaging satellites
- Flexible options—Standard Imagery is normalized for topographic relief and Ortho Ready Standard Imagery is ready for users to orthorectify
- Purchase only the coverage needed for your project and budget
- Improve feature classification and identification in dark or bright areas such as building shadows or snow and perform more flexible image enhancement
- Get your project up and running quickly and easily based on standard map projections and formats

Hong Kong

www.digitalglobe.com

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DATA SHEET

INFORMATION PRODUCTS » STANDARD IMAGERY

DigitalGlobe

Specifications

Product options	Pixel resolution*	Image bands
Panchromatic	30 cm, 50 cm, as collected	Panchromatic
Multispectral (4-band)**	1.2 m, 2 m, as collected	Blue, Green, Red, NIR1
Multispectral (8-band)	1.2 m, 2 m	Coastal, Blue, Green, Yellow, Red, Red Edge, NIR1, NIR2
Bundle (pan + 4-band)	30 cm, 50 cm, as collected	Panchromatic
	1.2 m, 2 m, as collected	Blue, Green, Red, NIR1
Bundle (pan + 8-band)	30 cm, 50 cm	Panchromatic
	1.2 m, 2 m	Coastal, Blue, Green, Yellow, Red, Red Edge, NIR1, NIR2
Natural Color	30 cm, 50 cm, as collected	Blue, Green, Red
Color Infrared	30 cm, 50 cm, as collected	Green, Red, NIR1
4-band Pan Sharpened	30 cm, 50 cm, as collected	Blue, Green, Red, NIR1

Spectral characteristics (nanometers)	Coastal	Blue	Green	Yellow	Red	Red Edge	Near-IR1	Near-IR2	Pan (B&W)
QuickBird***		430–545	466–620		590–710		715–918		405–1053
GeoEye-1		450–510	510–580		655–690		780–920		450–800
WorldView-1									397–905
WorldView-2	396–458	442–515	506–586	584–632	624–694	699–749	765–901	856–1043	447–808
WorldView-3	400–450	450–510	510–580	630–625	630–690	705–745	770–895	860–1040	450–800

Image accuracy specifications	
QuickBird***	23 m CE90
GeoEye-1	5.0 m CE90
WorldView-1, WorldView-2**, WorldView-3	5.0 m CE90

Processing	Standard	Ortho Ready Standard
Applied corrections	Radiometric, sensor, and geometric corrections Mapped to a cartographic projection	
Geometric corrections	Projected to a plane using map projection and datum, coarse DEM applied to normalize for topographic relief	Projected to a plane using map projection and datum, projected to a constant base elevation to allow for orthorectification

Order parameters	
Product type	Panchromatic, Multispectral, or Bundle; Natural Color; Color Infrared; 4-band Pan Sharpened
Image bits / pixel	8 or 16 bits
File formats	GeoTIFF 1.0, NITF 2.1, NITF 2.0

* All four bands delivered in a single file
** Up to 30° off nadir
*** Archive Only

Deliverables

Standard Imagery can be acquired directly from the DigitalGlobe archive or you can submit a new collection request. Standard Imagery is ordered by area, with a minimum purchase of 25 sq km for archive or 100 sq km tasking orders, up to a maximum of 10,000 sq km per order. If your order crosses more than one strip, one standard imagery product per scene is delivered. Products are delivered on your choice of standard digital media with Image Support Data files including image metadata.

Delivery methods

Media delivery: DVD

Media delivery: external HD

Web-based delivery: FTP

DS-STAND 10/14

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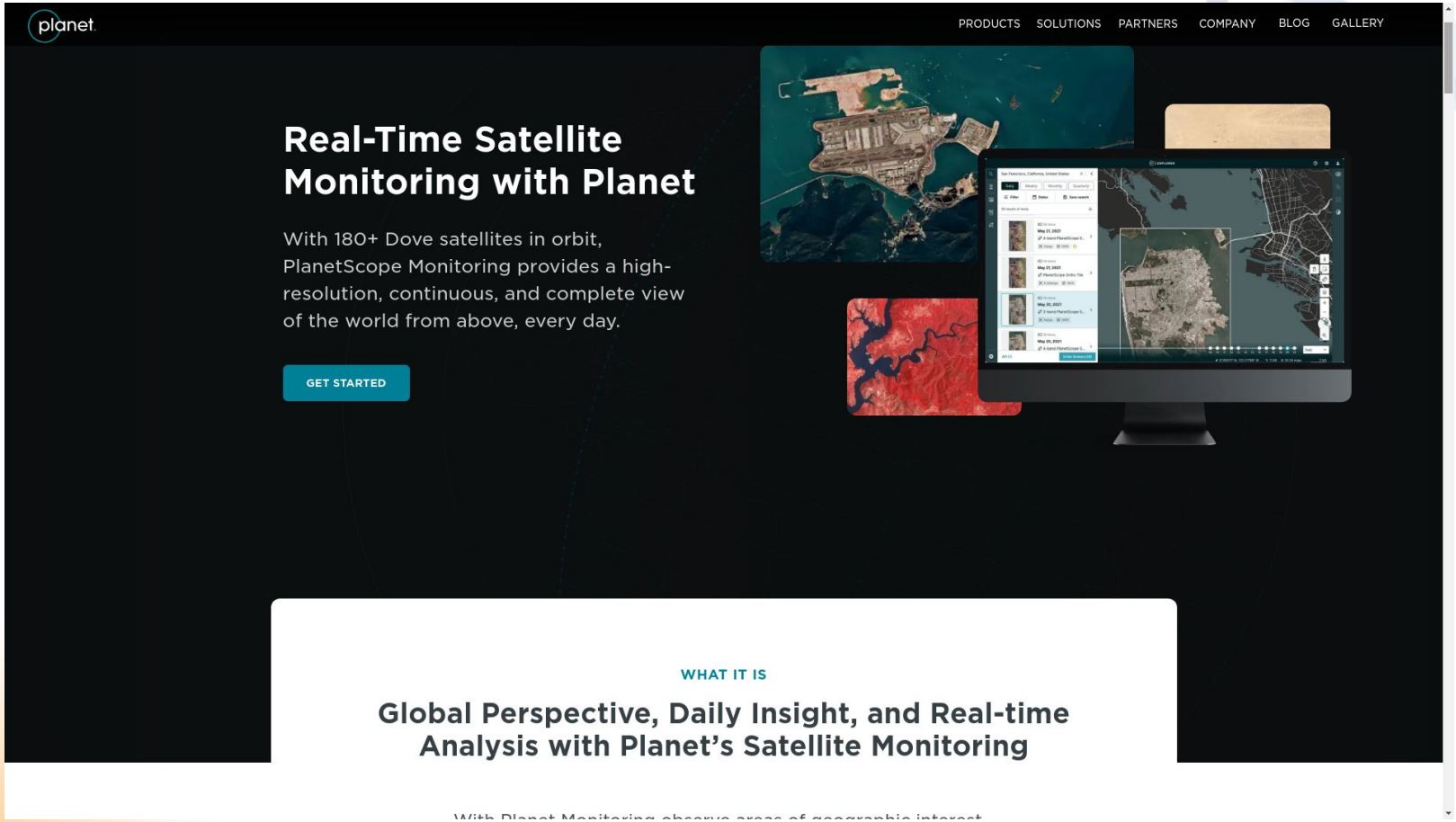
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Global Perspective, Daily Insight, and Real-time Analysis with Planet's Satellite Monitoring

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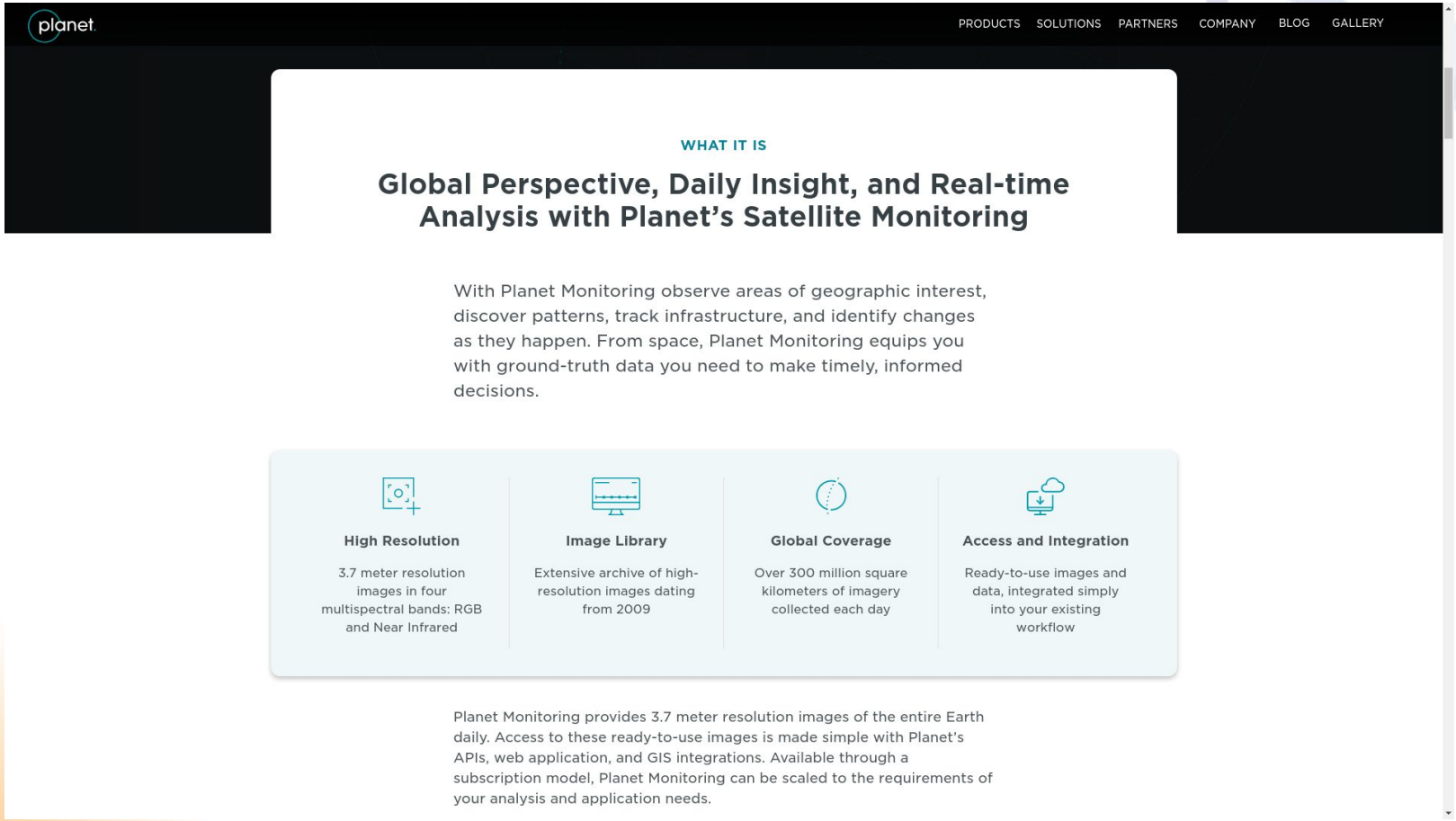
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WHAT IT IS
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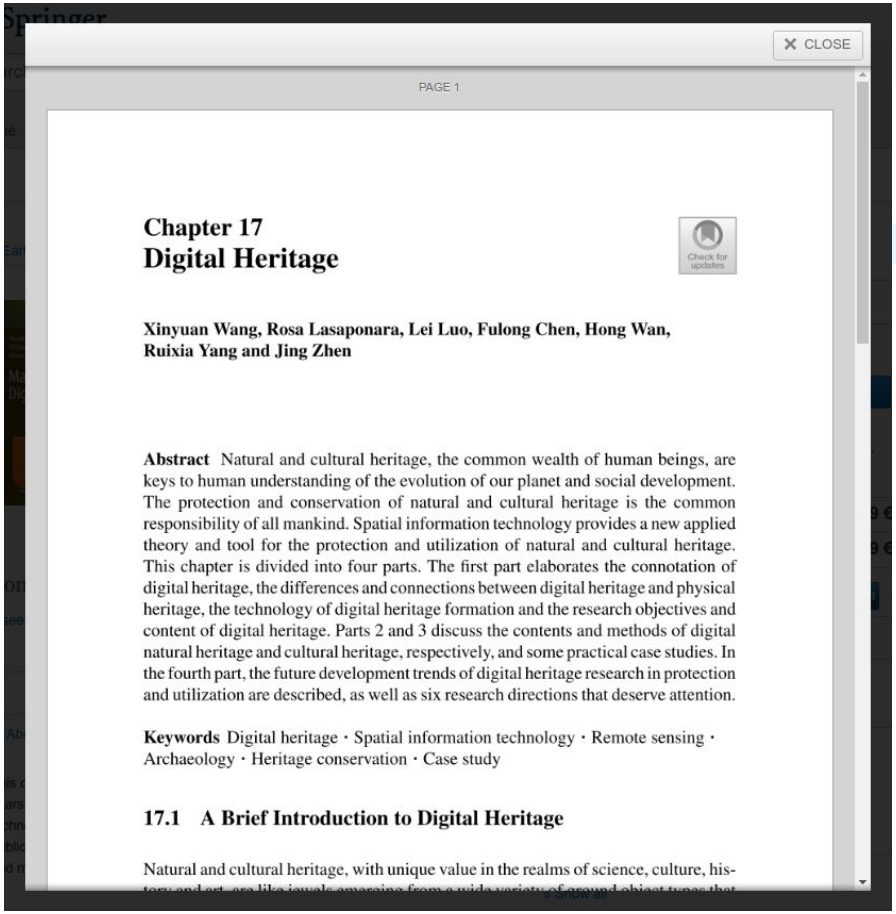
High Resolution
3.7 meter resolution images in four multispectral bands: RGB and Near Infrared
Image Library
Extensive archive of high-resolution images dating from 2009
Global Coverage
Over 300 million square kilometers of imagery collected each day
Access and Integration
Ready-to-use images and data, integrated simply into your existing workflow
Planet Monitoring provides 3.7 meter resolution images of the entire Earth daily. Access to these ready-to-use images is made simple with Planet's APIs, web application, and GIS integrations. Available through a subscription model, Planet Monitoring can be scaled to the requirements of your analysis and application needs.

Manual of Digital Earth



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PAGE 1

Chapter 17
Digital Heritage

Xinyuan Wang, Rosa Lasaponara, Lei Luo, Fulong Chen, Hong Wan, Ruixia Yang and Jing Zhen

Abstract Natural and cultural heritage, the common wealth of human beings, are keys to human understanding of the evolution of our planet and social development. The protection and conservation of natural and cultural heritage is the common responsibility of all mankind. Spatial information technology provides a new applied theory and tool for the protection and utilization of natural and cultural heritage. This chapter is divided into four parts. The first part elaborates the connotation of digital heritage, the differences and connections between digital heritage and physical heritage, the technology of digital heritage formation and the research objectives and content of digital heritage. Parts 2 and 3 discuss the contents and methods of digital natural heritage and cultural heritage, respectively, and some practical case studies. In the fourth part, the future development trends of digital heritage research in protection and utilization are described, as well as six research directions that deserve attention.

Keywords Digital heritage · Spatial information technology · Remote sensing · Archaeology · Heritage conservation · Case study

17.1 A Brief Introduction to Digital Heritage

Natural and cultural heritage, with unique value in the realms of science, culture, his-

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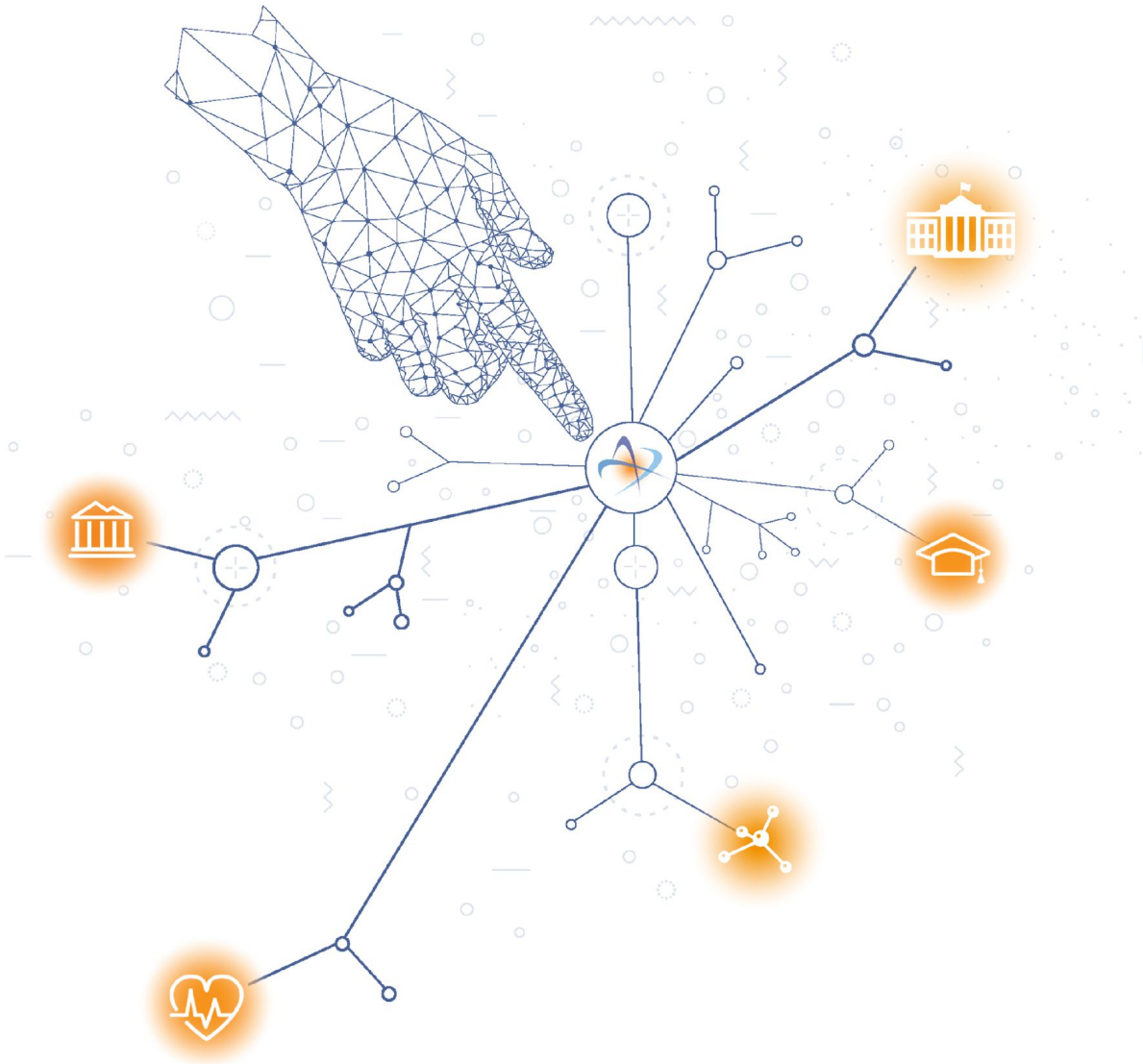

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