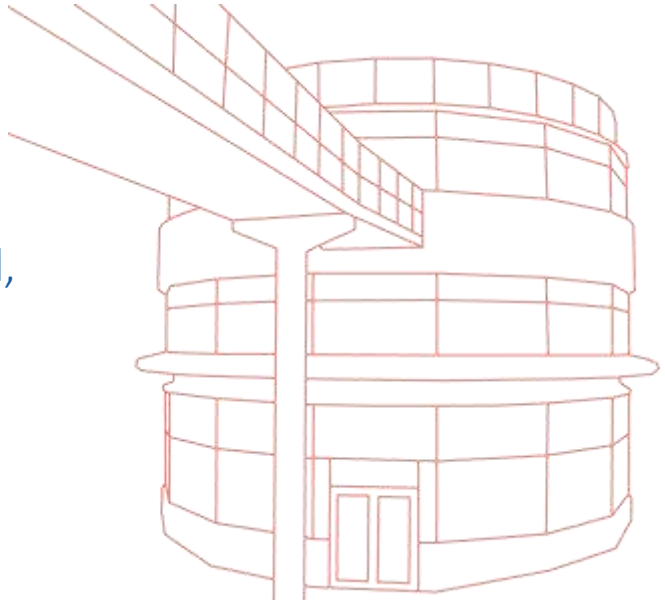
Exploitation de données Pléiades HR et Pléiades NEO dans le cadre de suivi de de réservoirs et de lacs en France et en Chine et pour la cartographie de dégâts de séismes en Turquie



Herve Yésou, Jérôme Maxant, Thomas Ledauphin, Sabrine Amzil, Stéphanie Battiston, Mathilde Caspard, Claire Huber & Stephen Clandillon

ICUBE SERTIT, Université de Strasbourg
herve.yesou@unistra.fr

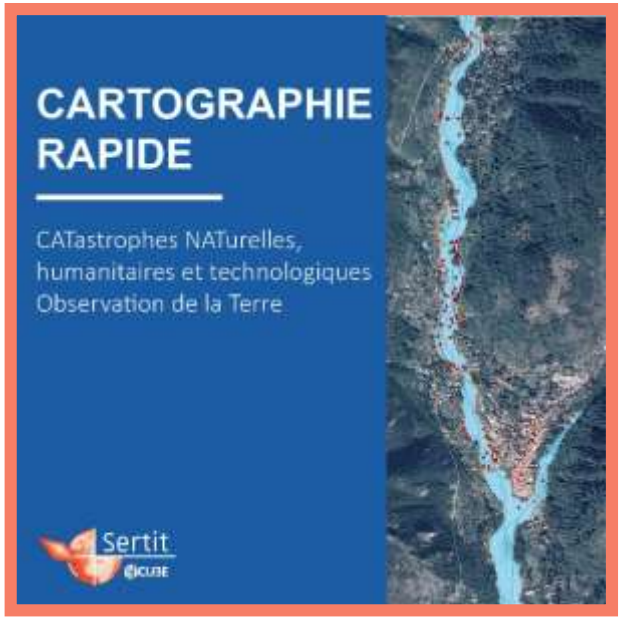
SERTIT: La télédétection au service de la prospective environnementale et territoriale

Le SERTIT, SERvice de Traitement d'Image et de Télédétection

- Crée en 1986, le SERTIT est la plateforme technologique et de services dans l'Observation de la Terre

  - Fondateur : Paul de Fraipont
  - 100% autofinancée sur contrats (européens, français)
  - …de la R&D appliquée aux services opérationnels
  - au carrefour des mondes (labos, agences spatiales, collectivités, industriels)
- 2015, rattachement au Laboratoire ICube
  - CA 2023 1,8 à 2.0 m€
  - Environ 21 personnes

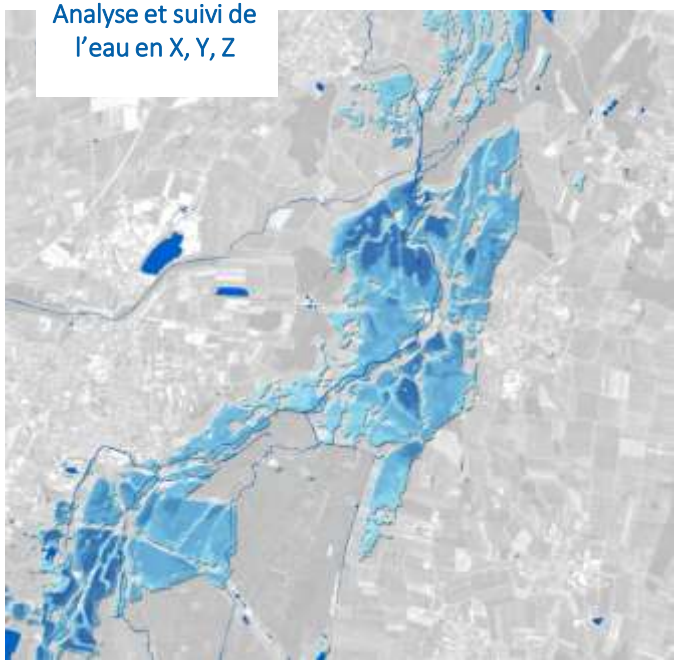
Le SERTIT et ses principaux services



Le SERTIT et ses activités

- Etudes spécifiques & Expertise (données et applications)
- Production d'information géographique

Analyse et suivi de l'eau en X, Y, Z



Suivi des ressources naturelles

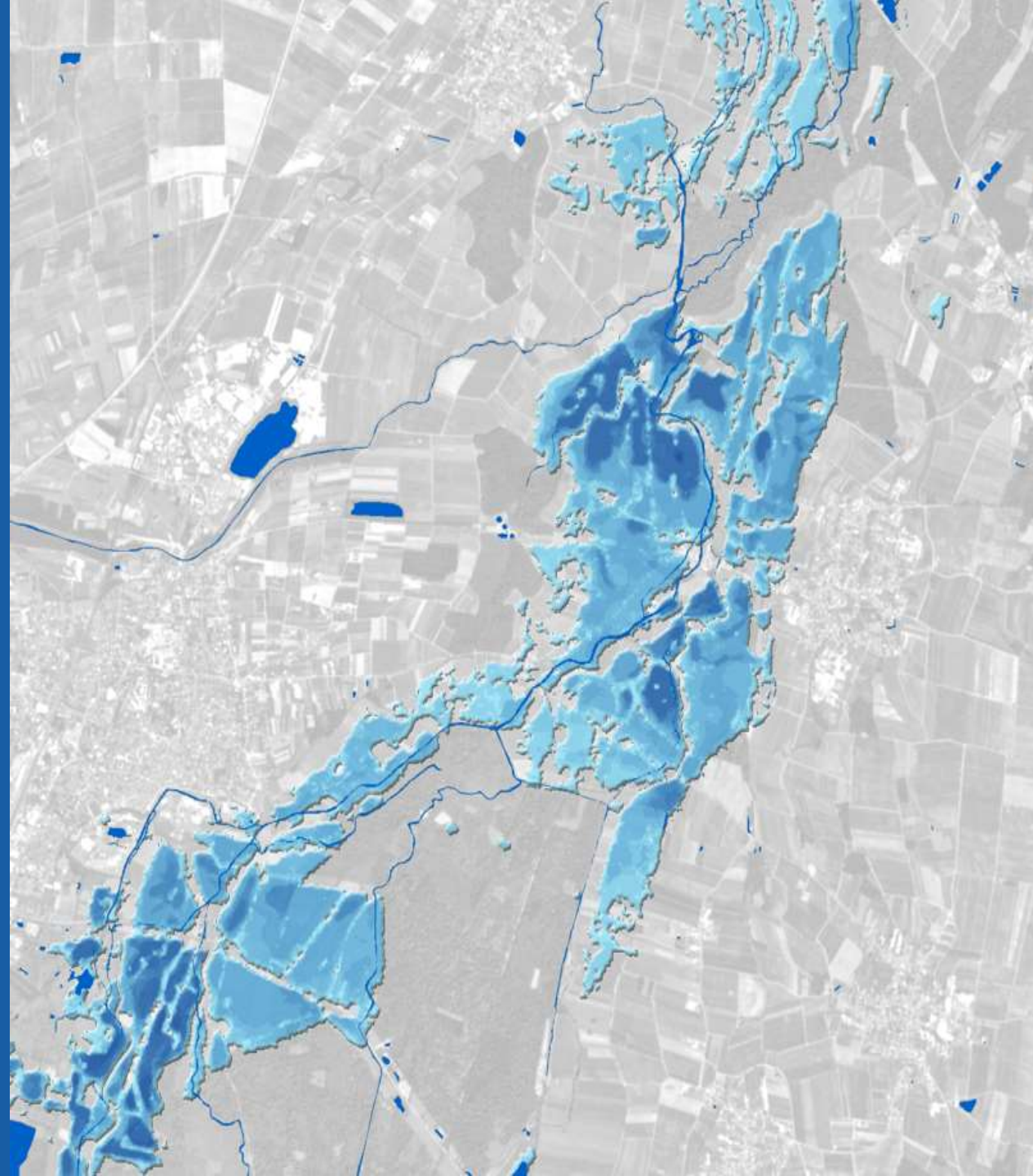
Aménagement du territoire

Unique en France

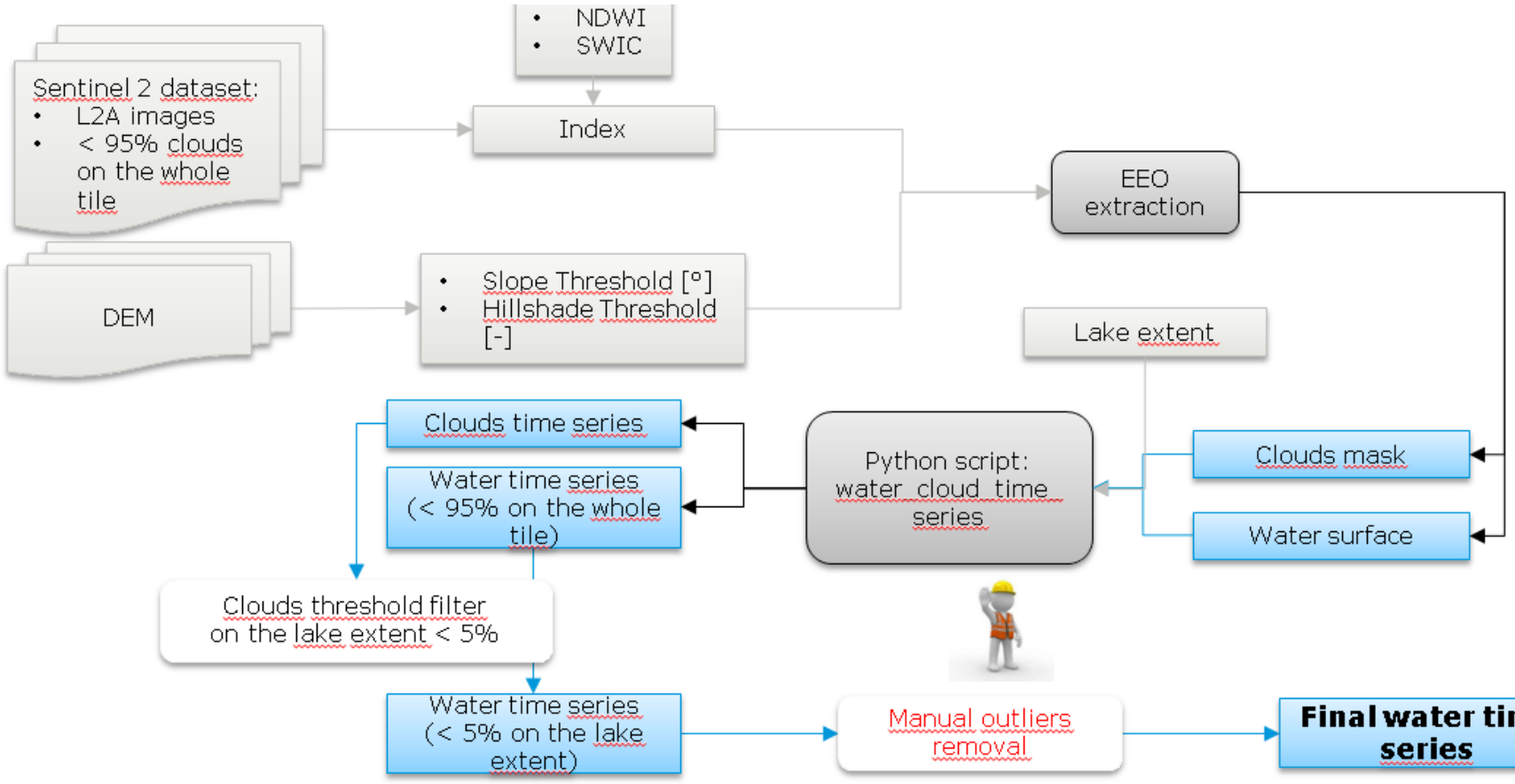
24/7
Service de cartographie rapide
Catastrophe naturelle
et gestion des risques

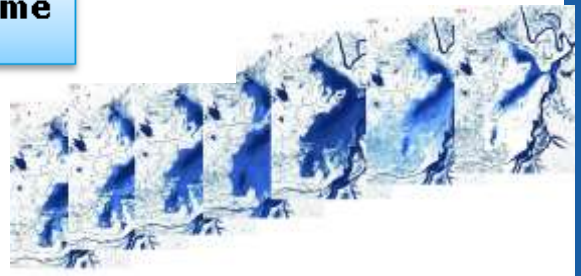
SERTIT: : La télédétection au service de la prospective environnementale et territoriale

Validation des surfaces en Eau



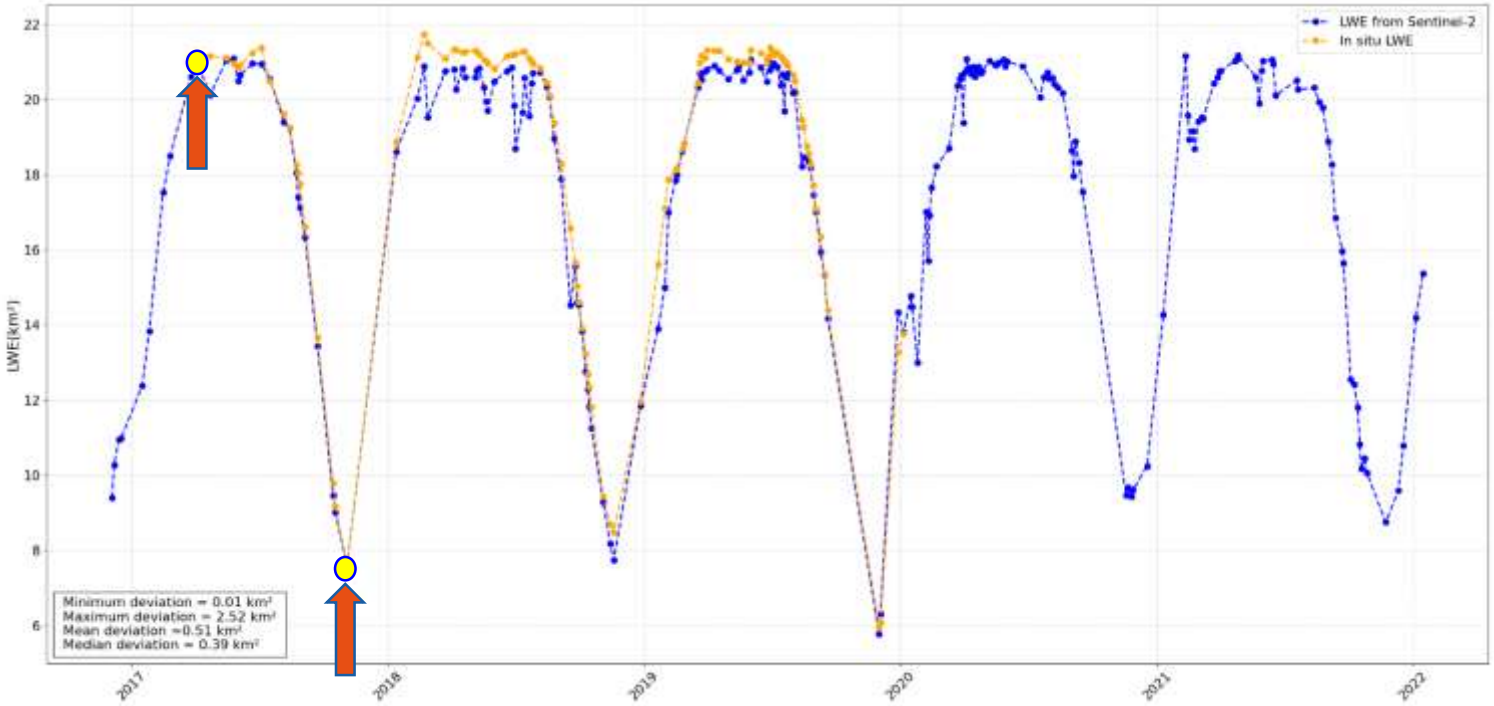
VHR pour validation chaine traitement

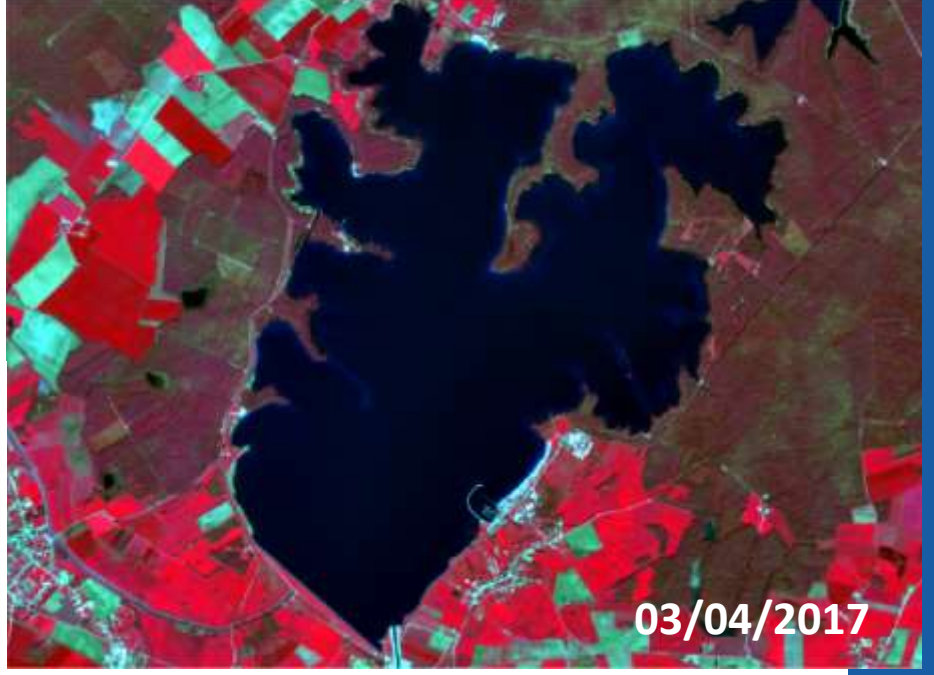




ExtractEO chaine de traitement in house du SERTIT

Validation chaine traitement / produit LWE

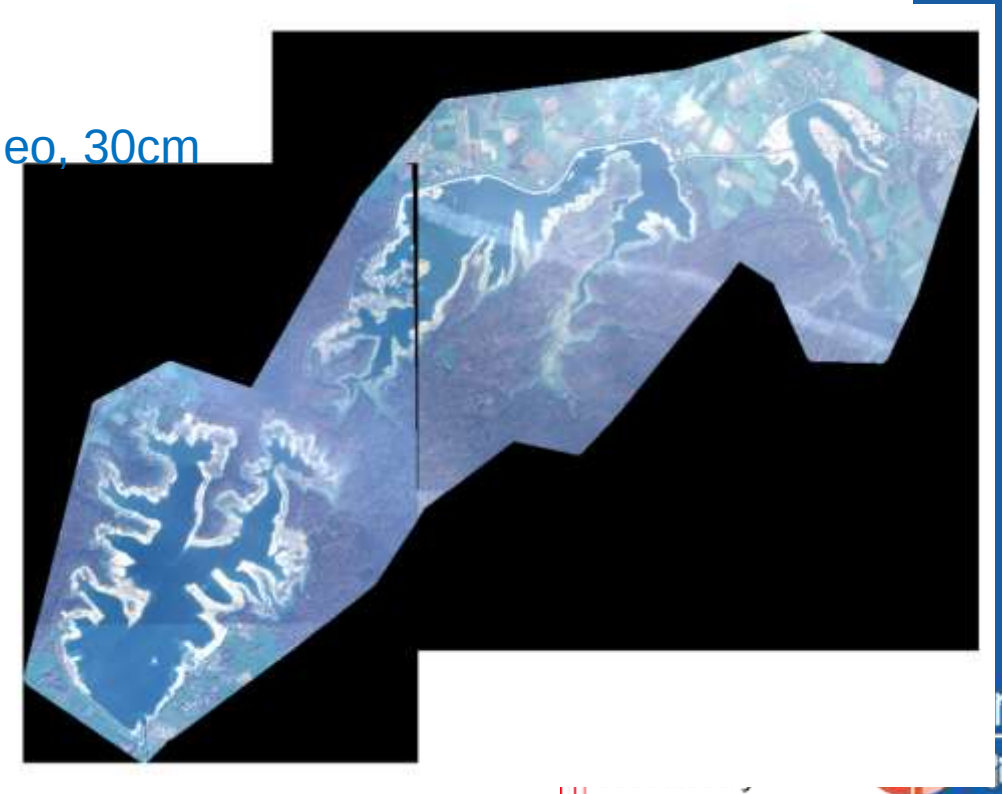




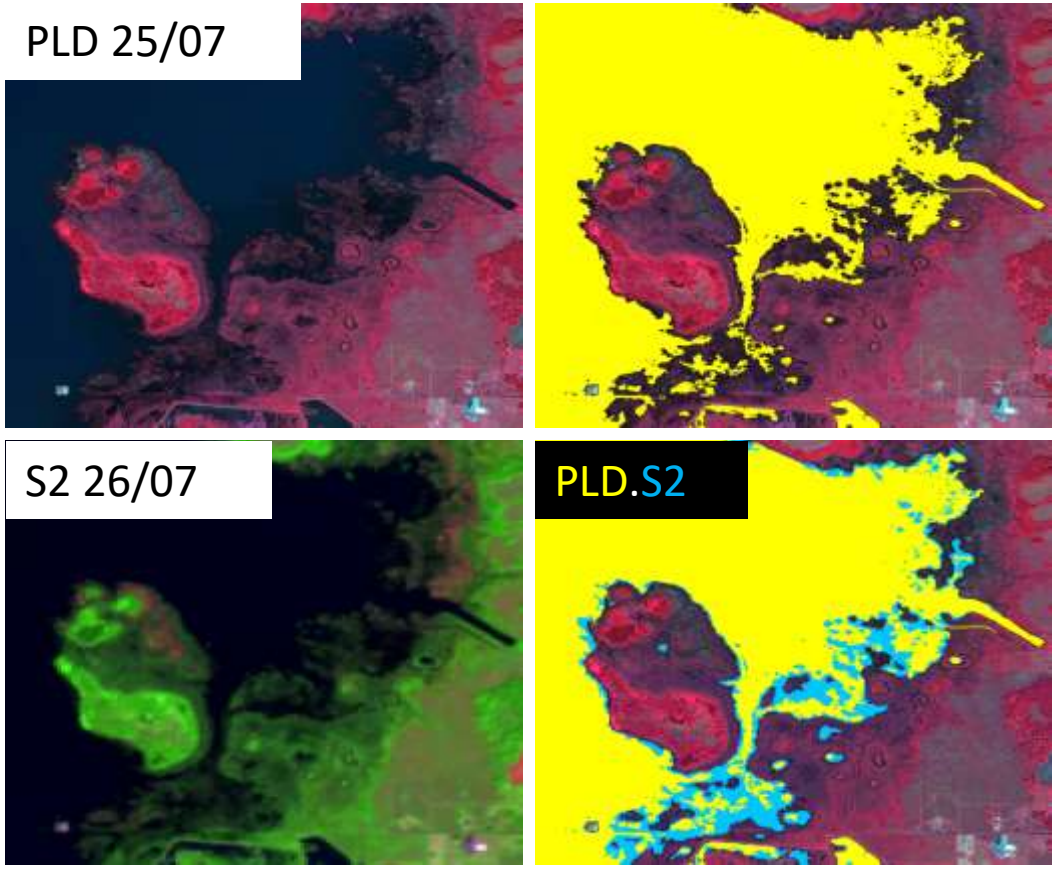
Serie temporelle de LWE dérivée de données Sentinel2

VHR images pour qualifier/valider les extractions de LWE dans divers environnements

- Fitri Lake, Chad, Plain flood lake, Pleiades 2021 & 2022
- Villamette River and Fern Reservoir, USA, Pleiades, SPOT 6-7
- Shenjing lake, China, shallow water, Pléiades Neo, 30 cm
- Orient, Auzon-Temple, Amance, France, reservoirs, Pleiades Neo, 30cm
- Lacs Lorrains etc …. (SWOT)
- …

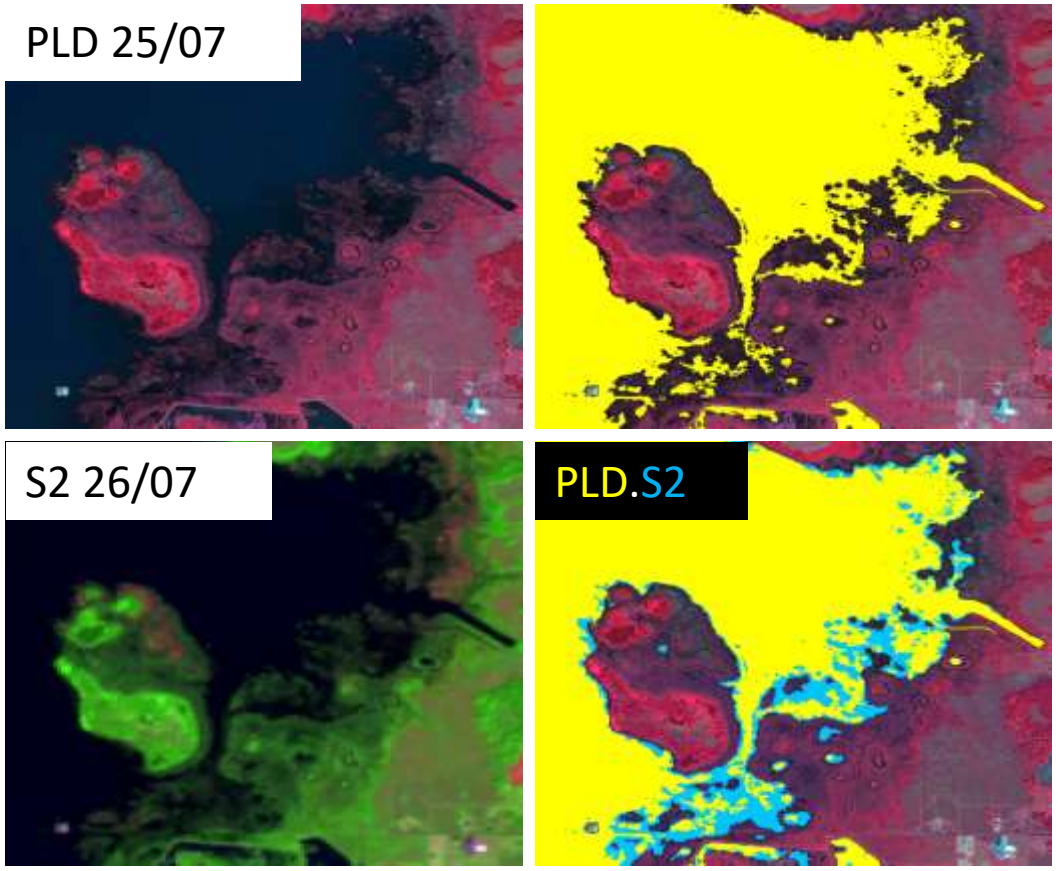


Comparaison LWE S2 / Pleiades: Fern Ridge Reservoir, Oregon USA



More water detected in S2 in the Eastern part of the reservoir (wetlands) due to SWIR processing

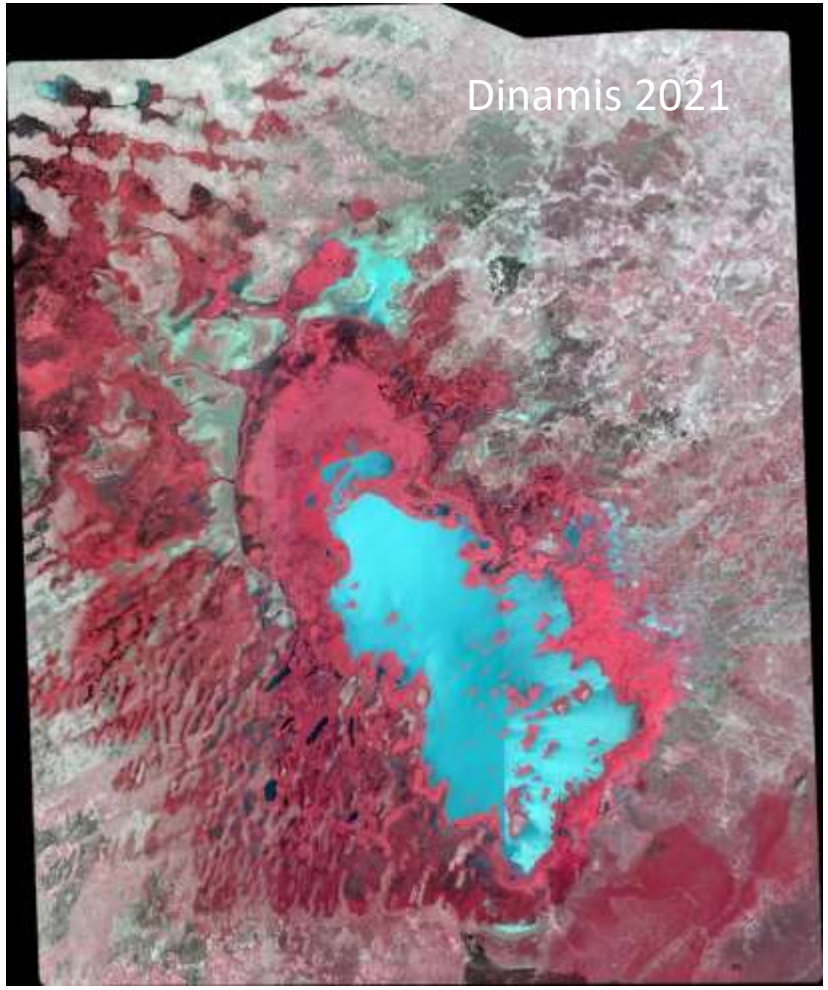
Comparaison LWE S2 / Pleiades: Fern Ridge Reservoir, Oregon USA



More water detected in S2 in the Eastern part of the reservoir (wetlands) due to SWIR processing

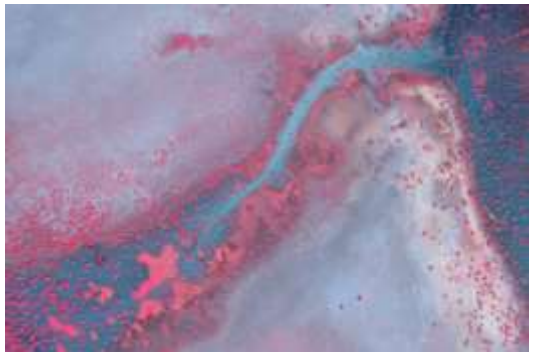
	Pleaides on 26/07/2022, S-2 on 25/07/2022				Pleaides and S-2 on 29/07/2022		
Type	Frequency	Sum Area	Percent		Frequency	Sum Area	Percent
Reference	91	27242769.9	100		102	27205236.4	100
Database	42	28411100.	104.29		51	28188500.	103.61
Omission	84	347057.1	1.27		94	350991.15	1.29
Commission	42	1515387.2	5.53		50	1334254.74	4.73
Detection rate	31	26895712.8	98.73		36	26854245.2	98.71
Accuracy rate	1	999999.0	94.67		1	999999.0 1.0	95.27
Break	1	1.0	1		1	1.0	1
Precision	1	1.0	0.95		1	1.0	0.95
Recall	1	1.0	0.99		1	1.0	0.99
F_score	1	1.0	0.97		1	1.0	0.97
CSI	1	1.0	0.94		1	1.0	0.94

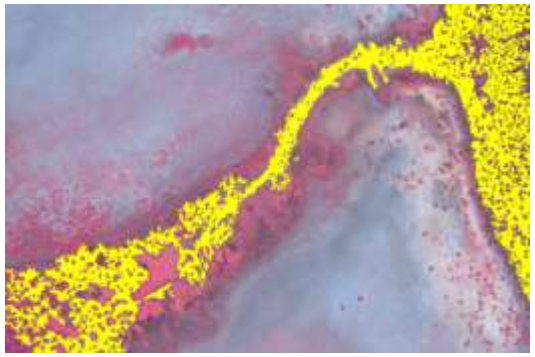
Comparaison LWE S2 / Pleiades: Lac Fitri, Tchad

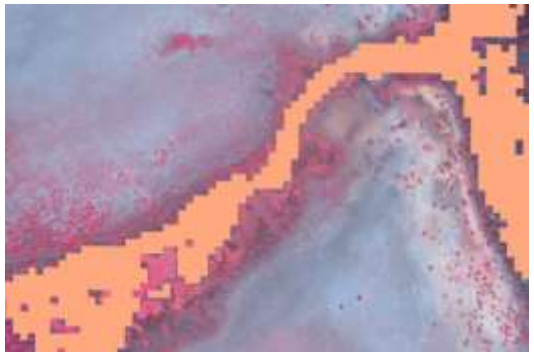


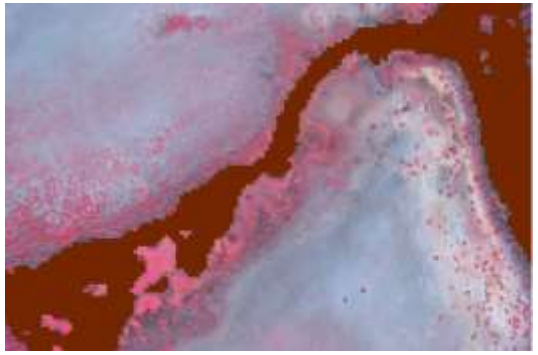
Comparaison Surfaces en eau Sentintel 2 et image Pléiades THR (50cm) acquisitions du 2021-11-11

Comparaison LWE S2 / Pleiades: Lac Fitri, Tchad









Comparison of LWE derived from Pleaides image and Seneintel 2 with UL, Pleiades colour composite of a flood branch of the Fitri lake, upper right, LWE derived from Pleaides, Bottom left, LWE derived from a Sentinel2 image at 20 m of spatial resolution and bottom right, LWE from A Sentinel2 processed at 10m

	S-2 20m versus Pleiades				S-2 10m versus Pleiades		
Type	Frequency	Sum Area	Percent		Frequency	Sum Area	Percent
Reference	63797	370516696.8	100		63797	370516696.8	100
Database	7629	353542800	94.42		8193	361739810.3	97.6
Omission	62591	48843863.9	13.18		94	46444991.5	12.53
Commission	7459	31869966.8	9.01		50	37668104.8	10.41
Detection rate	7353	321672833.1	86.82		36	32417105.3	87.46
Accuracy rate	1	999999.0	90.99		1	999999.0	89.59
Break	1	1.0	1		1	1.0	1
Precision	1	1.0	0.91		1	1.0	0.90
Recall	1	1.0	0.87		1	1.0	0.87
F_score	1	1.0	0.89		1	1.0	0.86
CSI	1	1.0	0.80		1	1.0	0.79

Metrics obtained from the comparison of LWE derived from Pleiades and Sentinel 2 MSI at 20 m (left), and 10 m (right).

Pleiades NEO: nouveau challenge

Pleiades
NEO
30 cm

Bouée ou .. ??

AIRBUS DEFENCE & SPACE

Université de Strasbourg

Sertit ICUBE

Pleiades NEO: nouveau challenge

Pleiades
NEO
30 cm

Bouée ou .. ??

Cygne tuberculé

Poids : 8,5 – 12 kg
Longueur : 1,2 – 1,7 m
Nom scientifique : Cygnus olor
Envergure : 2 – 2,4 m (Adulte)

AIRBUS DEFENCE & SPACE

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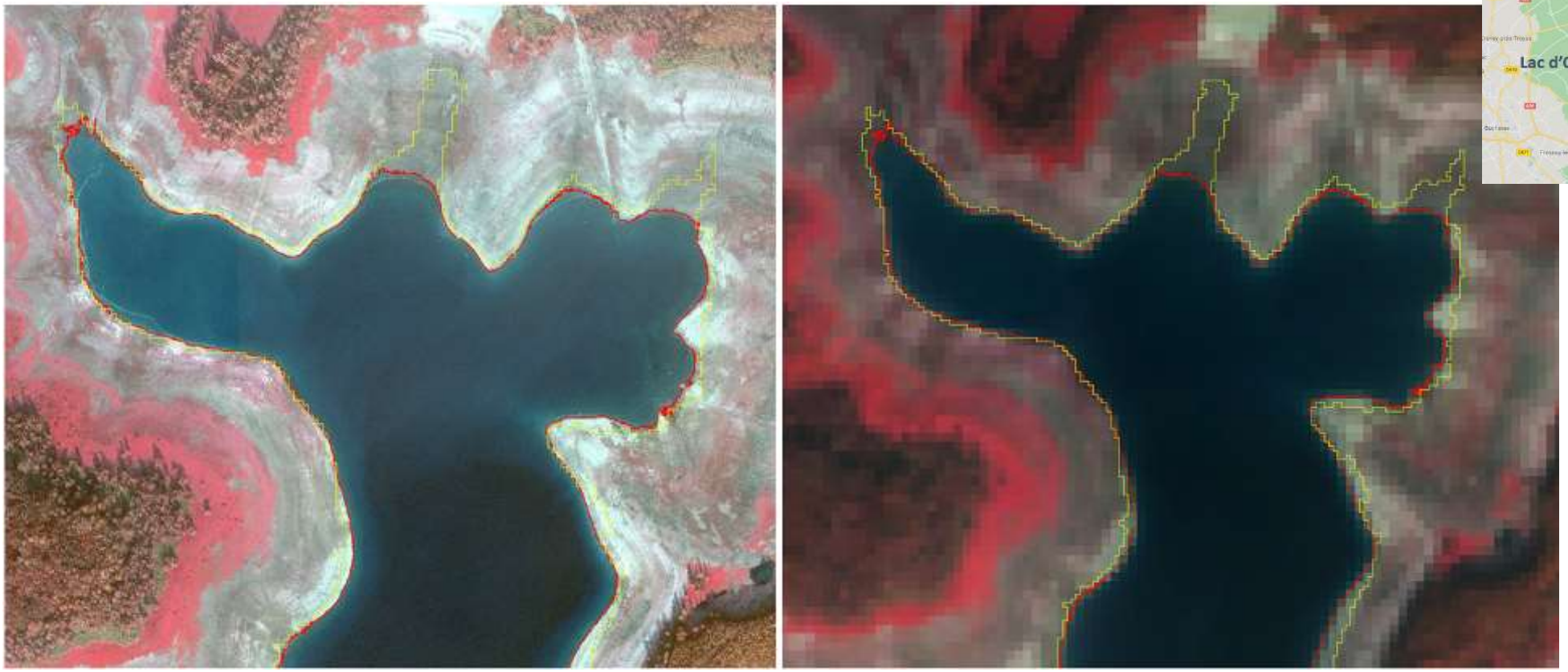
ICUBE

Comparaison LWE S2 / Pleiades NEO

Effect of resolution in Temple Lake. The red line marks LWE from Pleiades NEO (30cm); the yellow line shows the saw tooth limits derived from Sentinel-2 MSI.

Comparaison LWE S2 / Pleiades NEO



Comparison of VHR/HR in Orient Lake. Left: Pleaides NEO. Right: Sentinel-2. Red lines are the LWE limits derived from Pleaides NEO, yellow lines the Sentinel LWE limits

Comparaison LWE S2 / Pleiades NEO

Comparison of VHR/HR in Orient Lake. Left: Pleaides NEO. Right: Sentinel-2. Red lines are the LWE limits derived from Pleaides NEO, yellow lines the Sentinel LWE limits

Comparaison LWE S2 / Pleiades NEO

All			
Metric	FREQUENCY	Area m²	Percentage
reference	72	21693449,96	100,00
database	23	21800055,36	100,49
omission	72	570486,23	2,63
commission	23	677091,66	3,11
taux_detection	17	21122963,70	97,37
taux_justesse	1	999999,00	96,89
BREAK	1	1,00	1,00
precision	1	1,00	0,97
recall	1	1,00	0,97
Fscore	1	1,00	0,97
CSI	1	1,00	0,94

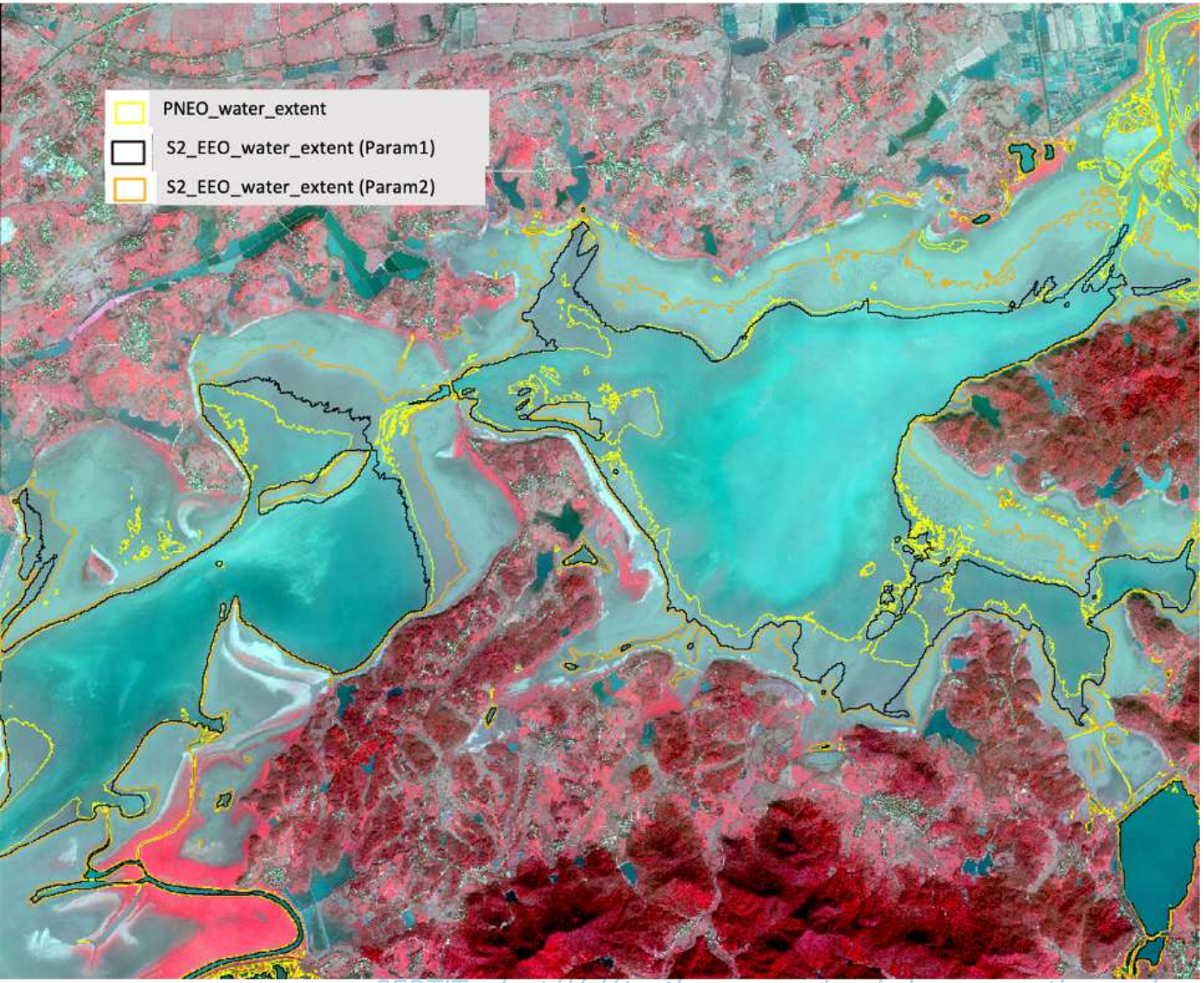
Auzon Temple			
Metric	FREQUENCY	Area m²	Percentage
reference	25	8711286,40	100,00
database	8	8473200,00	97,27
omission	25	338141,24	3,88
commission	8	100054,90	1,18
taux_detectio	6	8373145,10	96,12
taux_justesse	1	999999,00	98,82
BREAK	1	1,00	1,00
precision	1	1,00	0,99
recall	1	1,00	0,96
Fscore	1	1,00	0,97
CSI	1	1,00	0,95

Amance			
	REQUENCY	Area m²	Percentage
	20	1819683,51	100,00
	6	1903600,00	104,61
	20	56409,20	3,10
commission	6	140325,68	7,37
taux_detectio	3	1763274,32	96,90
taux_justesse	1	999999,00	92,63
BREAK	1	1,00	1,00
precision	1	1,00	0,93
recall	1	1,00	0,97
Fscore	1	1,00	0,95
CSI	1	1,00	0,90

Orient			
	FREQUENCY	Area m²	Percentage
nce	13	10829060,28	100,00
se	3	11147755,36	102,94
on	13	96436,30	0,89
ission	3	415131,38	3,72
etectio	2	10732623,98	99,11
ustesse	1	999999,00	96,28
	1	1,00	1,00
on	1	1,00	0,96
recall	1	1,00	0,99
Fscore	1	1,00	0,98
CSI	1	1,00	0,95

Analyse des comparaisons LWE S2 / LWE Pleiades NEO

Comparaison LWE S2 / Pleiades NEO: Shenjing Chine



Sensor	Resol	Date	Surface (km2)
Sentinel-2	**10m**	**07/12/2021**	**33.7**
Pleiades NEO	**0,30**	**10/12/2021**	**32.7**

	Parametrization 1		
Type	Frequency	Sum Area	Pourcent
Reference	513	32691145.8	100
Database	41	33698468.7	103.8
Omission	442	4099507.1	12.54
Commission	30	5106830	15.15
Detection rate	36	28591638.7	87.46
Accuracy rate	1	999999.0	84.85
Break	1	1.0	1
Precision	1	1.0	0.85
Recall	1	1.0	0.87
F_score	1	1.0	0.86
CSI	1	1.0	0.75

Cartographie d Urgence

VA Pleiades : Charte Espace Catastrophes majeures

VA Pleiades : Charte Espace Catastrophes majeures

PNEO très haut niveau de détails

- éléments toits,
- parebrise

EMS - MAPPING
- Who can use the service
- How to use the service
- Portfolio: Rapid Mapping
- Portfolio: Risk and Recovery
- Quality control
- User Guide

RAPID MAPPING
- List of Activations
- Online Manual

RISK AND RECOVERY
- List of Activations
- Map of Activations
- GeoRSS Feed
- Online Manual

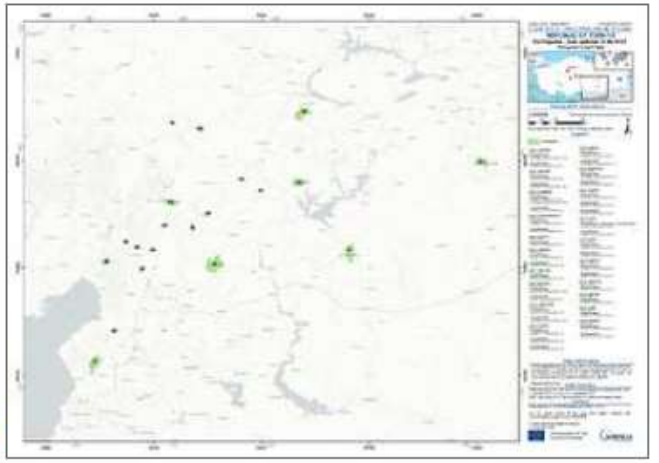
OTHER
- Map of Activations of Other Organizations
- Meetings, Workshops

EMSR648: Earthquake in East Anatolian Fault Zone

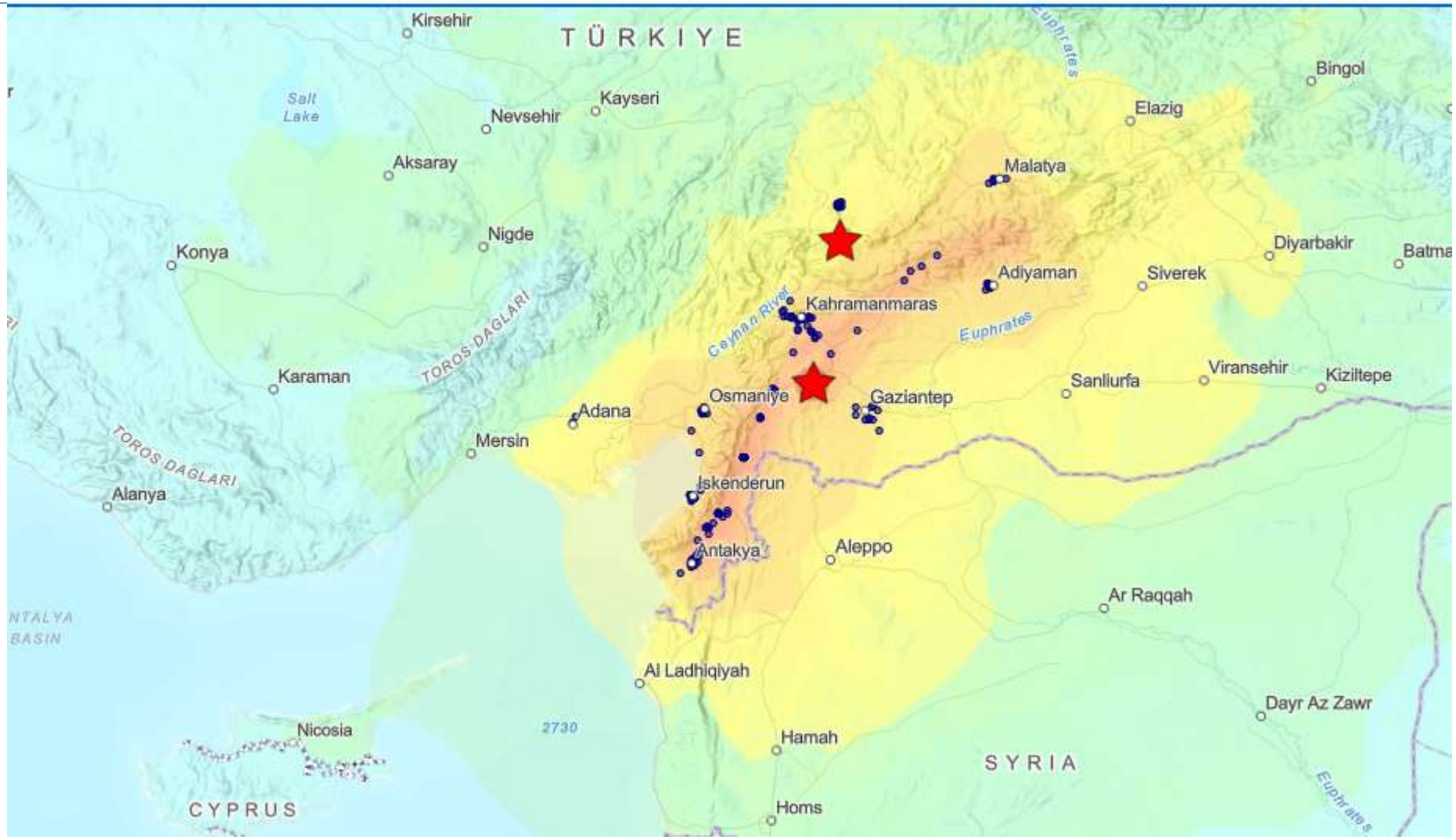
Event Time (UTC): 2023-02-06 01:17
Event Time (LOC): 2023-02-06 01:17
Event Type: Earthquake (Ground shaking)
Activation Time (UTC): 2023-02-06 04:43
Activation Status: Closed
Affected Countries/Territories:
Türkiye
Service Output: 37 products (64 maps)
Grading: 37 products (64 maps)
Authorised User:
EC Services|DG ECHO

Activation Reason:
A 7.8-magnitude quake struck just after 4 a.m. Monday morning local time, 23 kilometers (14.2 miles) east of Nurdagi, Gaziantep province. It is one of the strongest earthquakes to hit Republic of Türkiye in more than 100 years. The event caused dozens of collapsed buildings and fatalities. GDACS ID: EQ1357591.

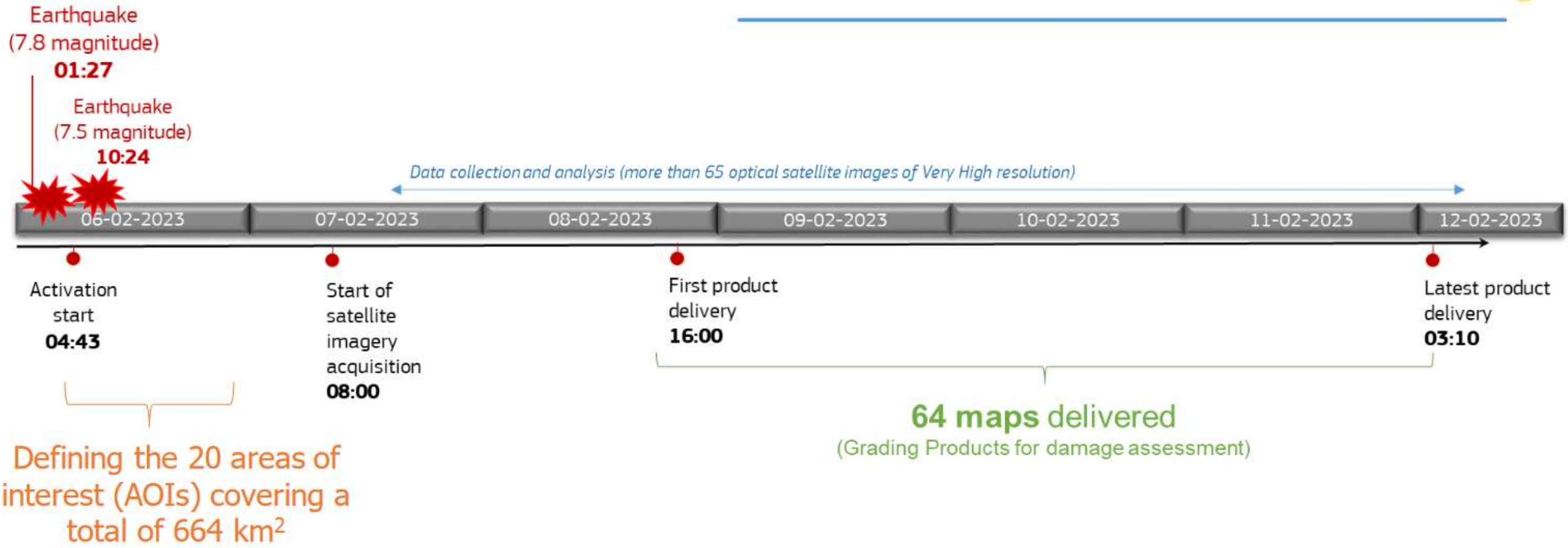
Activation Final Report
Report_EMSR648_Earthquake_Türkiye_20230217.pdf



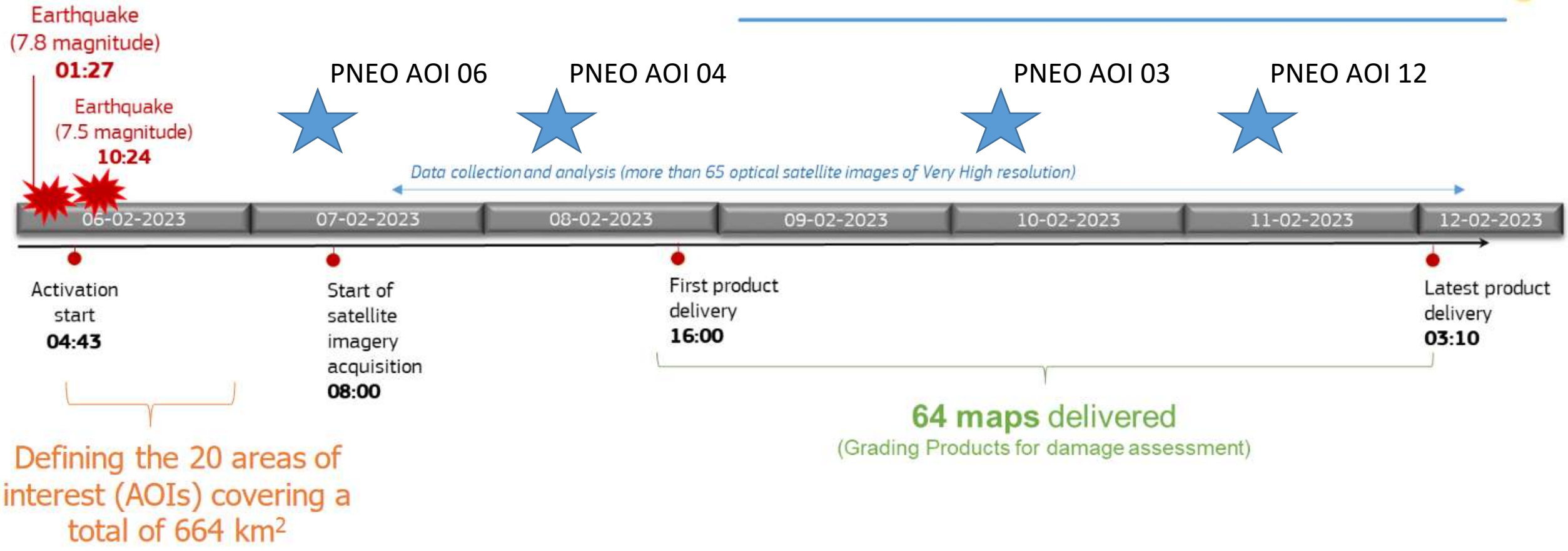
EMSR648 - Activation Extent Map
Release: r10 - Version: v2 - Delivered: 2023-02-13 17:35
View as: EMSR648-AEM-JPG - EMSR648-AEM-KMZ - EMSR648-AEM


TÜRKIYE
Kirsehir
Salt Lake
Nevsehir
Kayseri
Aksaray
Nigde
Konya
Karaman
TOROS DAGLARI
Alanya
Mersin
Adana
Osmaniye
Gaziantep
Kahramanmaras
Ceyhan River
Euphrates
Adiyaman
Malatya
Elazig
Bingol
Siverek
Diyarbakir
Batman
Sanliurfa
Viransehir
Kiziltepe
Iskenderun
Antakya
Aleppo
Ar Raqqah
Al Ladhiqiyah
Hamah
Homs
Dayr Az Zawr
SYRIA
Nicosia
CYPRUS
2730
NTALYA BASIN

EARTHQUAKE EVENT IN EAST ANATOLIAN FAULT ZONE – EMSR648



EARTHQUAKE EVENT IN EAST ANATOLIAN FAULT ZONE – EMSR648



EMSR648: Earthquake in East Anatolian Fault Zone

Event Time (UTC): 2023-02-06 01:17
Event Time (LOC): 2023-02-06 01:17
Event Type: Earthquake (Ground shaking)
Activation Time (UTC): 2023-02-06 04:43
Activation Status: Closed
Affected Countries/Territories:
Türkiye
Service Output: 37 products (64 maps)
Grading: 37 products (64 maps)

GLIDE number: 2023-000015 Activation ID: EMSR648
Int. Charter call ID: 797 Product N.: Activation Extent Map, r10, v2, English

REPUBLIC OF TÜRKIYE
Earthquake - last updated 13/02/2023
Activation Extent Map

Cartographic Information
1:1000000 Full color ISO A2, medium resolution (200 dpi)
0 12.5 25 50 km
N
Tick marks WGS 1984 UTM Zone 37N map coordinate system

Legend
Completed

Map Information
A 7.8-magnitude quake struck just after 4 a.m. Monday morning local time, 23 kilometers (14.2 miles) east of Nurdagi, Gaziantep province. It is one of the strongest earthquakes to hit Türkiye in more than 100 years. The event caused dozens of collapsed buildings and fatalities.

GDACS: EQ1357591

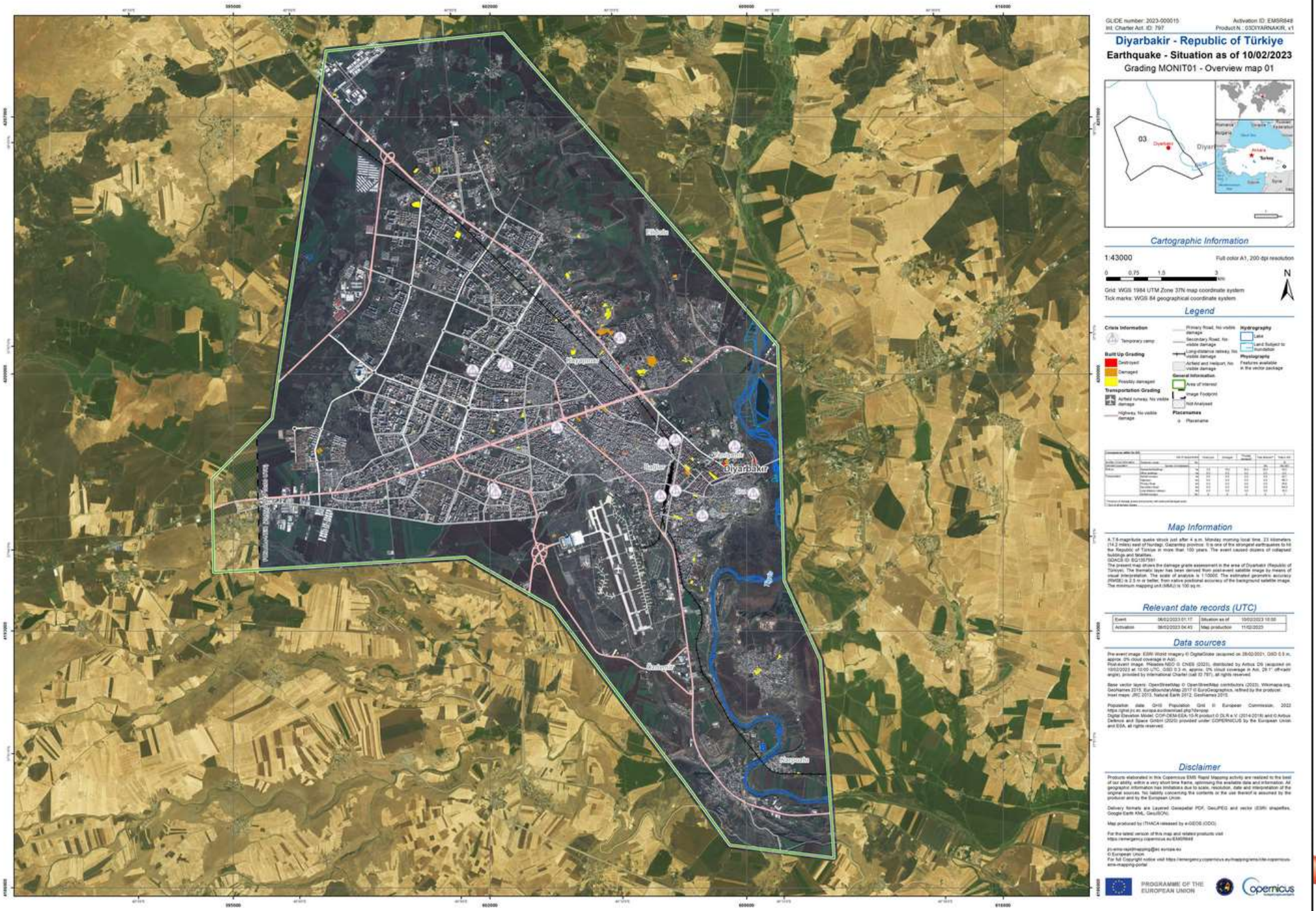
Data Sources
Inset map based on: JRC 2013, © EuroGeographics, Natural Earth 2012, CCM River DB © EUJRC2007, GeoNames 2013
Main map based on: © OpenStreetMap contributors © Natural Earth

Contact
Map produced by e-GEOS released by e-GEOS (ODO).

For the latest version of this map and related products visit http://emergency.copernicus.eu/EMSR648

jrc-ems-rapidmapping@ec.europa.eu
© European Union

PROGRAMME OF THE EUROPEAN UNION
Copernicus

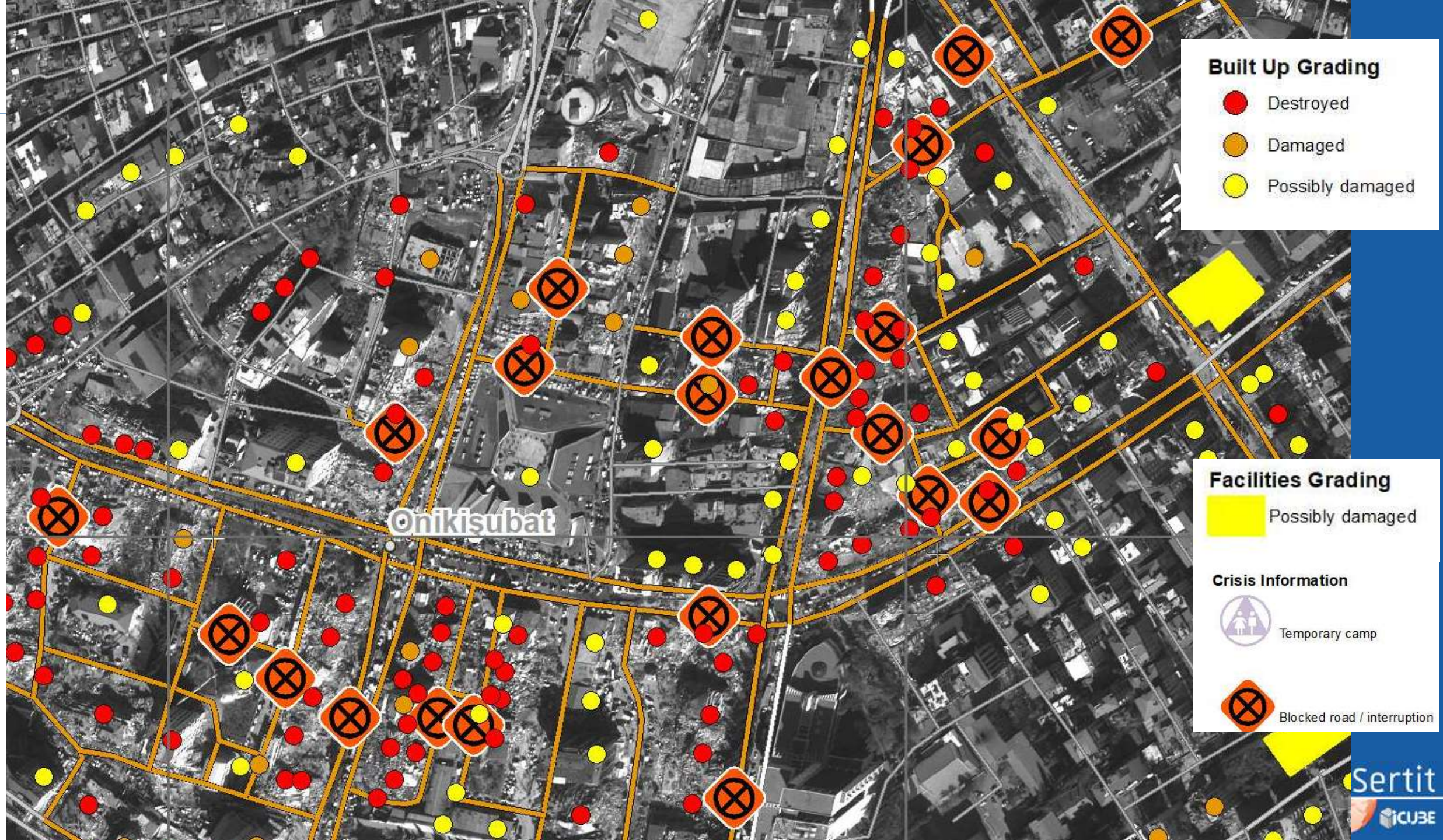

GLIDE number: 2023-000015
Int. Charter Act. ID: 797
Activation ID: EMSR648
Product N.: 03DIYARNAKIR, v1
Diyarbakir - Republic of Türkiye
Earthquake - Situation as of 10/02/2023
Grading MONIT01 - Overview map 01
Cartographic Information
1:43000
Full color A1, 200 dpi resolution
0 0.75 1.5 3 km
N
Grid: WGS 1984 UTM Zone 37N map coordinate system
Tick marks: WGS 84 geographical coordinate system
Legend
Crisis Information
Temporary camp
Built Up Grading
Destroyed
Damaged
Possibly damaged
Transportation Grading
Airfield runway, No visible damage
Highway, No visible damage
Primary Road, No visible damage
Secondary Road, No visible damage
Long-distance railway, No visible damage
Airfield and Heliport, No visible damage
General Information
Area of Interest
Image Footprint
Not Analysed
Placenames
Placename
Hydrography
Lake
Land Subject to Inundation
Physiography
Features available in the vector package
Map Information
Relevant date records (UTC)
Event 06/02/2023 01:17 Situation as of 10/02/2023 10:00
Activation 06/02/2023 04:43 Map production 11/02/2023
Data sources
Disclaimer
PROGRAMME OF THE EUROPEAN UNION
Copernicus

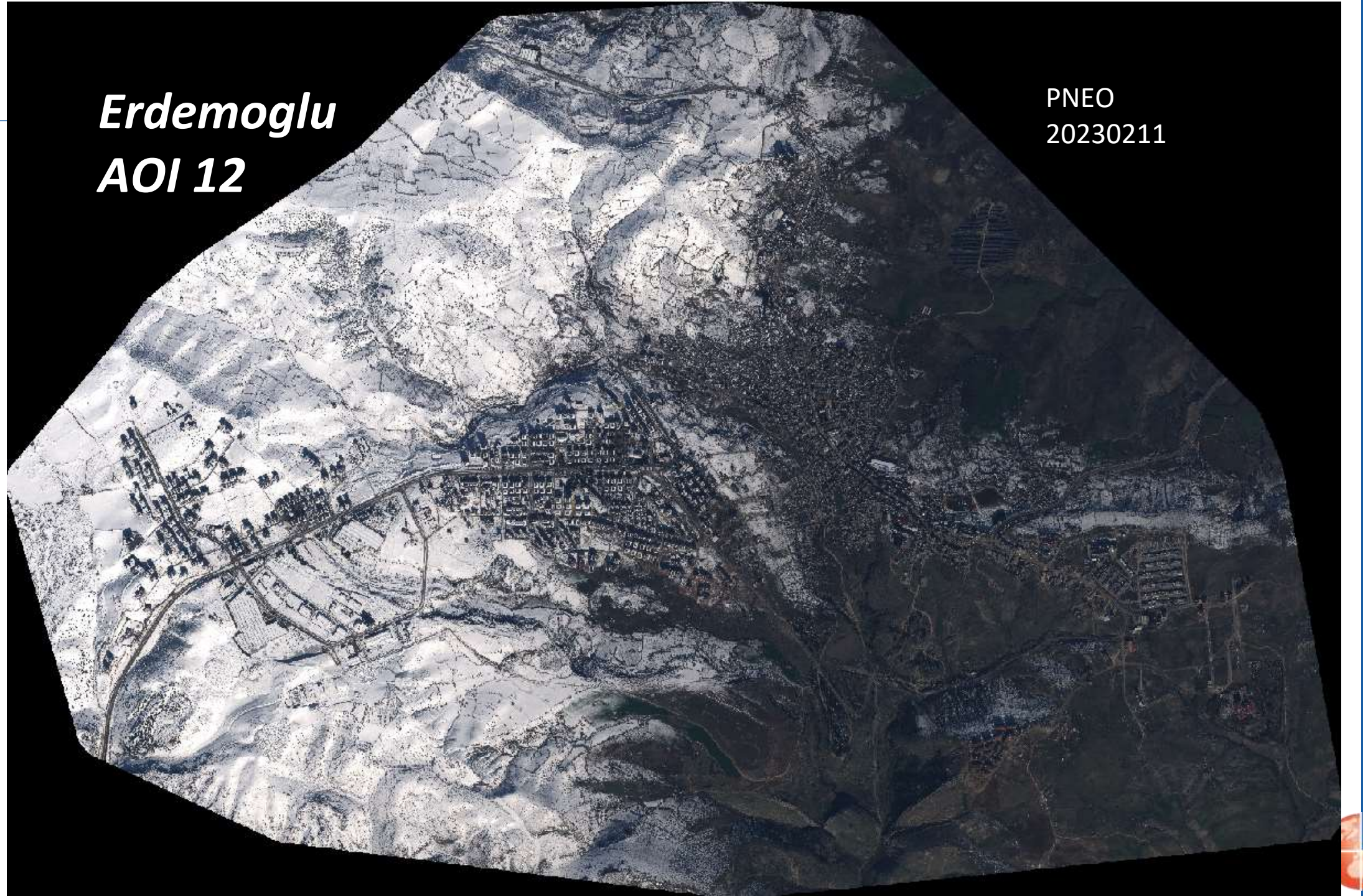
Kahramanmaras

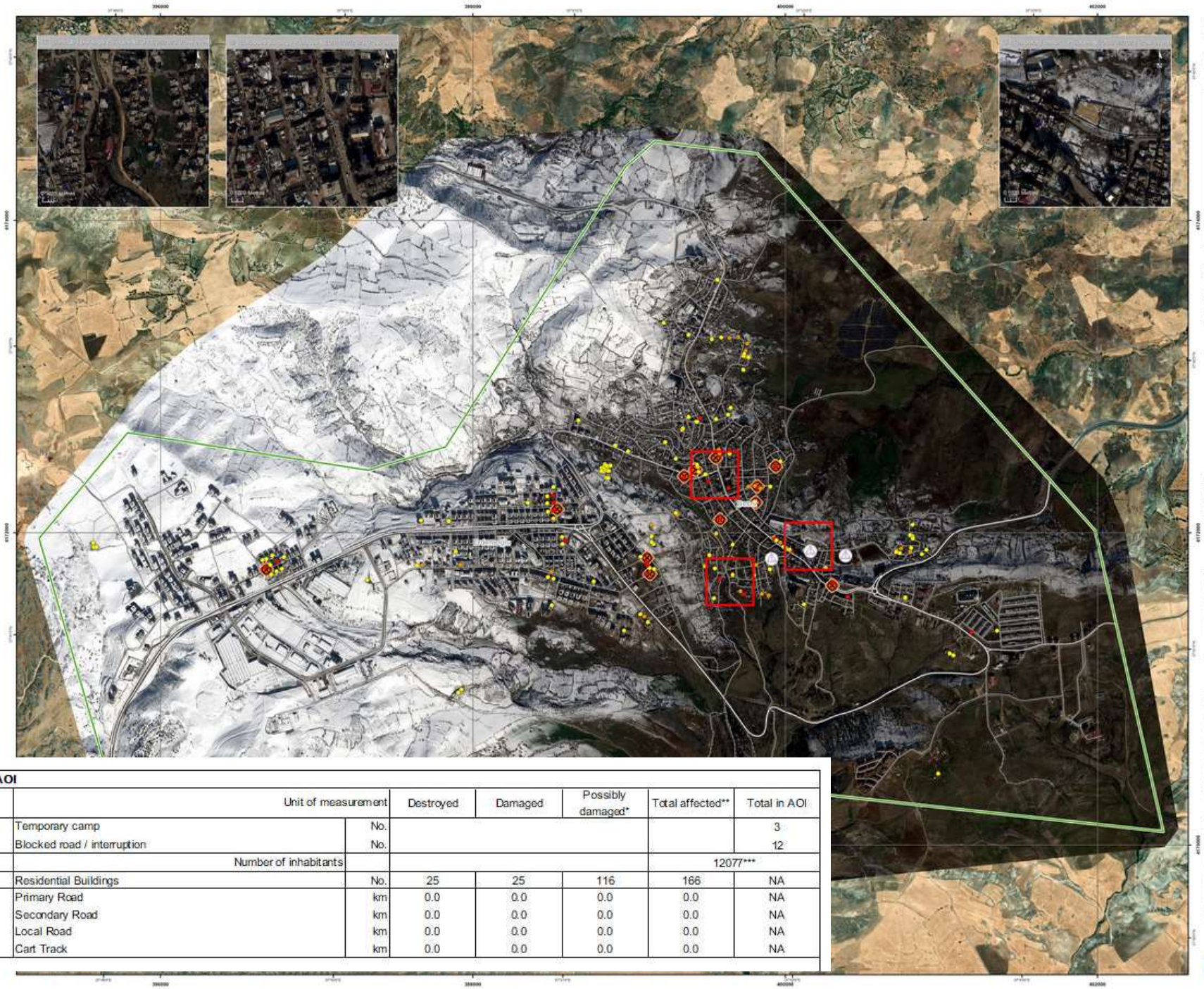
Université de Strasbourg

Sertit ICUBE


GLIDE number: 2023-000015
Int. Charter Act. ID: 797
Activation ID: EMSR648
Product N.: 04KAHRAMANMARAS, v1
Kahramanmaras - REPUBLIC OF TÜRKIYE
Earthquake - Situation as of 08/02/2022
Grading MONIT01 - Detail map 03
Hatay
Cartographic Information
1:5000
Full color A1, 200 dpi resolution
0 0.125 0.25 0.5 km
N
Grid: WGS 1984 UTM Zone 37N map coordinate system
Tick marks: WGS 84 geographical coordinate system
Kahramanmaras
Built Up Grading
Destroyed
Damaged
Possibly damaged
Facilities Grading
Possibly damaged
Crisis Information
Temporary camp
Blocked road / interruption
PROGRAMME OF THE EUROPEAN UNION
Copernicus


Built Up Grading
Destroyed
Damaged
Possibly damaged
Onikişubat
Facilities Grading
Possibly damaged
Crisis Information
Temporary camp
Blocked road / interruption
Sertit
ICUBE


Erdemoglu
AOI 12
PNEO
20230211

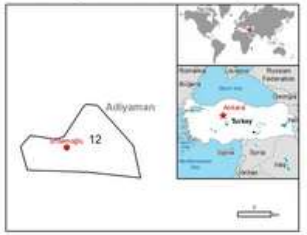


GLIDE number: 2023-000015 Activation ID: EMSR648
Int. Charter Act. ID: 767 Product N. 12ERDEMOGLU_v1

Erdemoğlu - Republic of Türkiye

Earthquake - Situation as of 11/02/2023

Grading MONIT01 - Overview map 01



Cartographic Information

1:11000 Full color A1, 200 dpi resolution

0 0.25 0.5 1 km

N

Grid: WGS 1984 UTM Zone 37N map coordinate system
Tick marks: WGS 84 geographical coordinate system

Legend

Map Information

A 7.6-magnitude quake struck just after 4 a.m. Monday morning local time, 23 kilometers (14.3 miles) east of Nurdagi, Gaziantep province. It is one of the strongest earthquakes to hit Republic of Türkiye in more than 100 years. The event caused dozens of collapsed buildings and fatalities.
GDACS ID: EQ1357591

The present map shows the damage grade assessment in the area of Erdemoğlu (Republic of Türkiye). The thematic layer has been derived from post-event satellite image by means of visual interpretation. The scale of analysis is 1:10000. The estimated geometric accuracy (RMSE) is 2.5 m or better, from native positional accuracy of the background satellite image. The minimum mapping unit (MMU) is 100 sq.m.

Relevant date records (UTC)

Event	06/02/2023 01:17	Situation as of	11/02/2023 09:19
Activation	06/02/2023 04:43	Map production	11/02/2023

Data sources

Pre-event image: Pléiades-1A © CNES (2022), distributed by Airbus DS (acquired on 15/08/2022 at 09:20 UTC, GSD 0.5 m, approx. 0% cloud coverage in AoI, 9.6° off-nadir angle), provided under COPERNICUS by the European Union and ESA, all rights reserved.

Post-event image: Pléiades NEO © CNES (2023), distributed by Airbus DS (acquired on 11/02/2023 at 08:19 UTC, GSD 0.3 m, approx. 0% cloud coverage in AoI, 34.5° off-nadir angle), provided under COPERNICUS by the European Union and ESA, all rights reserved.

Base vector layers: OpenStreetMap © OpenStreetMap contributors (2023), Wikimapia.org. GeoNames (2015, EuroBoundaryMap 2017 © EuroGeographics, refined by the producer. Inset maps: JRC 2013, Natural Earth 2012, GeoNames 2015.

Population data: GHS Population Grid © European Commission, 2022 (https://ghsl.jrc.ec.europa.eu/download.php?ds=pop).
Digital Elevation Model: COP-DEM-EEA-10-R product © DLR e.V. (2014-2018) and © Airbus Defence and Space GmbH (2020) provided under COPERNICUS by the European Union and ESA, all rights reserved.

Disclaimer

Products elaborated in this Copernicus EMS Rapid Mapping activity are realized to the best of our ability, within a very short time frame, optimising the available data and information. All geographic information has limitations due to scale, resolution, date and interpretation of the original sources. No liability concerning the contents or the use thereof is assumed by the producer and by the European Union.

Delivery formats are Layered Geospatial PDF, GeoJPEG and vector (GDB, shapefiles, Google Earth KML, GeoJSON).

Map produced by e-GEOS released by e-GEOS (ODG).

For the latest version of this map and related products visit: https://emergency.copernicus.eu/EMSR648

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Consequences within the AOI

		Unit of measurement	Destroyed	Damaged	Possibly damaged*	Total affected**	Total in AOI
Ancillary Crisis Information	Temporary camp	No.					3
	Blocked road / interruption	No.					12
Estimated population	Number of inhabitants					12077***	
Built-up	Residential Buildings	No.	25	25	116	166	NA
Transportation	Primary Road	km	0.0	0.0	0.0	0.0	NA
	Secondary Road	km	0.0	0.0	0.0	0.0	NA
	Local Road	km	0.0	0.0	0.0	0.0	NA
	Cart Track	km	0.0	0.0	0.0	0.0	NA

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Conclusion - perspectives

- Pléiades a montré la voie
  - Quid de la fin de vie de Pléiades (maintenance en activité aussi longue que possible: Initiative "Longue vie aux Pléiades" de E. Berthier et S. Gascoin)

- Pléiades NEO, très haute valeur
- Comparaison Pléiades / Pléiades NEO :
  - Maroc, séisme Septembre 2023
  - Lybie, rupture/ inondation Septembre 2023
  - atteinte des données Pléiades NEO

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- Grand Grand Merci aux équipes du CNES / Dinamis

DATATERRA DINAMIS

Université de Strasbourg

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Merci de votre attention

Contact : herve.yesou@unsitra.fr