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The May 19, 2021, Schinos [Greece] forest fire

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About

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REGION OF ATTICA

E. Kosmopoulos



INTRODUCTION

This Newsletter is the outcome of a fruitful collaboration and knowledge-sharing among geologists, biologists, and geographers, interested in mapping and monitoring the May 19-24, 2021 forest fire in Geraneia Mountains and its effects. It comprises:

- the brief review of the geography, geology and the geodynamics in the forest fire affected area
- the recent flood and forest fire phenomena of the wider area, as well as the geomorphological evolution of some key-areas
- the description of the forest fire and its spread,
- satellite imagery analysis products providing the boundaries of the affected area
- a map of the estimated fire severity
- Normalized Difference Vegetation Index (NDVI) delivered from satellite imagery of the area before and after the forest fire
- the preliminary assessment of loss on vegetation, domestic animals, flora and fauna based on field survey and other sources.
- the presentation of the effects on the build environment, mobile objects, road network, and infrastructure of the affected area, as recorded in the field surveys conducted by the Post-graduate Studies Program "Environmental Disasters & Crises Management Strategies", University of Athens scientific team during the phenomenon
- the impact of the forest fire on the geomorphology and drainage network, derived from the field survey and topographical models produced by UAV raw data, as well as the assessment of high-risk points or areas for near-future landslides, rockfalls, landfalls, or debris flow phenomena
- the case of the Vamvakes alluvial and the risk of the specific area
- the study conclusions regarding the post-fire near-future hazards in the area



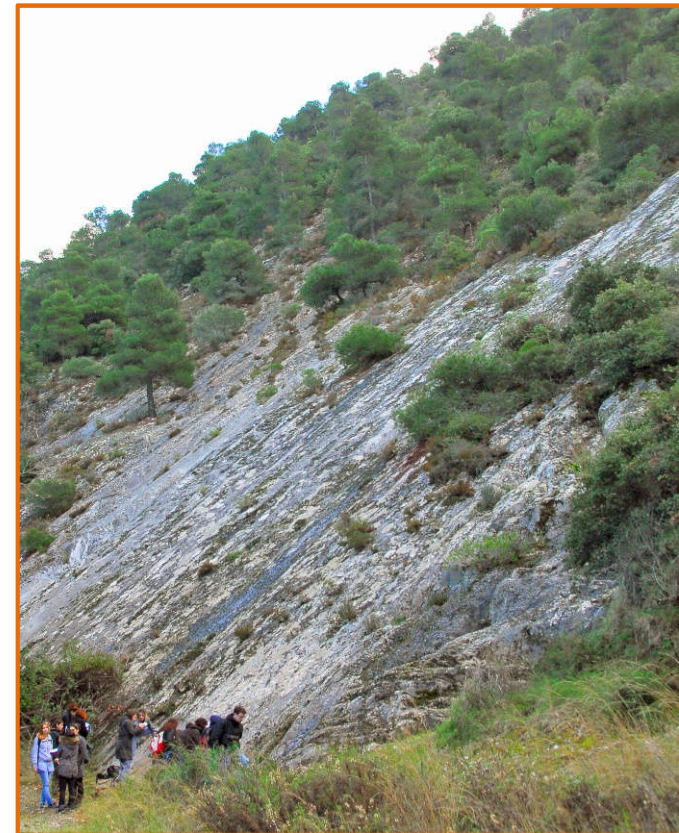
GEOLOGY, TECTONICS AND GEOMORPHOLOGICAL SETTING

Mt Geraneia (max. altitude 1369 m, Makryplagi peak) is a mountain with considerable relief and steep slopes dropping down both towards the Corinth and the Saronic gulfs, to the north and south, respectively. This mountainous mass forms a natural barrier between central mainland Greece and the Peloponnesus, a natural obstacle that should be circumvented, either via its northern or southern sides. The northern pass involves a long and tedious detour, so the most straightforward corridor runs along the southern flank, which has been known under the name of Kakia Skala, i.e., the Skironian Rocks of the antiquity.

The mountain is characterized by outcrops of Mesozoic carbonate rocks, tectonically overlain by an ophiolitic suite. The latter consists of peridotites, and serpentinites, mafic bodies, shales and cherts and outcrops at the central part of the mountain and its northern flanks, while the carbonate outcrops dominate the entirety of the eastern western and southern parts of it.

The northern margin of Geraneia is controlled by the normal to oblique-normal, north-throwing

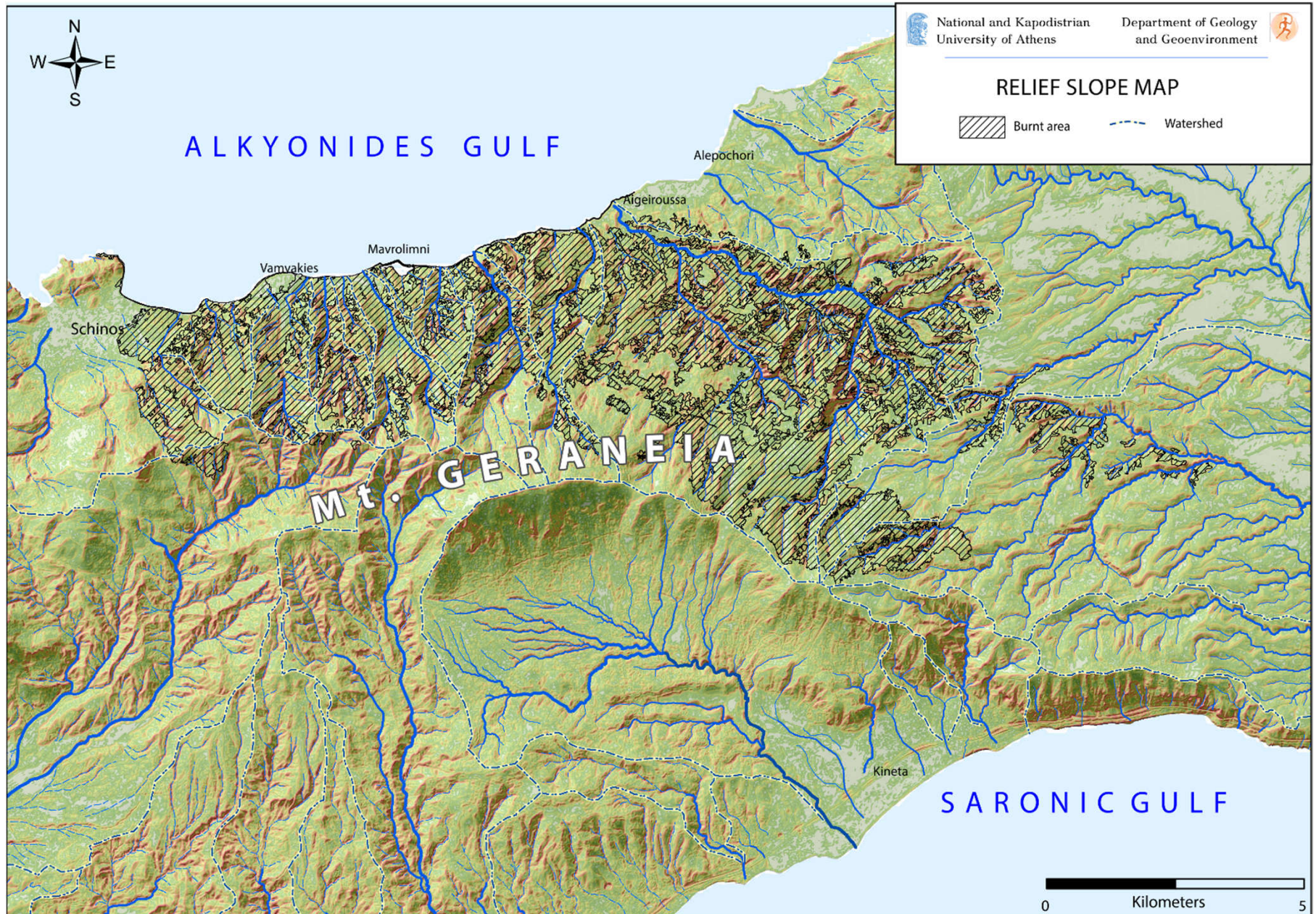
onshore Schinos and Pissia faults (both of which were reactivated in the 1981 earthquake sequence) and partly by the active offshore Alepochori fault. These active faults are mainly responsible for the uplift of the Geraneia range.



Pissia Fault

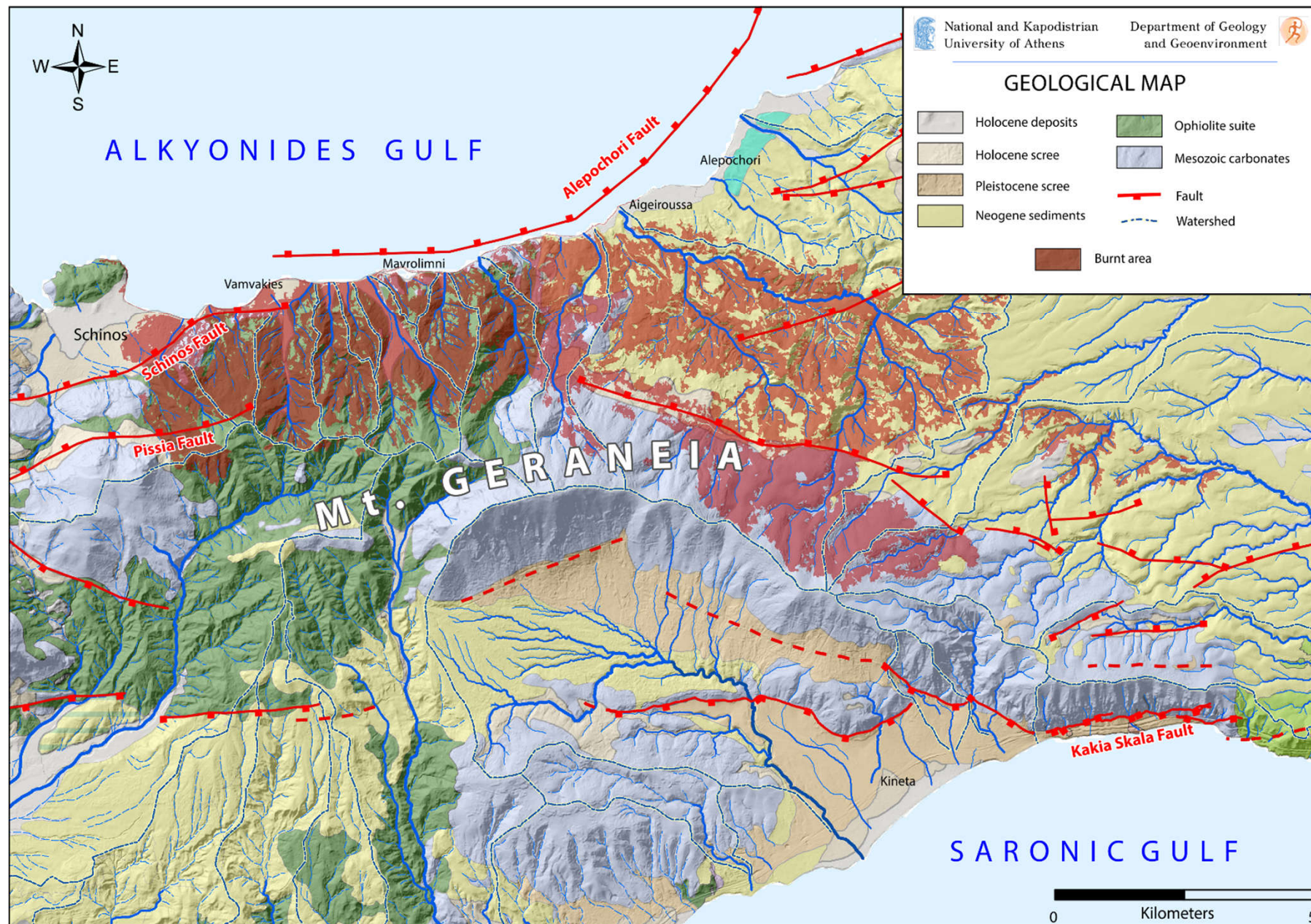


RELIEF SLOPE MAP





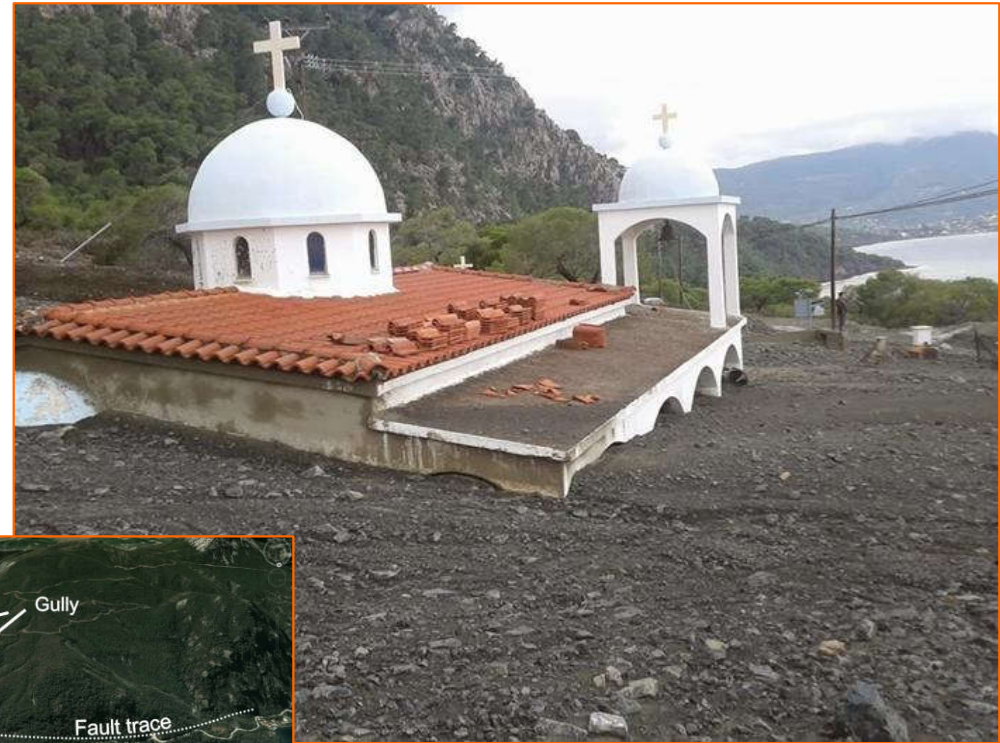
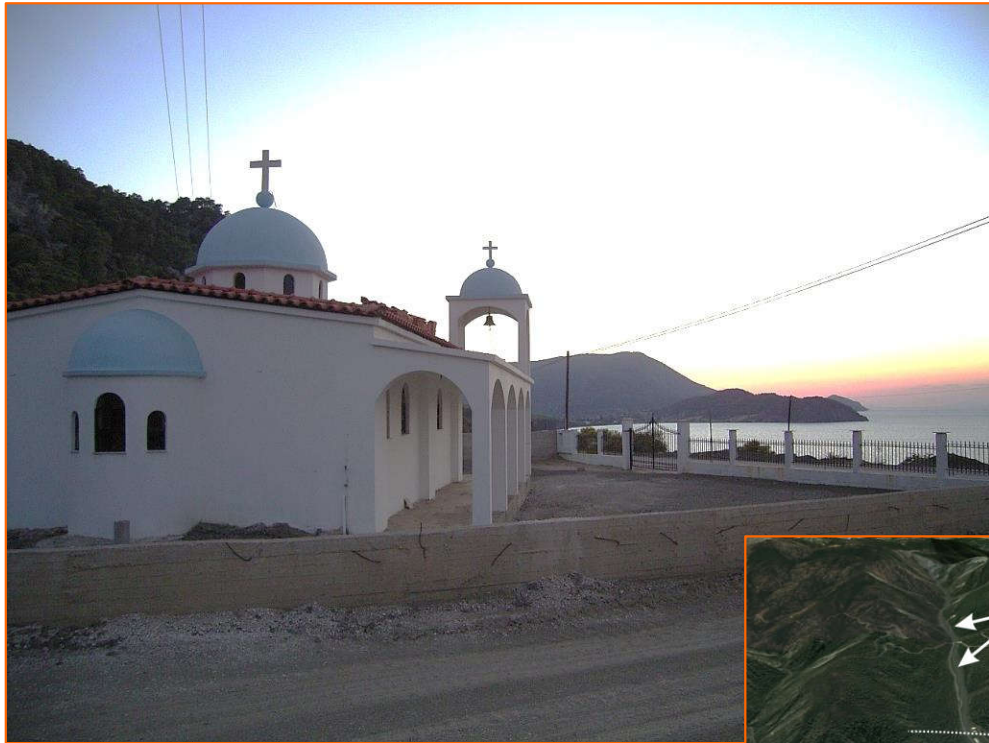
GEOLOGICAL MAP





RECENT CATASTROPHIC EVENTS

SCHINOS, CORINTH FLOOD 2013 (NORTH OF THE GERANEIA Mt.)



In December 2013, after a short torrential downpour, debris covered almost entirely a church in Vamvakes that had been built some years before on Soureas torrent active streambed.



RECENT CATASTROPHIC EVENTS

KINETA, WEST ATTICA FIRE 2018 (SOUTH OF THE GERANEIA Mt.)



On July 23rd 2018 (13:00 local time) a forest fire started west of Athens near Kineta, West Attica (coast of the Saronic Gulf, south of the Geraneia mountains).

A total of 14 people were injured, more than 60,000 acres of dense pine forest were burned, and hundreds of vacation houses were damaged.

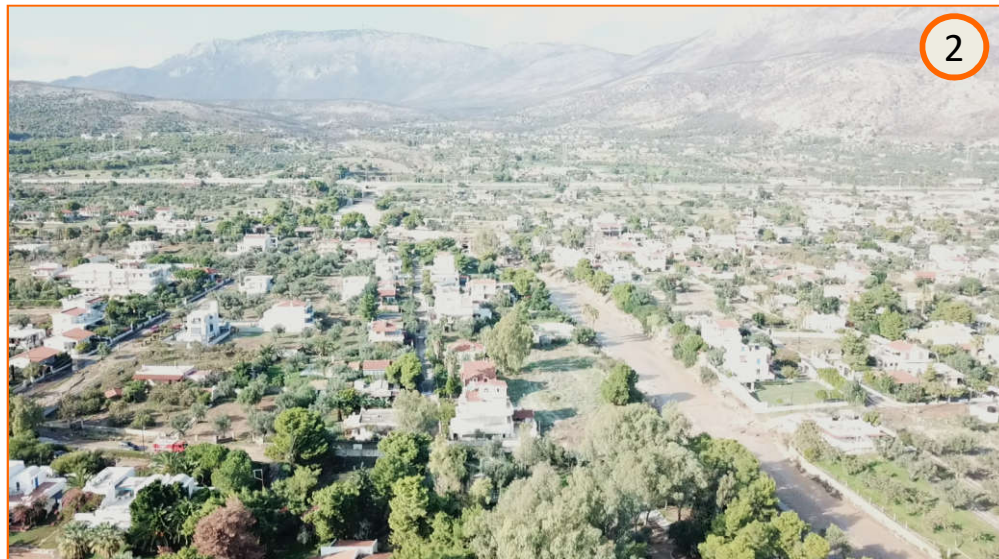
Images above produced from footage captured by UAV flights carried out by the NKUA team at the time.





RECENT CATASTROPHIC EVENTS KINETA, WEST ATTICA FLOOD 2019

Impacts on the
coastal zones
(fig. 1)



On 25 November 2019 a post-fire flood was triggered at Kineta, West Attica. The image upstream (fig. 2) and downstream (fig. 3, 4) describes the effects to the settlement. Damages were caused to the built and natural environment with flooded houses, flooded infrastructures and geomorphological changes. The flood was intensified to a great extent by the fire of 2018 in the Pikas torrent catchment showing the post-fire potential of the area.



THE MAY 19, 2021 SCHINOS FOREST FIRE

On Wednesday, May 19, 2021 (21:45), a forest fire broke out in a grassland eastern of Schinos, Corinthia, adjacent to a forest area. Agricultural remains burning has been speculated as the cause of the forest fire. Because of the extreme weather conditions, fire spread swiftly to the east, affecting, as it travelled along, a series of settlements throughout the Geraneia Mts.

The wide seismic active area with intense morphology around the Gulf of Corinth has a rugged terrain with steep slopes, which along with the winds (up to 8 Beaufort wind gusts), and the dense vegetation, facilitated the spread of fire and made it difficult to extinguish it.

The forest fire has entered the territory of Attica Region on May 20. Part of the smoke from the fire was transported to Attica, resulting in a gradual increase of particulate pollution levels, as recorded in real time by the particulate matter monitoring network.

Single European Emergency Phone Number Service 112 has been activated 3 times at May 20, calling people located in Chani Derveni, Pefkeneas,,

Liakoto, Aegirouses-Dourakos settlements and near the church of Agios Ierotheos to evacuate. Fire Service also evacuated Schinos, Agia Sotira, Vamvakies, Mazi, Mavrolimni, Pefkogiali, Paraskeva, Monasteries of Agios Ioannis and Agia Paraskevi.

GR-ALERT

Γενική Γραμματεία Πολιτικής
Προστασίας **20-05-2021 13:45**.
Δασική πυρκαγιά σε εξέλιξη
και ραγδαία ενίσχυση ανέμων
στην περιοχή σας. Αν βρίσκε-
στε στην ευρύτερη περιοχή
από Χάνι Δερβένι έως Άνω και
Κάτω Πευκενέα, απομακρυν-
θείτε άμεσα προς Μέγαρα για
προληπτικούς λόγους.

Civil Protection Greece
20-05-2021 13:45. Wildfire in
your area, winds are rapidly
increasing. If you are located in
the area between Chani Derveni,
Ano and Kato Pefkeneas,
evacuate now towards Megara
as a precaution.

OK

One of the 112 alert
messages sent
during the forest fire



THE MAY 19, 2021 SCHINOS FOREST FIRE

The same day (May 20), the Copernicus EMS Rapid Mapping Service has been activated and the same night produced the first disaster delineation showing a 5,664.1 ha and a 6,647 ha burnt area in the second version at May 26 (spatial resolution=12m).

Using 3m-resolution satellite data, we delineated the area at 46,687 decares of:

- coniferous forest (75.49%),
- shrublands (15.51%),
- arable land (8.33%),
- open shrublands (0.60%), and
- permanent crops (0.08%),

leaving scattered unaffected patches, including approximately 6,414 decares (13.74%) of Natura 2000 area.

Burned houses, infrastructure damages and loss in fauna are included in the aftermath of the forest fire in the north part of Geraneia Mountains.

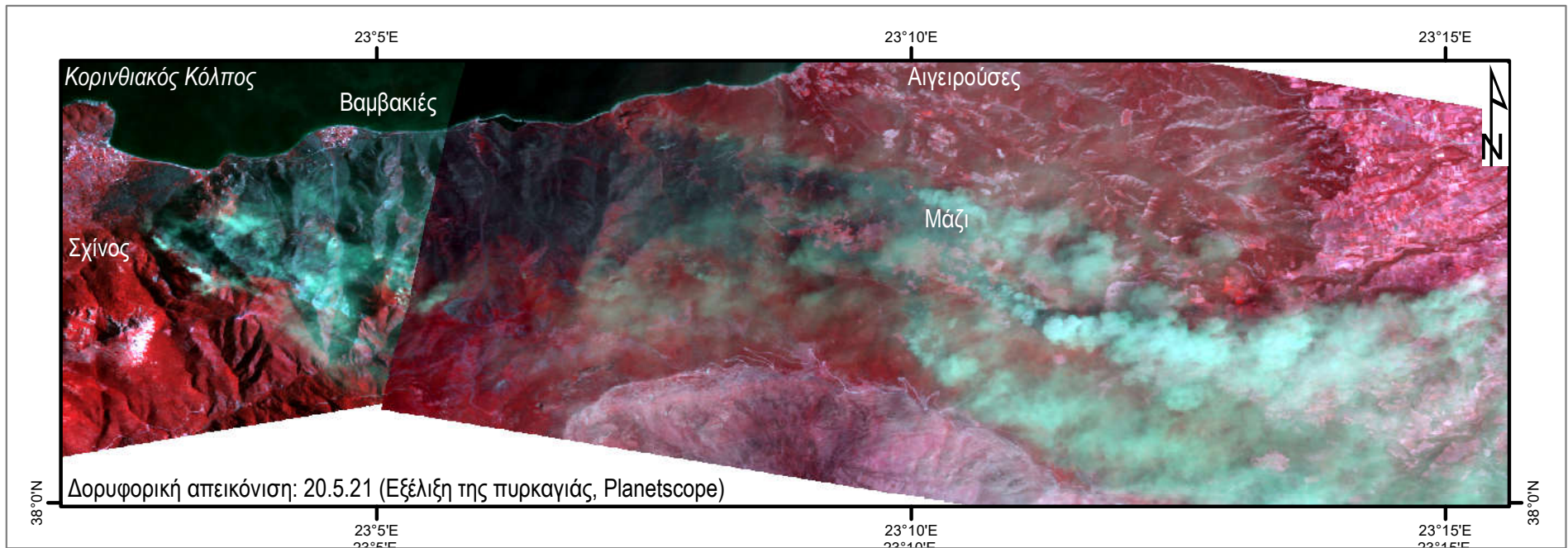
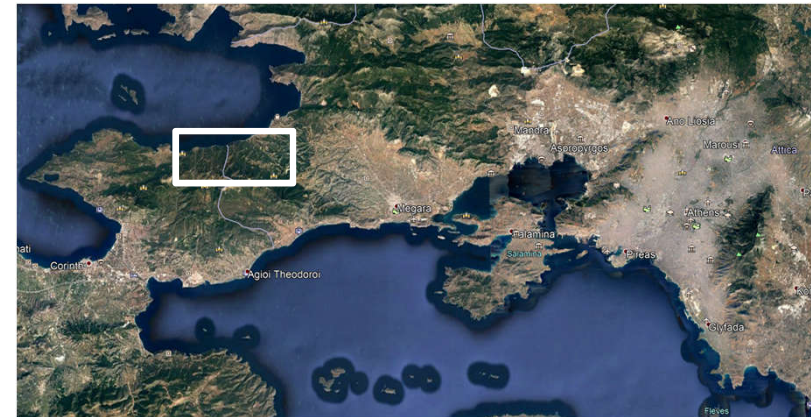
The geological and geomorphological conditions of the area increase the post-fire risk of flood and landslide phenomena.

It is significant to note that at July 23, 2018 the south part of Geraneia Mountains has been burnt. 16 months later, at November 24-25, 2019 [a destructive flood has been recorded in Kineta](#), south of Geraneia Mountains.

From *Hellenic General Secretariat for Civil Protection, Copernicus EMS, Hellenic Fire Service*



THE MAY 19, 2021 SCHINOS FOREST FIRE



False-color satellite image of the effected area during the disaster (20.05.2021)
[Planetscope - Spatial Resolution: 3m]



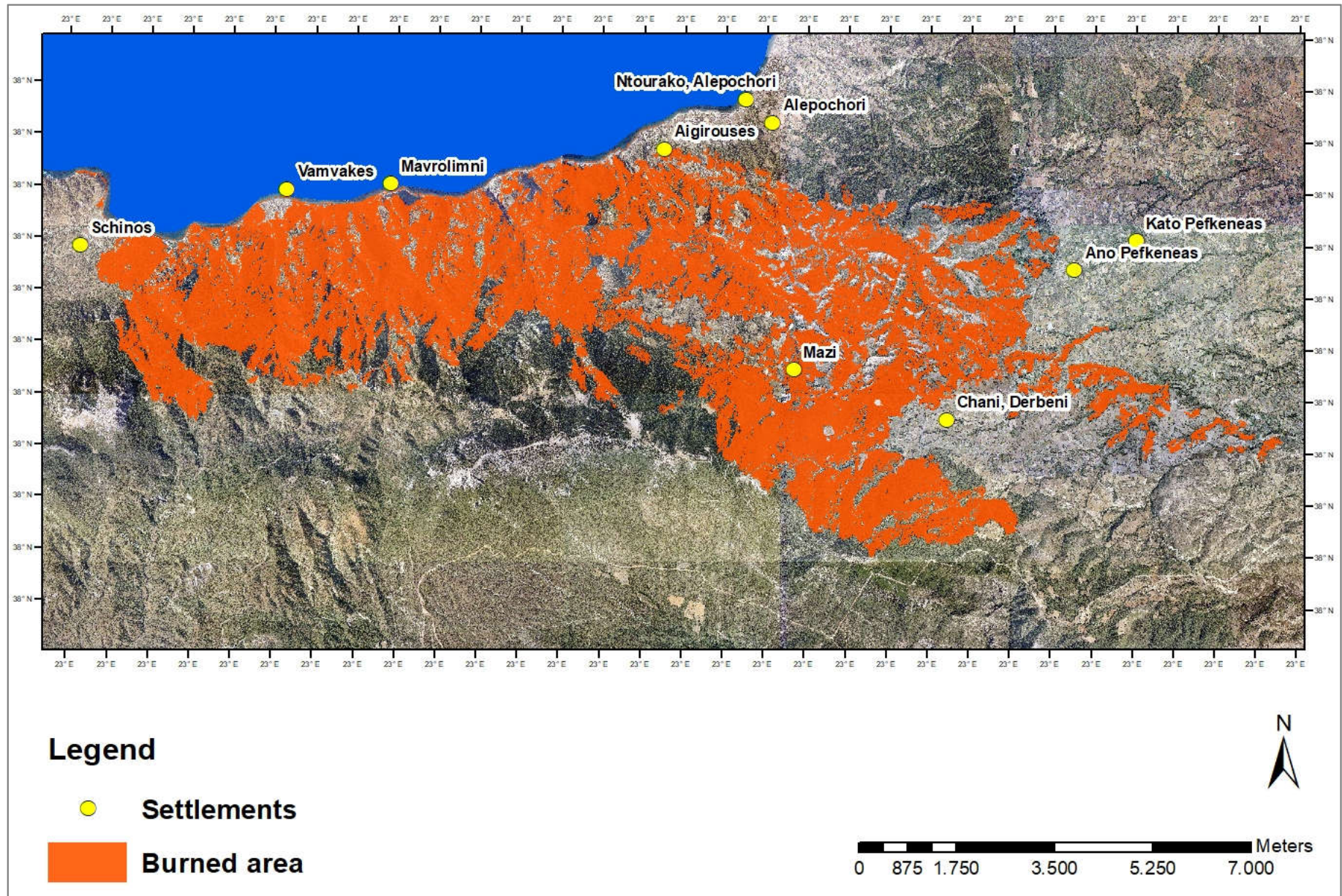
THE MAY 19, 2021 SCHINOS FOREST FIRE
APPROXIMATE BOUNDARIES OF THE FIRE AFFECTED AREA (Copernicus EMS, Sentinel2 | S.R.:12m)



From COPENICUS Emergency Management Rapid Mapping Service
<https://emergency.copernicus.eu/mapping/list-of-components/EMSR510>

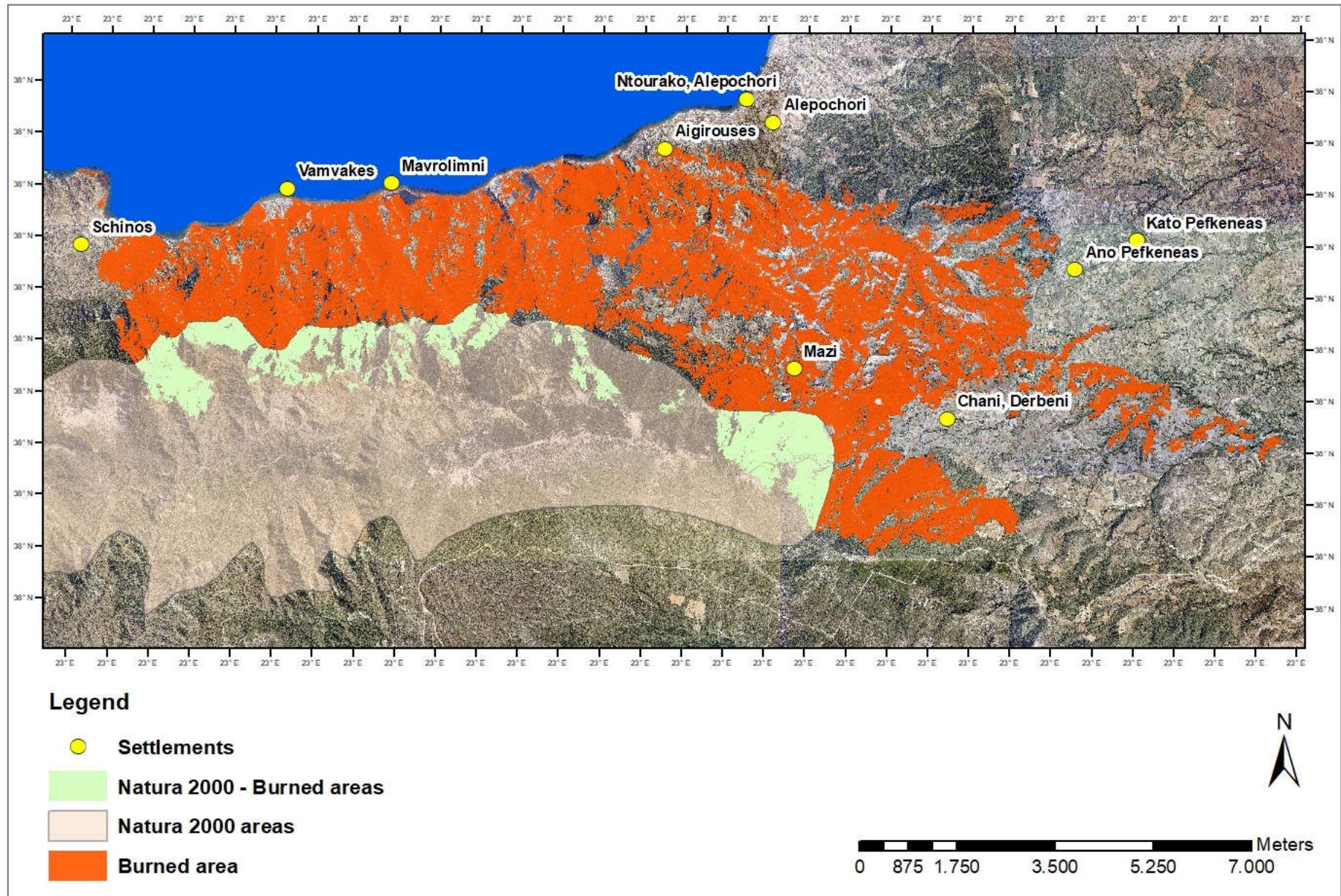


THE MAY 19, 2021 SCHINOS FOREST FIRE BOUNDARIES OF THE FIRE AFFECTED AREA (Planetscope | S.R.: 3m)



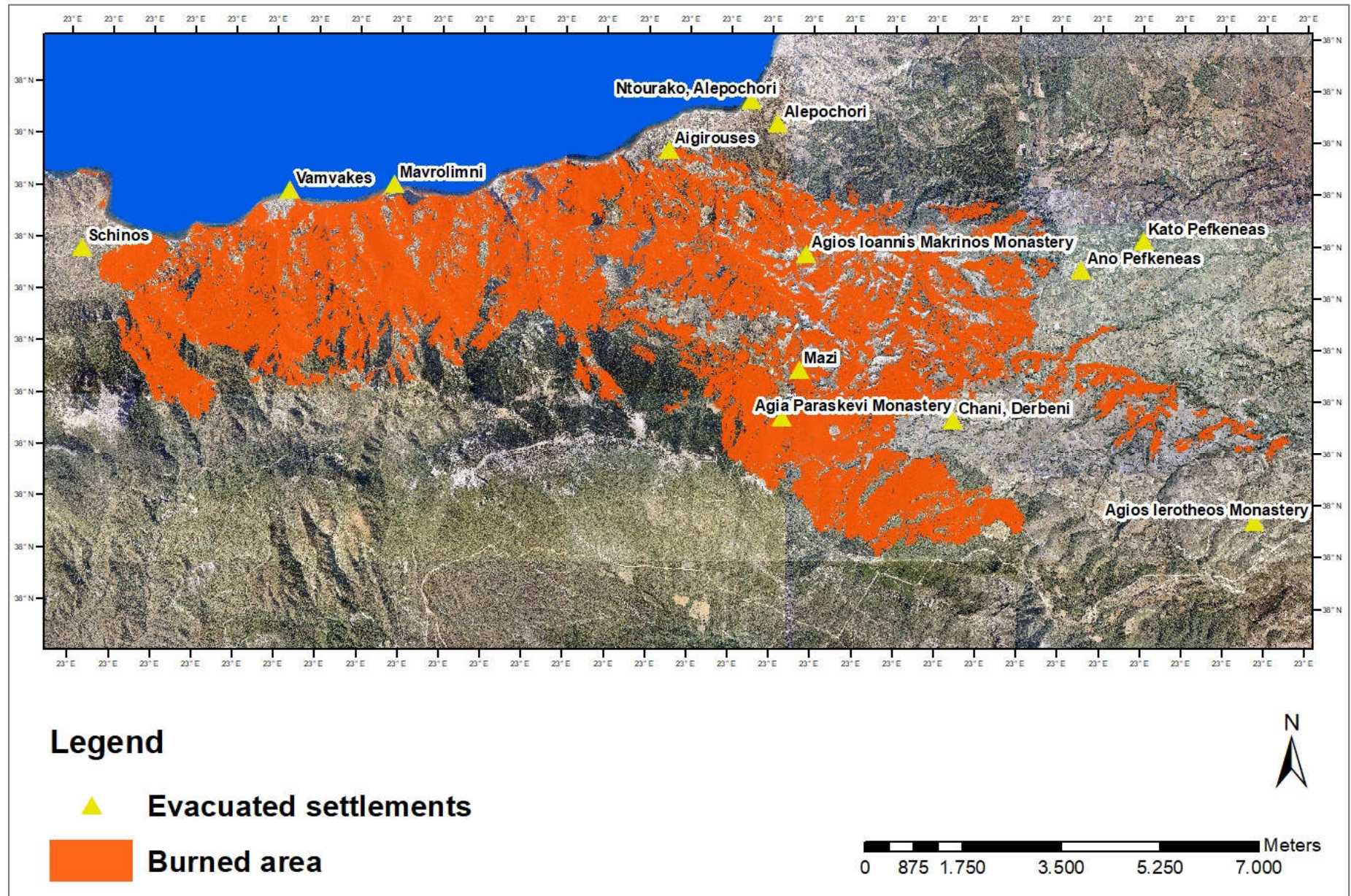


THE MAY 19, 2021 SCHINOS FOREST FIRE BOUNDARIES OF THE FIRE AFFECTED AREA AGAINST LOCAL NATURA 2000 AREA





THE MAY 19, 2021 SCHINOS FOREST FIRE EVACUATED SETTLEMENTS





THE MAY 19, 2021 SCHINOS FOREST FIRE **BOUNDARIES OF THE FIRE AFFECTED AREA – UAV (DRONE) DATA**



Schinos settlement



Rokas Village



Vamvakes – Mavrolimni Road



Aigirousa Road



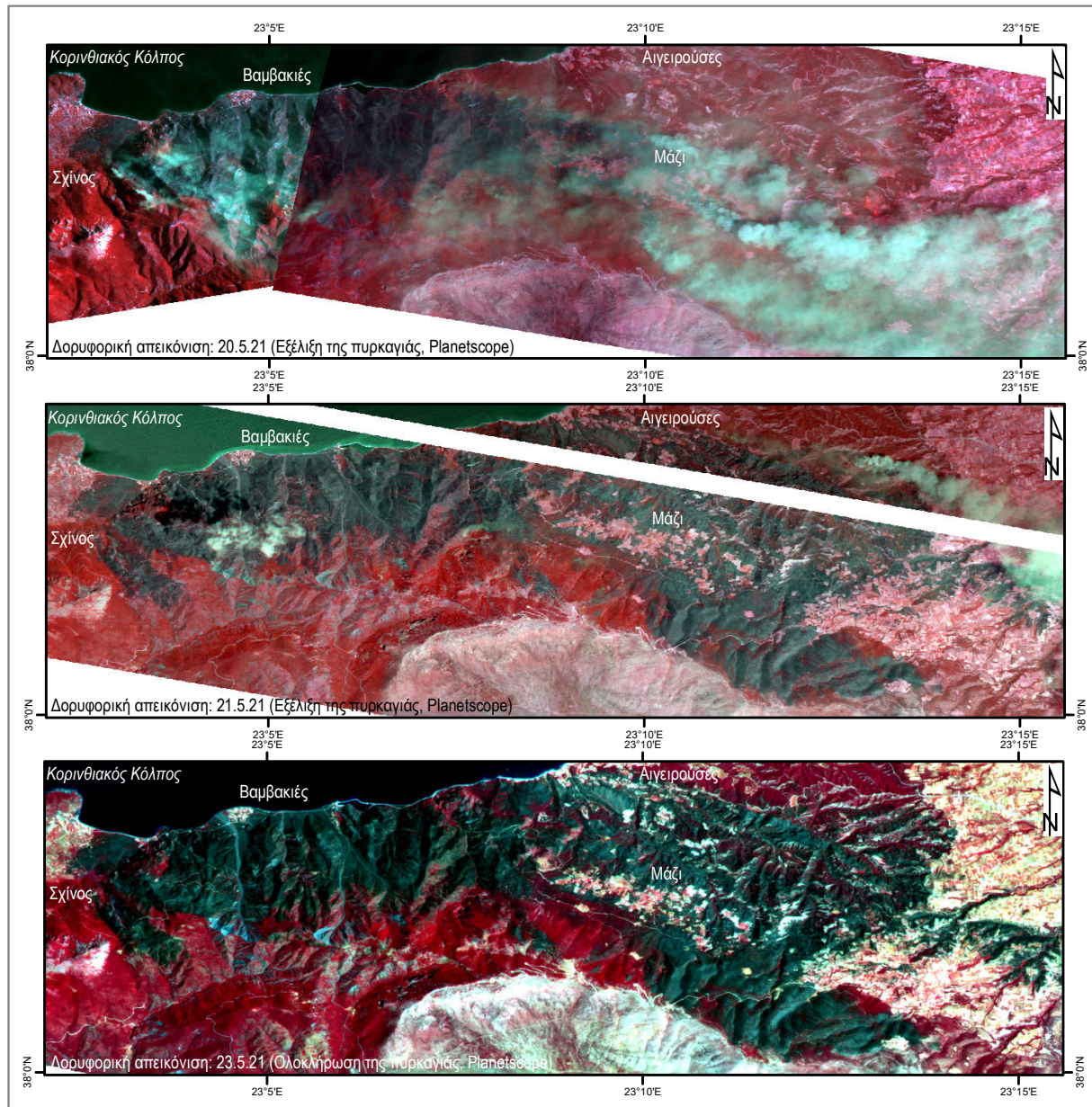
THE MAY 19, 2021 SCHINOS FOREST FIRE UAV (DRONE) DATA



Some vegetation patches (with lighter shade) have remained unburnt in the boundaries of the fire affected area. Monitoring and processing with the use of aerial observations (Drone imagery).



THE MAY 19, 2021 SCHINOS FOREST FIRE THE FOREST FIRE SPREAD



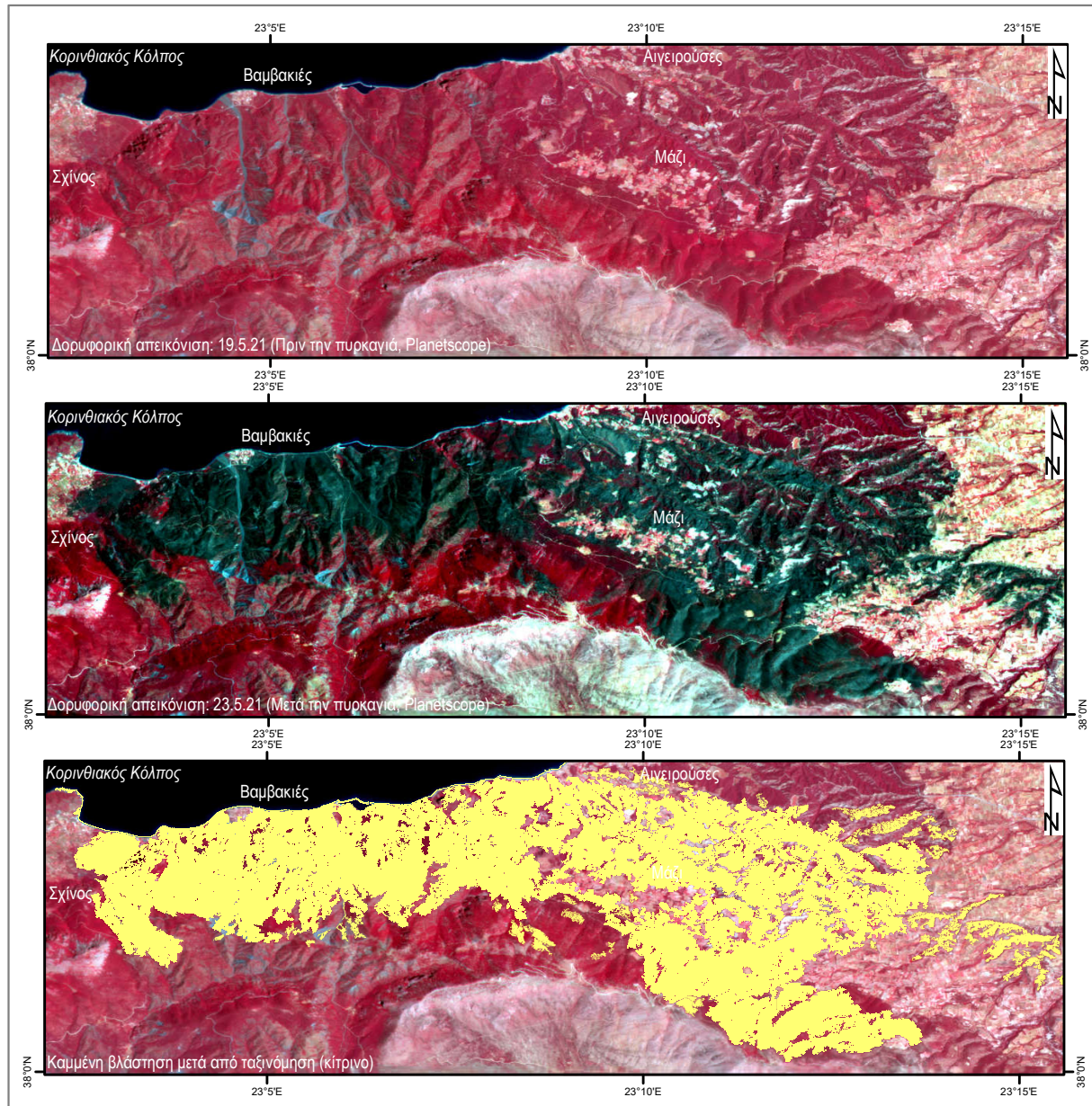
False-color satellite images of the affected area during the fire:

- 20.05.2021 (up)
- 21.05.2021 (middle)
- 23.05.2021 (down)

[Planetscope - Spatial Resolution: 3m]



THE MAY 19, 2021 SCHINOS FOREST FIRE IMPACT ON VEGETATION

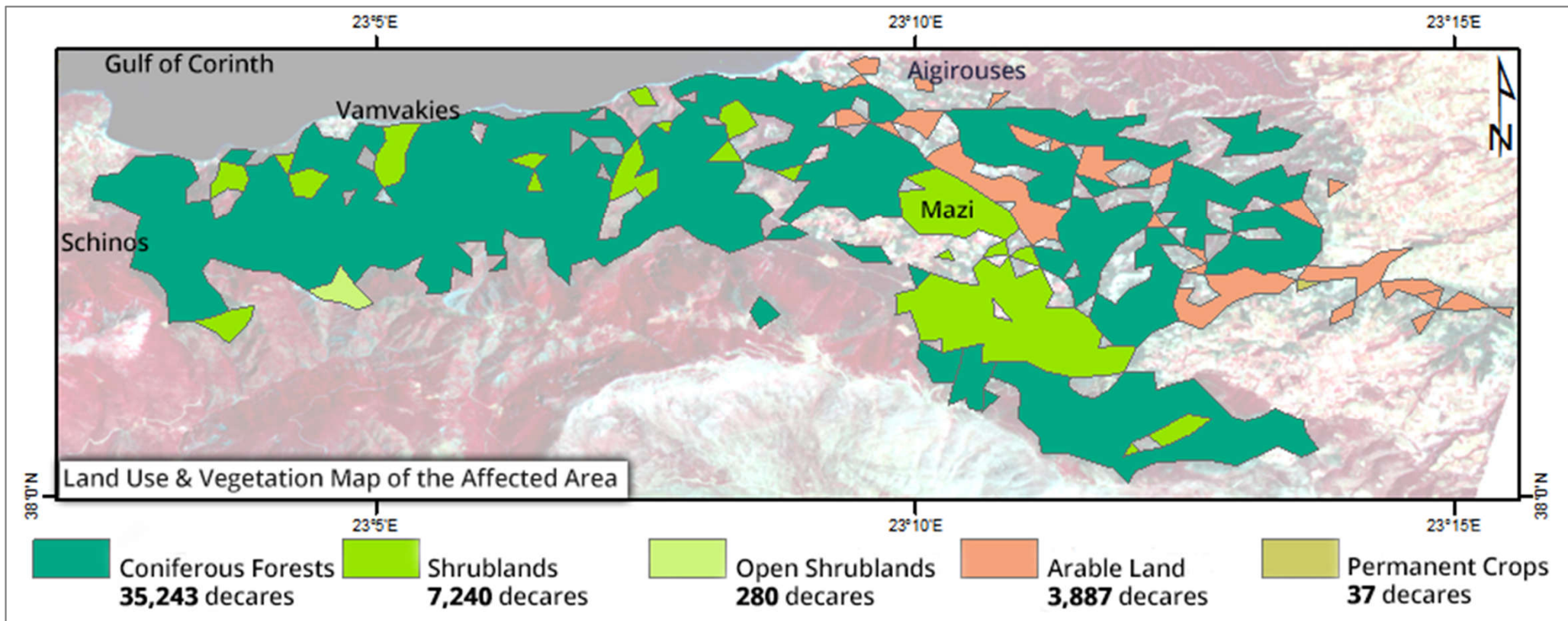


Vegetation cover of the affected area:
- before (up),
- during (middle), and
- after the fire (down)

[Planetscope - Spatial Resolution: 3m]



LAND USE & VEGETATION MAP OF THE AFFECTED AREA

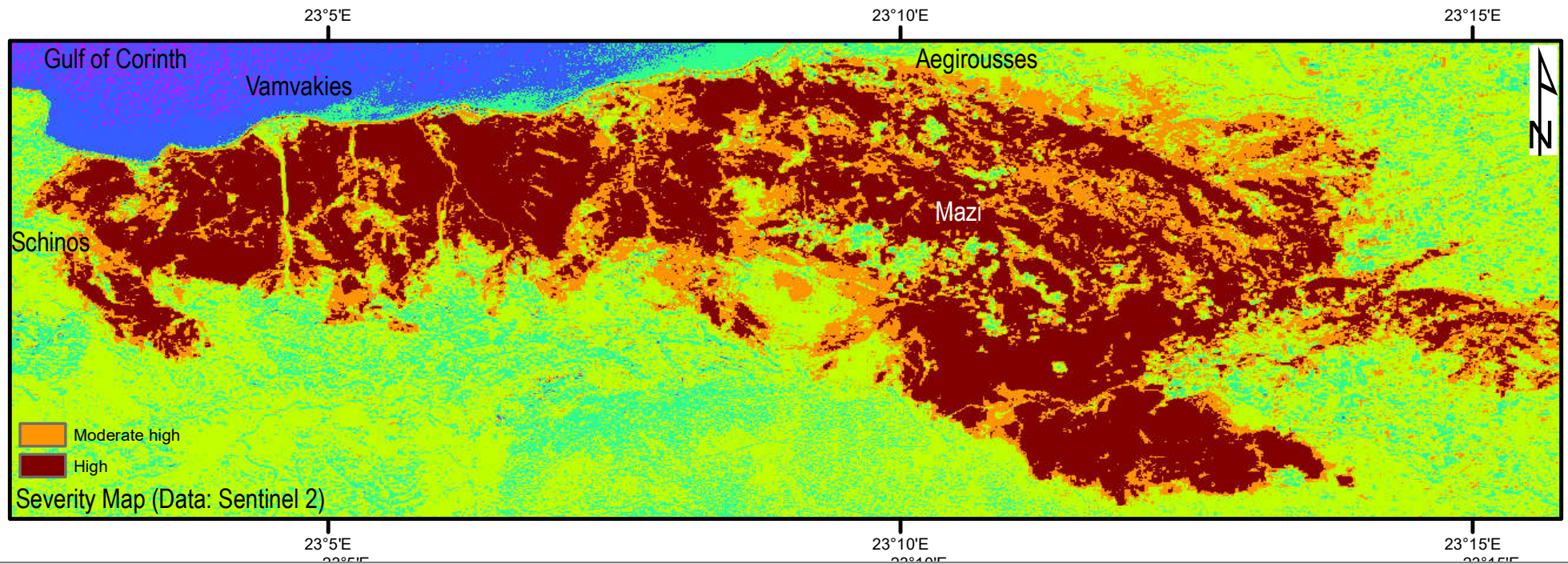


Total burned area: 46,687 decares

[Planetscope | Spatial Resolution: 3m]



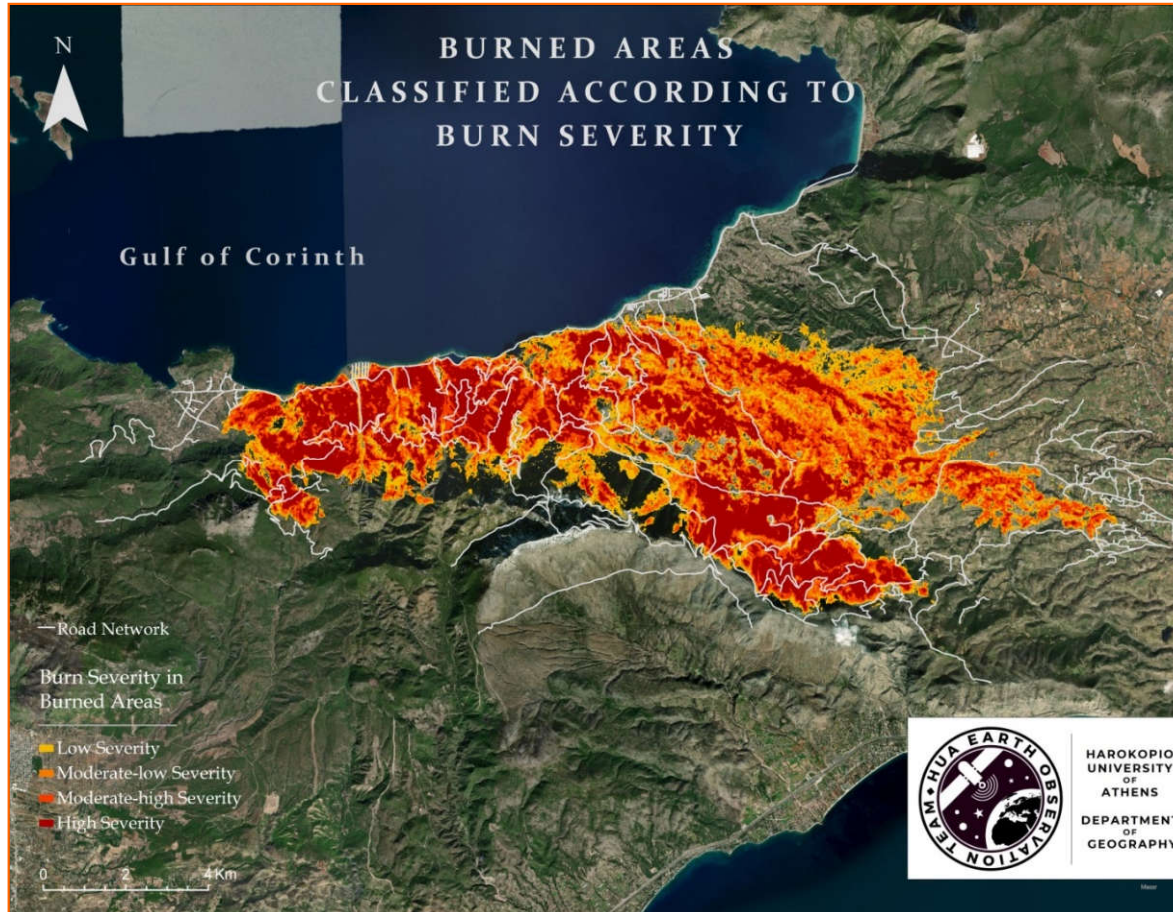
SEVERITY MAP



Total burned area: 46,687 decares



INITIAL BURN SEVERITY MAPPING [Spatial Resolution: 12m]



The NRB index (Normalized Burn Ratio - NBR) was designed as a way to record the severity of the fire with the use of remote sensing data (Key and Benson, 2006). Specifically in this case, satellite Earth Observation data, consisting of two Sentinel 2 images, were used in order to generate pre-fire NBR and post-fire NBR images. NIR and SWIR spectral bands are a powerful combination for the calculation of the burn severity index. The NRB index (Normalized Burn Ratio - NBR) was applied on Sentinel 2 image acquired on 23th May. Eventually, the difference between those two images produced the burn severity map, detecting the damage of the fire on the burned area.

Burn Severity	Area (km ²)	Area (da)	Area(%)
Low Severity	14,9048	14904,8	22,25594
Moderate-low Severity	13,0848	13084,8	19,5383
Moderate-high Severity	15,1892	15189,2	22,6806
High Severity	23,7912	23791,2	35,52516
Total	66,97	66970	100



THE MAY 2021 SCHINOS FOREST FIRE **IMPACT ON VEGETATION**



In several patches the canopy has remained intact or partially burned.



THE MAY 2021 SCHINOS FOREST FIRE **IMPACT ON VEGETATION**

Based on the first evaluation of the burned area it can be predicted that the potential natural regeneration of the burned Aleppo pine (*Pinus halepensis*) forest is very high, provided that no other disturbance will take place on the site (grazing, wood cutting).

The mature Aleppo pine forest has high capabilities of self recovery; for this we suggest that:

1. no burned trees are cut down in order to ensure that the remaining canopy will provide the necessary seed bank for the natural regeneration of the forest,
2. no understory shrubs are removed because they quickly re-sprout offering valuable soil cover, both on the severely burned patches as well as on the moderately burned ones.

In case of trees growing near the road slopes careful removal may be performed.



THE MAY 2021 SCHINOS FOREST FIRE IMPACT ON VEGETATION



It seems that there is no overlapping between the 2018 fire and the current one; yet, there are patches where tree trunks are completely consumed, probably because the fire remained there for long. These patches should be treated with special attention in order not to be trampled with any additional disturbance.



THE MAY 2021 SCHINOS FOREST FIRE **IMPACT ON VEGETATION**



Fallen burned trees may also be carefully removed, provided that the burned cones they bear, remain on site (if possible).



THE MAY 2021 SCHINOS FOREST FIRE **IMPACT ON VEGETATION**



Regarding the patches where there were shrublands burned, the suggestion is that we do nothing but leaving the burned shrubs intact, as they will quickly resprout offering a valuable vegetation cover protecting the soil from being eroded, either from wind or water erosion.



THE MAY 2021 SCHINOS FOREST FIRE IMPACTS ON FLORA AND FAUNA

Geraneia Mt is an extended mountain range at the west outskirts of Attica, central Greece, reaching the altitude of 1351 m, part of which is designated as Natura 2000 site (GR2530005) and is characterized by almost vertical slopes of carbonate rocks. The plants of the southern part of the mountain were almost completely burned by a wild fire in late July 2018, which consumed most of its *Pinus halepensis* forests. The ridge of the protected area, covered by endemic fir *Abies cephalonica* forest was also affected by the fire (Vasilakis et al. 2019, Geophysical Research Abstracts, Vol. 21, EGU2019-7561).

During the current fire, an area of approx. 6,414 decares has been affected, constituting mainly of Aleppo pine forests, leaving out of the fire scar the endemic fir.

Several important plant species occur within the Natura 2000 site, such as the Greek endemic *Centaurea attica* subsp. *megarensis*, a species included in the Annex II of 92/43 Directive, also reported as vulnerable by IUCN, *Fritillaria graeca*,

the endemic *Centaurea raphanina* subsp. *mixta*, the chasmophyte *Achillea umbellata* and others.

For the moment, no definite opinion can be expressed about the potential effect of fire upon these plants as a specific field survey should be organized. Yet, based on our expertise, we can deduce that possibly both *Centaureas* will manage to re-sprout and the same will possibly happen with the geophyte *Fritillaria*. The chasmophyte *Achillea* has great chances to have avoided of being burned.

Regarding the fauna living in the habitats affected by the May 2021 fire, little can be said. However, based on our knowledge, usually, birds fly away, small mammals like rodents also avoid fire by leaving the area, reptiles try to avoid fire, while soil invertebrates usually at this time of the year have vertically migrated deeper in the soil seeking better moisture conditions, so most probably have also avoided fire.



THE MAY 2021 SCHINOS FOREST FIRE **IMPACTS ON FLORA & FAUNA**



The majority of the vegetation burned was mature Aleppo pine forests with a well developed understory.

The intensity of the fire, judging from the remaining branches and twigs, was heterogeneous. Other patches were severely burned (down) while other in a rather moderate way (up), probably because of change of the wind direction.





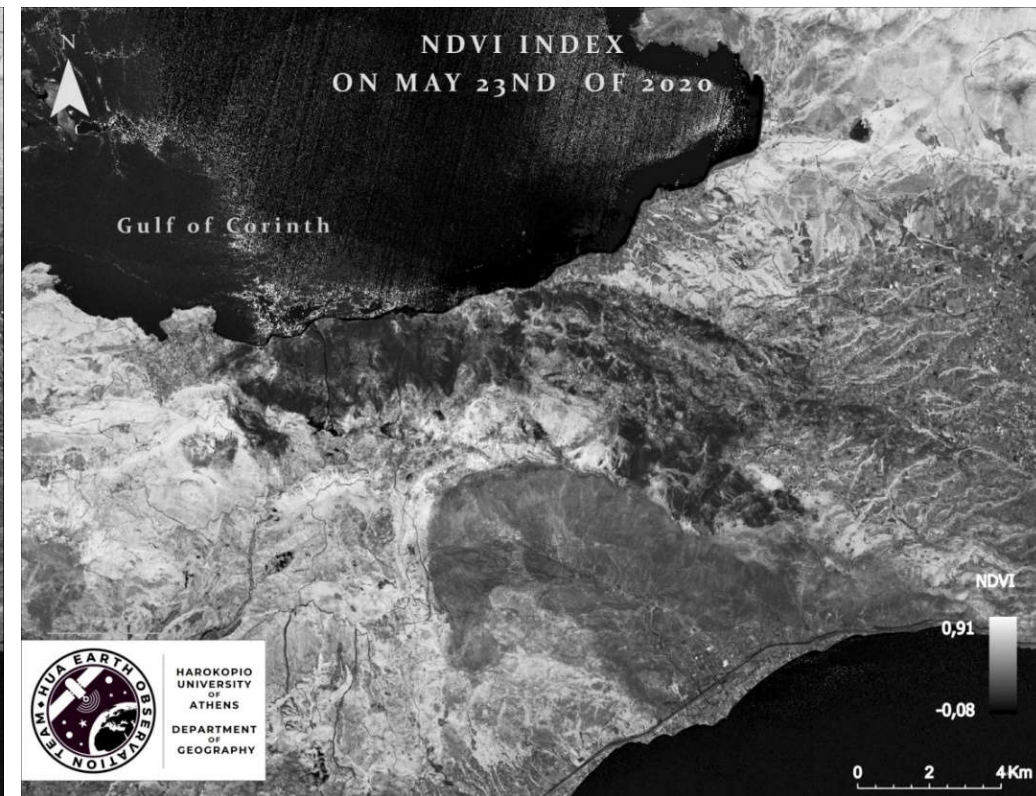
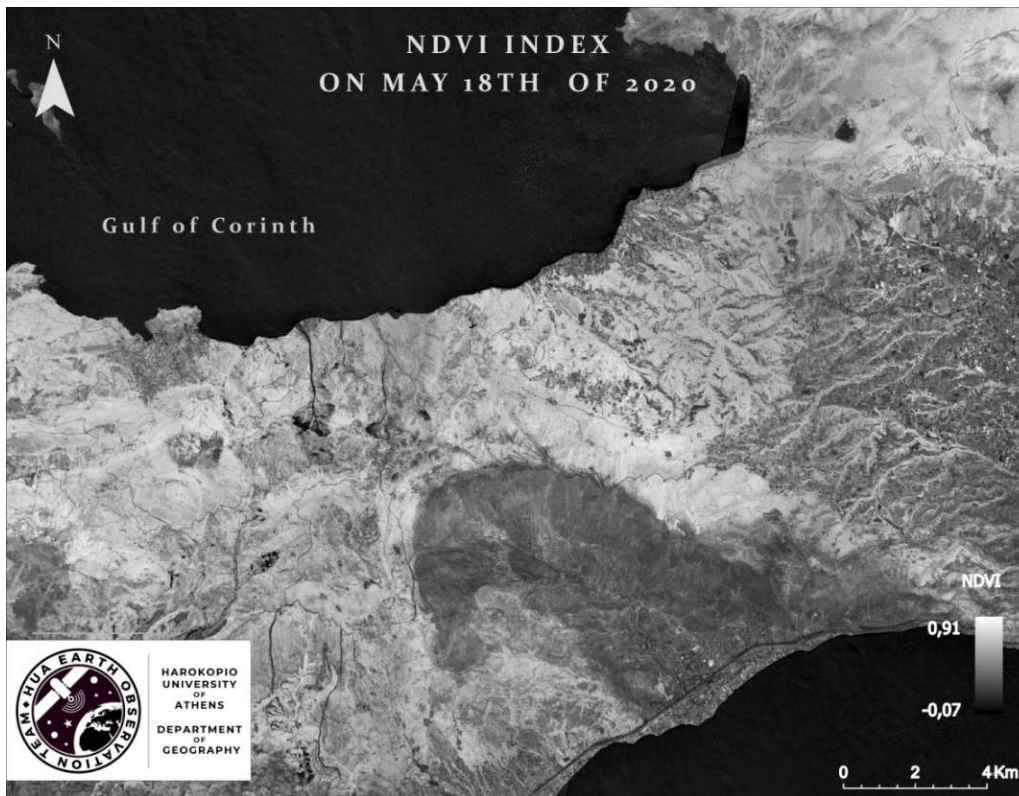
THE MAY 2021 SCHINOS FOREST FIRE **IMPACT ON DOMESTIC ANIMALS**



Many domestic animals affected. Bees, livestock and mostly farm holds animals (cows, horses, dogs etc.) found dead or injured (main image captured by drone, animal images source: [dailycrete.gr](https://www.dailycrete.gr)).



NORMALIZED DIFFERENCE VEGETATION (NDVI) INDEX



Comparing two Sentinel-2 images using Normalized Difference Vegetation Index (NDVI) (Gozdowski et al., 2020) acquired on May 18th (left image) and May 23th (right image) before and after the forest fire.

On the right image the extent of the burned area is noticeable. Negative values are represented by dark colors while positive ones are represented by lighter shades. On the right image, darker shades refer to the burned area.



IMPACT ON THE BUILT ENVIRONMENT

BUILDINGS WITH REINFORCED CONCRETE FRAME AND INFILL WALLS



Many buildings affected by the fire have reinforced concrete frame and infill brick walls. The most common recorded impact was burning of the wooden roof and its subsequent collapse, resulting in burning of internal parts and equipment of the buildings.



IMPACT ON THE BUILT ENVIRONMENT

BUILDINGS WITH REINFORCED CONCRETE FRAME AND INFILL WALLS



Exterior and interior combustible materials of the buildings were particularly vulnerable.

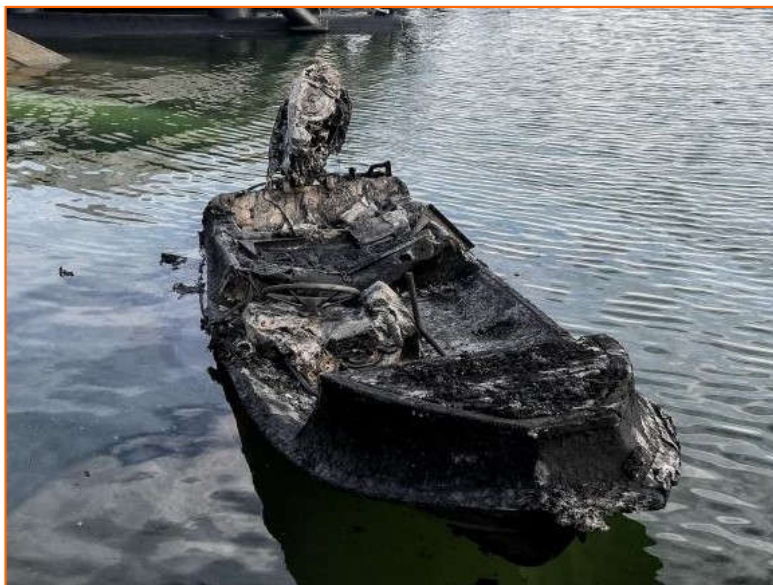


As regards the way the fire started in the buildings, it can be attributed to firebrands attack, radiant heat exposure and/or flame contact.



IMPACT ON THE BUILT ENVIRONMENT

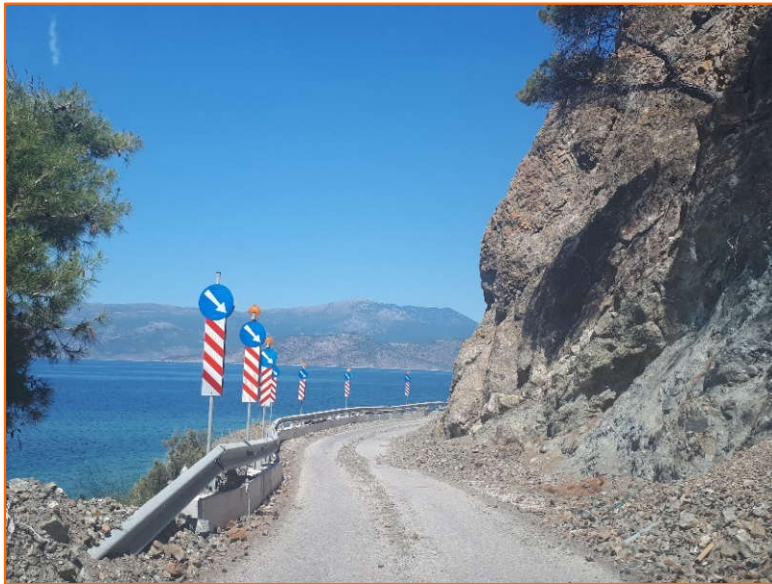
MOBILE OBJECTS



In addition to the buildings in the burnt area, the fire also affected mobile objects inside and outside forest areas, including private vehicles parked in the surrounding of buildings but also in indoor parking garage, trash and recycling bins, etc. It was impressive that the fire approached the sea resulting in burning of vessels.



IMPACT ON INFRASTRUCTURE **ROAD NETWORK**



The road network was slightly affected by the fire. Burnt trees fell and caused temporary traffic disruption, but they were quickly removed after the intervention of the Fire Service and residents of the fire-affected area.



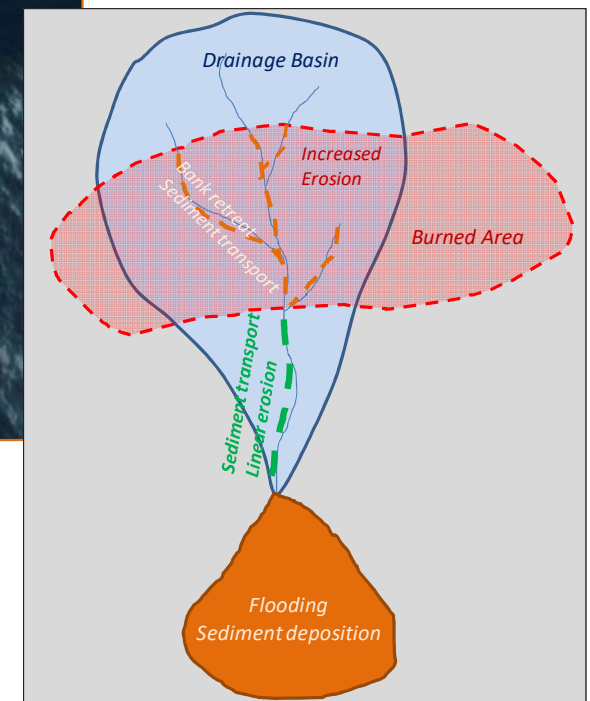
IMPACT ON INFRASTRUCTURE **POWER, WATER AND TELECOMMUNICATIONS NETWORKS**



There were numerous power, water and telecommunications outages during the fire, hampering fire management efforts. The repair of the fire-induced damages started after extinguishing the fire.

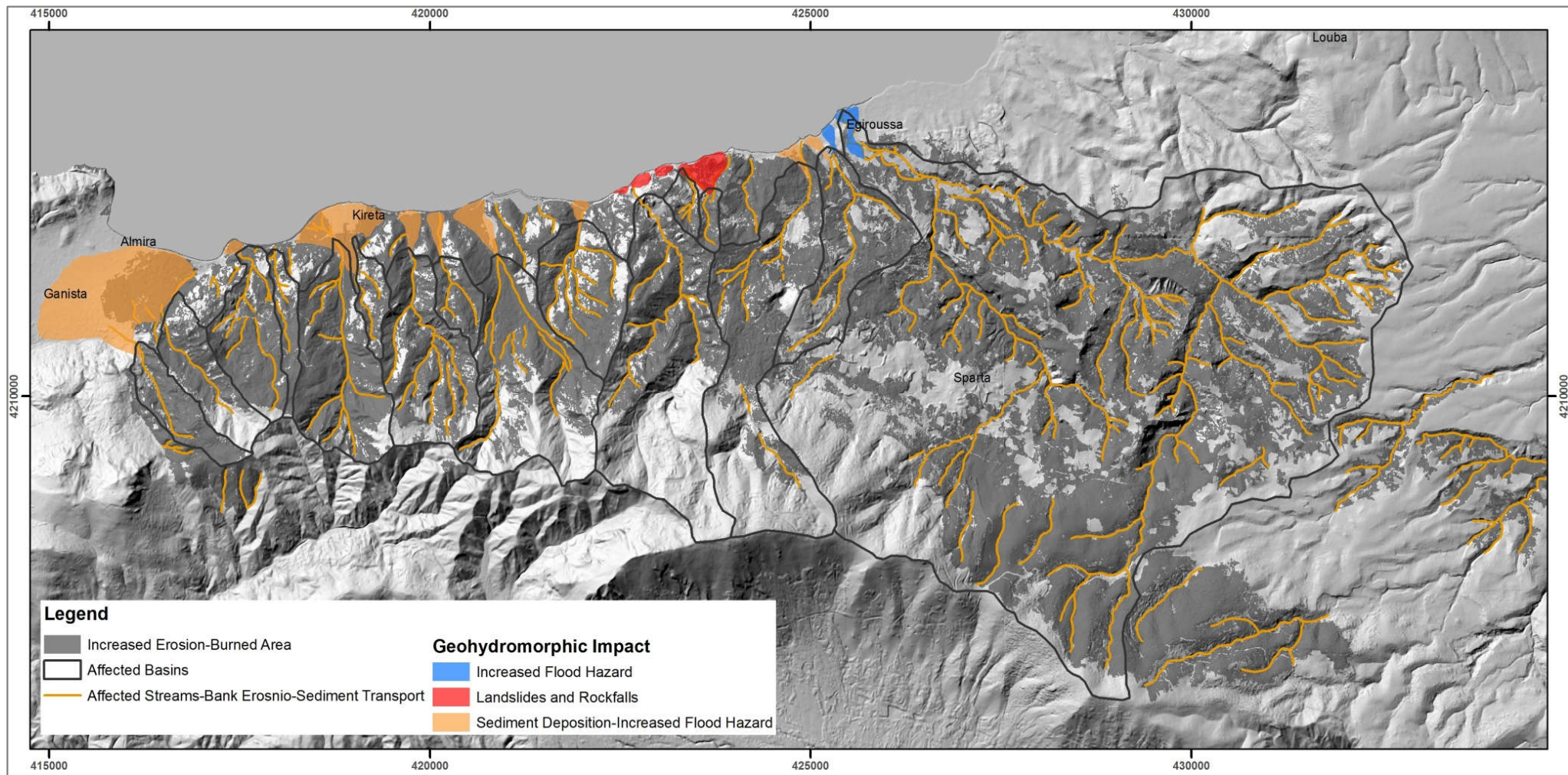


IMPACT ON GEOMORFOLOGY CONCEPTUAL MODEL



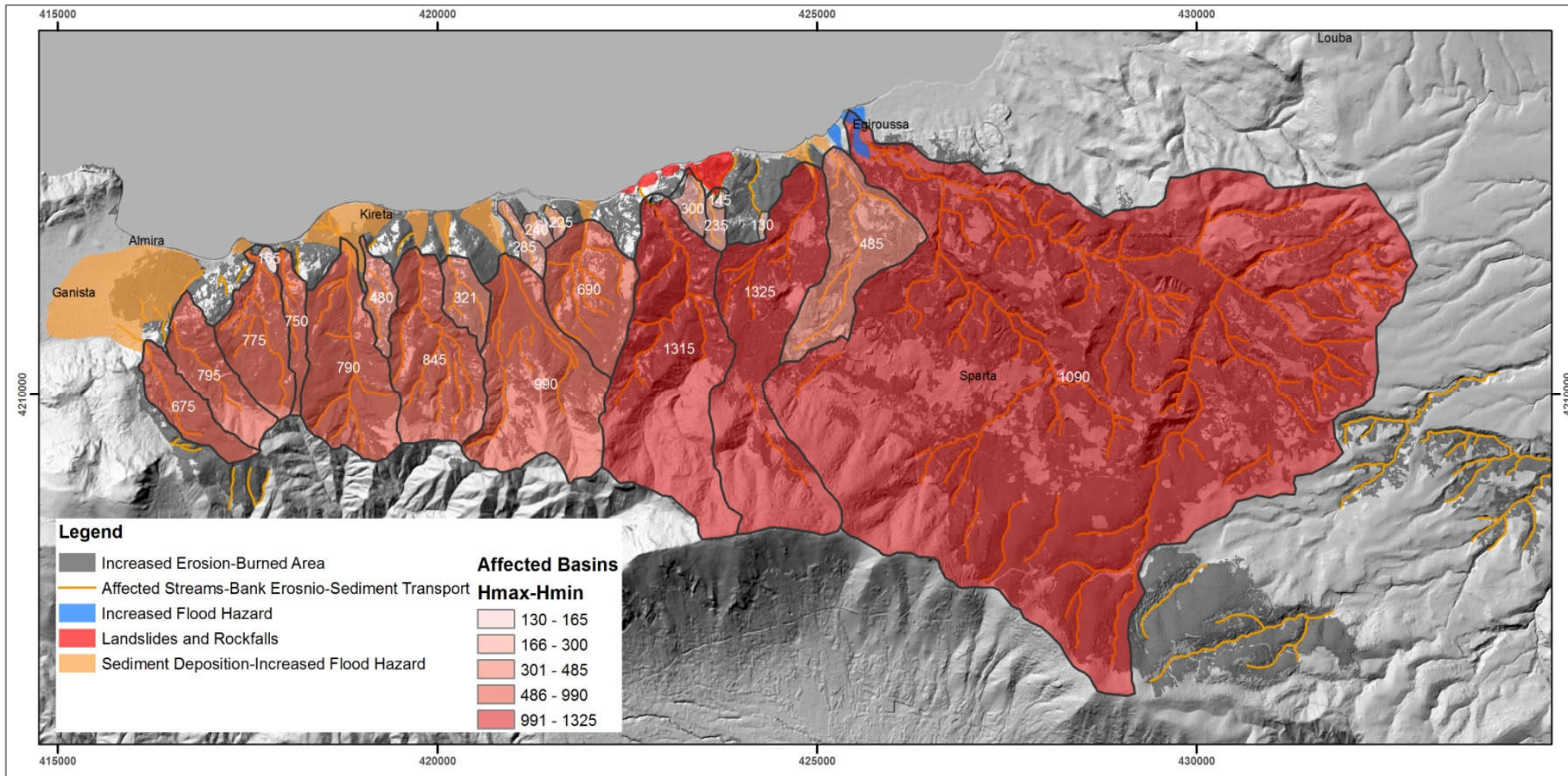


HYDROGEOMORPHOLOGICAL PROCESSES





VULNERABILITY TO LANDSLIDE PHENOMENA HIGH RISK POINTS & AREAS

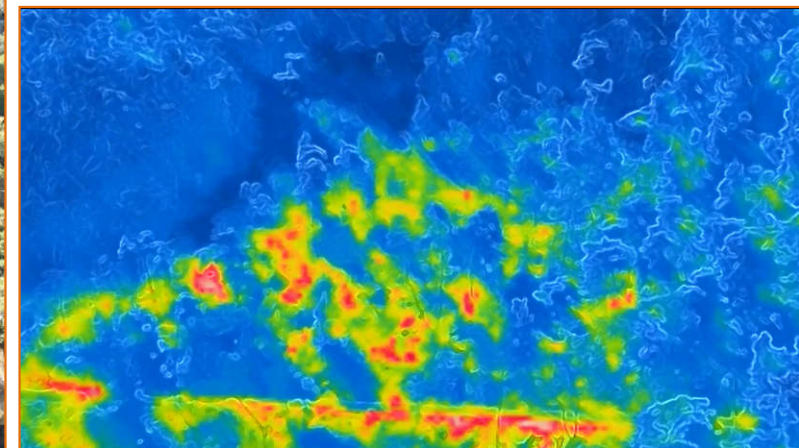




Rokas Village

◀ The fire destroyed all of the bushy vegetation and a large percentage of the trees. Rockfalls and debris (size from 10cm size rocks to several meters boulders) from uphill crests now lay on a 15%-35% slope with loose material and can be more easily mobilized during storms or earthquakes to affect the road or the hotel installations. Increased erosion is expected at the same area as well as partial destabilization of cut slopes along the road.

▼ IR imaging shows higher temperatures on sunny surfaces stripped of vegetation by the fire, exposed bedrock and road asphalt. The difference between burned and intact area (to the right) is quite significant (sometimes more than 20 degrees).





Vamvakes-Mavrolimni, Fan 01

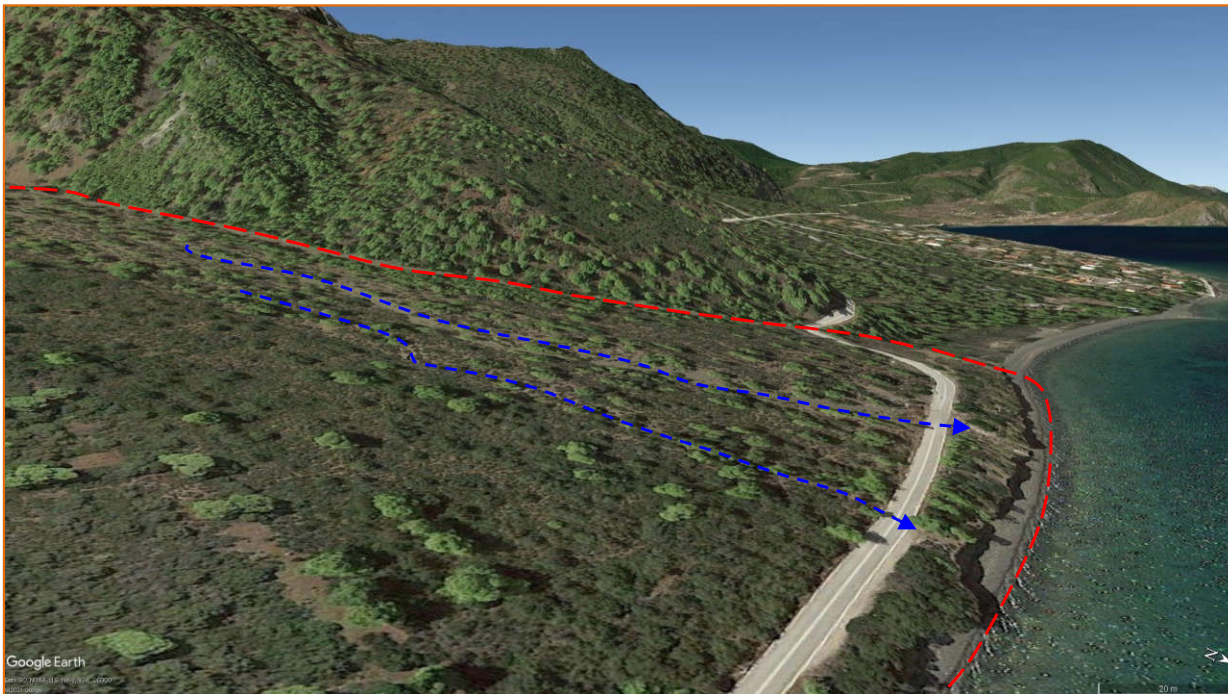
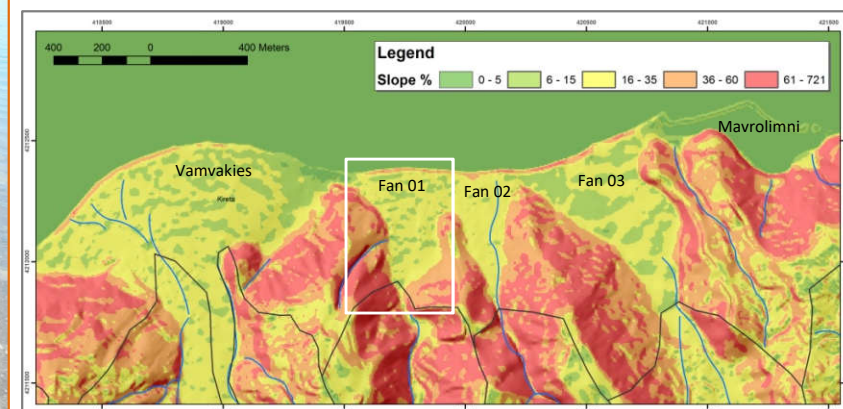
◀ The fire destroyed shrubland and pine forest, mainly on hill slopes and along ephemeral streambeds. The area is a fan with slopes 6 to 35%, surrounded by easily eroding steep hills (>60%). Increased overland and rill erosion is expected to increase solid transport and overland flow, and increased linear erosion along streams, as well as sediment and debris deposition downhill.

Uphill basin: 2.3km²

Hmax-Hmin=845m

Percentage burnt: ~50%

▼ Slope map of the area with fan location





Vamvakes-Mavrolimni, Fan 02

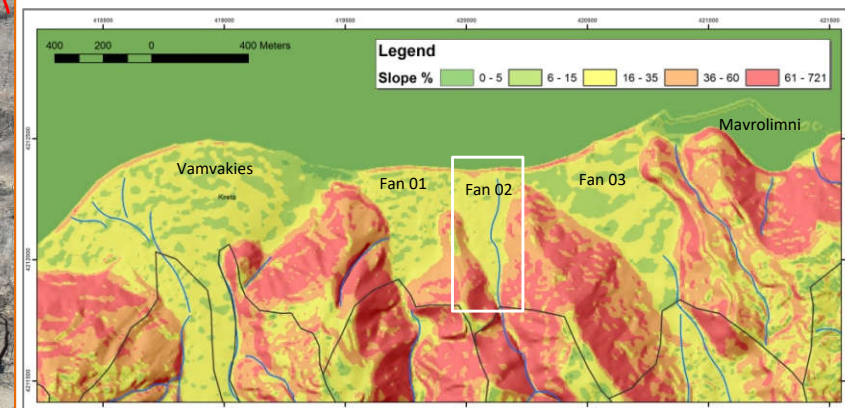
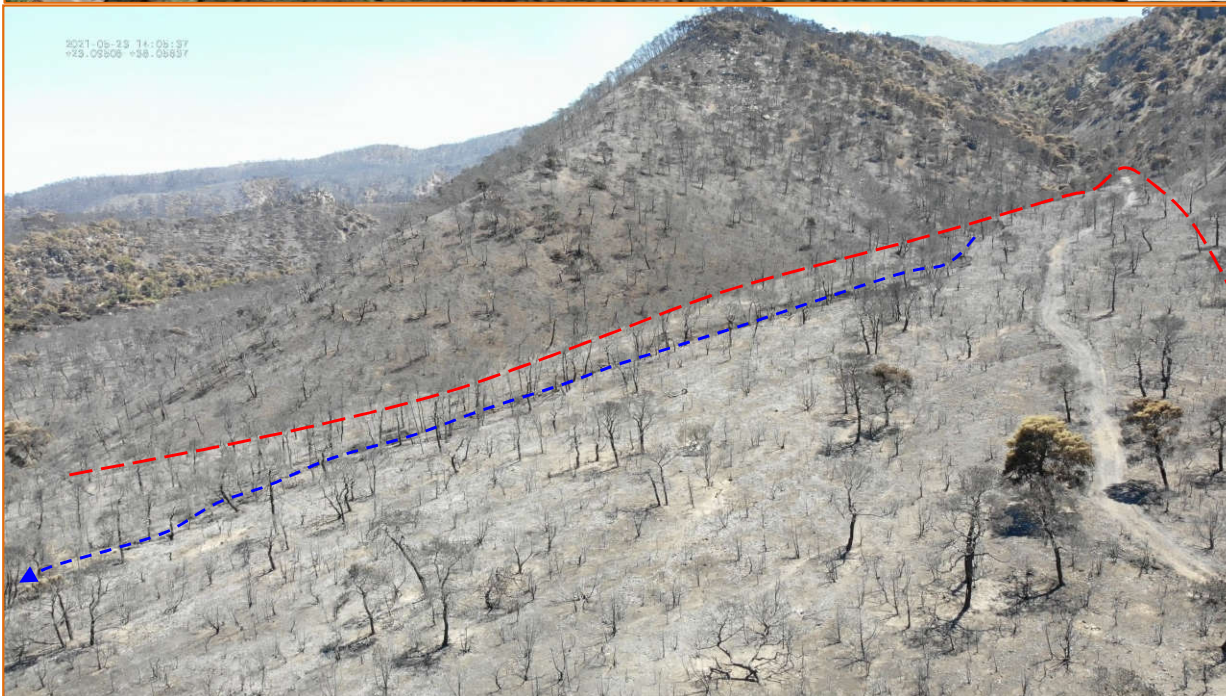
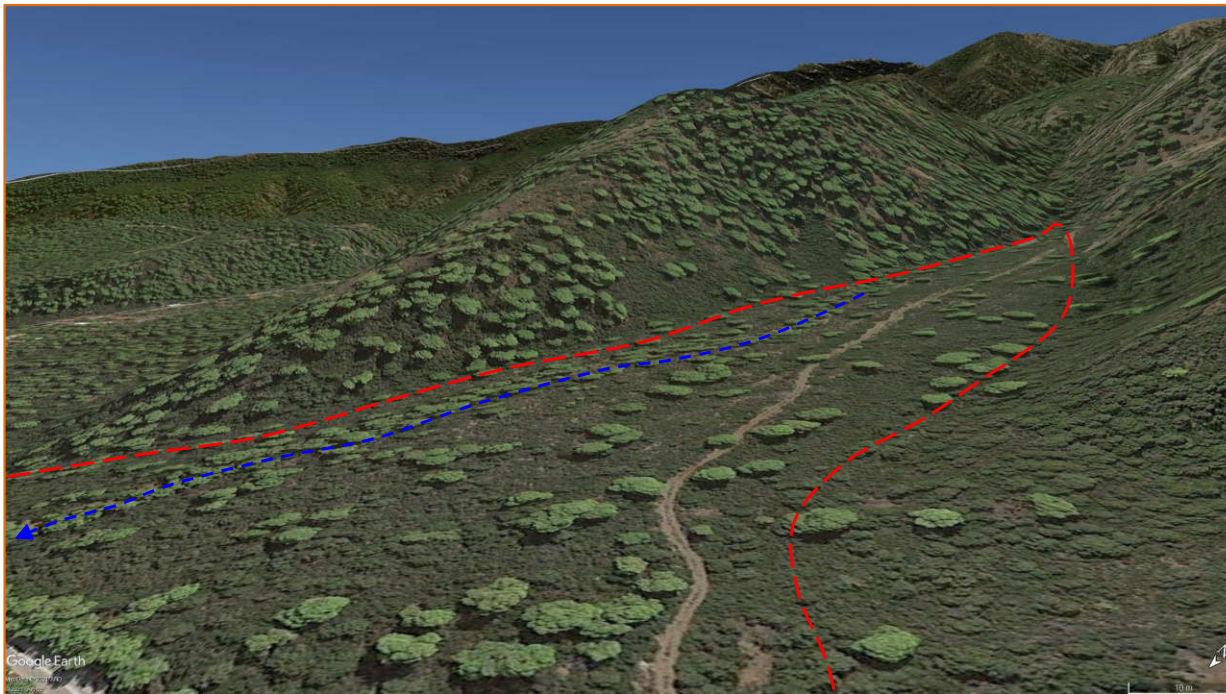
◀ The fire destroyed shrubland and pine forest, mainly on hill slopes and along ephemeral streambeds. The area is a fan with slopes 16 to 35%, surrounded by easily eroding steep hills (>60%). Increased overland and rill erosion is expected to increase solid transport and overland flow, and increased linear erosion along streams, as well as sediment and debris deposition downhill.

Uphill basin: 0.5km²

Hmax-Hmin=321m

Percentage burnt:~85%

▼ Slope map of the area with fan location





Vamvakes-Mavrolimni, Fan 03

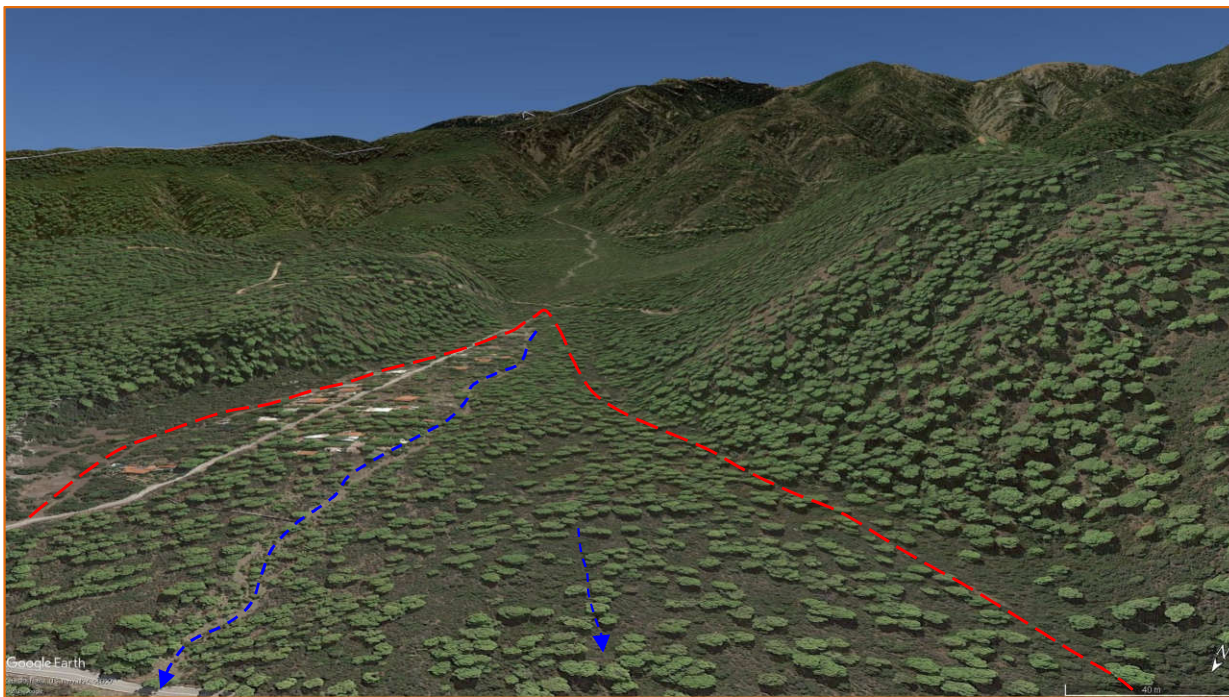
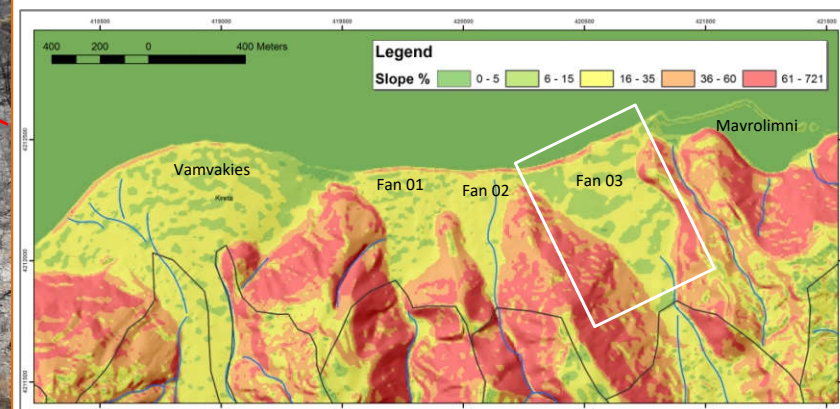
◀ The fire destroyed shrubland and pine forest, mainly on hill slopes and along ephemeral streambeds. The area is a fan with slopes 6 to 35%, surrounded by easily eroding steep hills (>60%). Increased overland and rill erosion is expected to increase solid transport and overland flow, and increased linear erosion along streams, as well as sediment and debris deposition downhill. A settlement consisting of a small number of residencies are developed between the apex, the main streambed and the east boundary of the fan, and there have to be a flood and debris flow risk assessment.

Uphill basin: 3.4km²

Hmax-Hmin=990m

Percentage burnt:~50%

▼ Slope map of the area with fan location

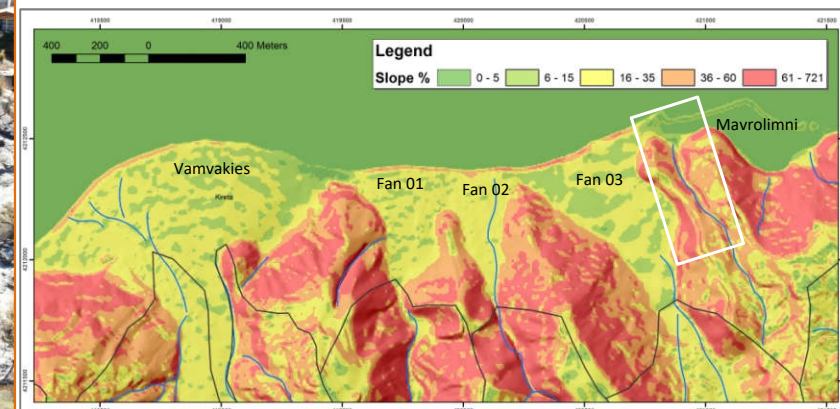


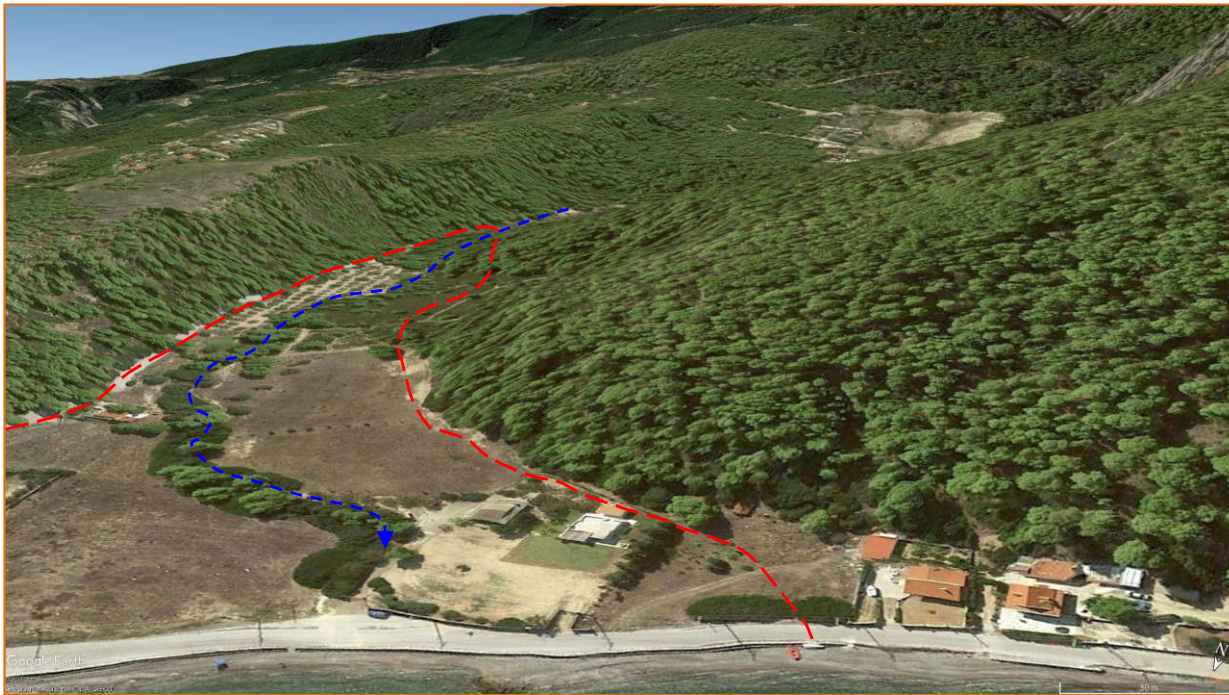


Mavrolimni

◀ Mavrolimni is at the outlet to the sea of a stream draining a small but high slope area, that was almost totally forested and now is mostly burned out, with the exception of an area along the west slopes in the deep of the valley. Expected phenomena include increased diffuse and rill erosion, transport of sediment and debris along the valley, and deposition at the central flat part of the area.

▼ Slope map of the area with fan location





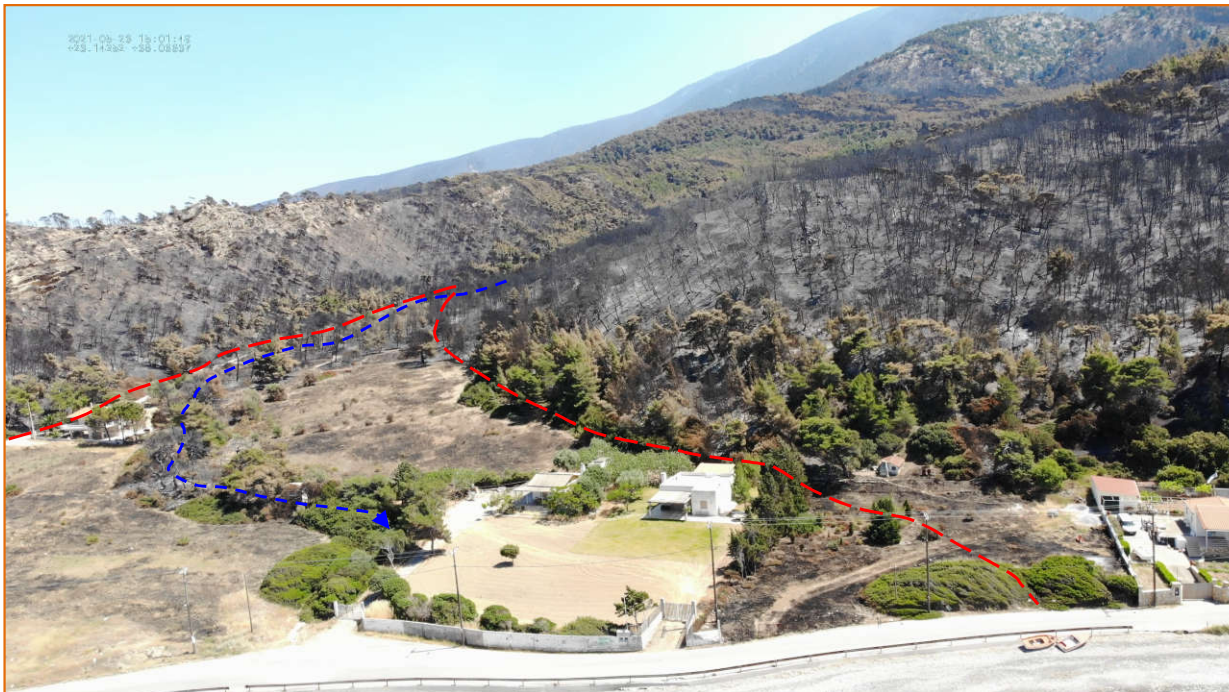
Aigiresses

◀ Delta fan west of Aigiresses, with large percentage of pine forest burnt during the wildfire. Increased flood hazard and sediment deposition expected.

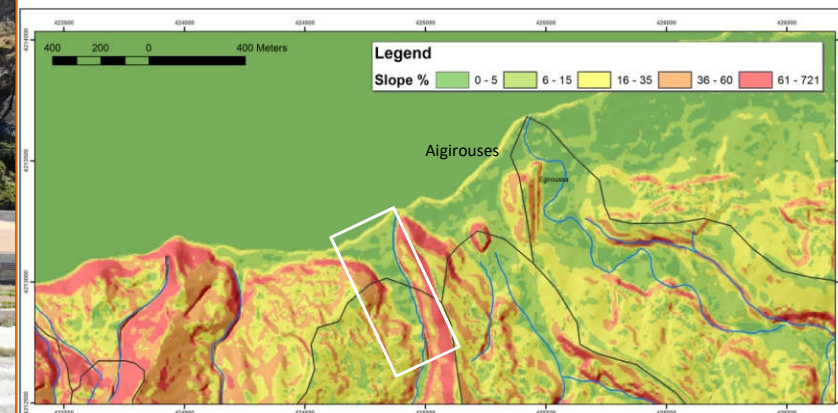
Uphill basin: 4.6km²

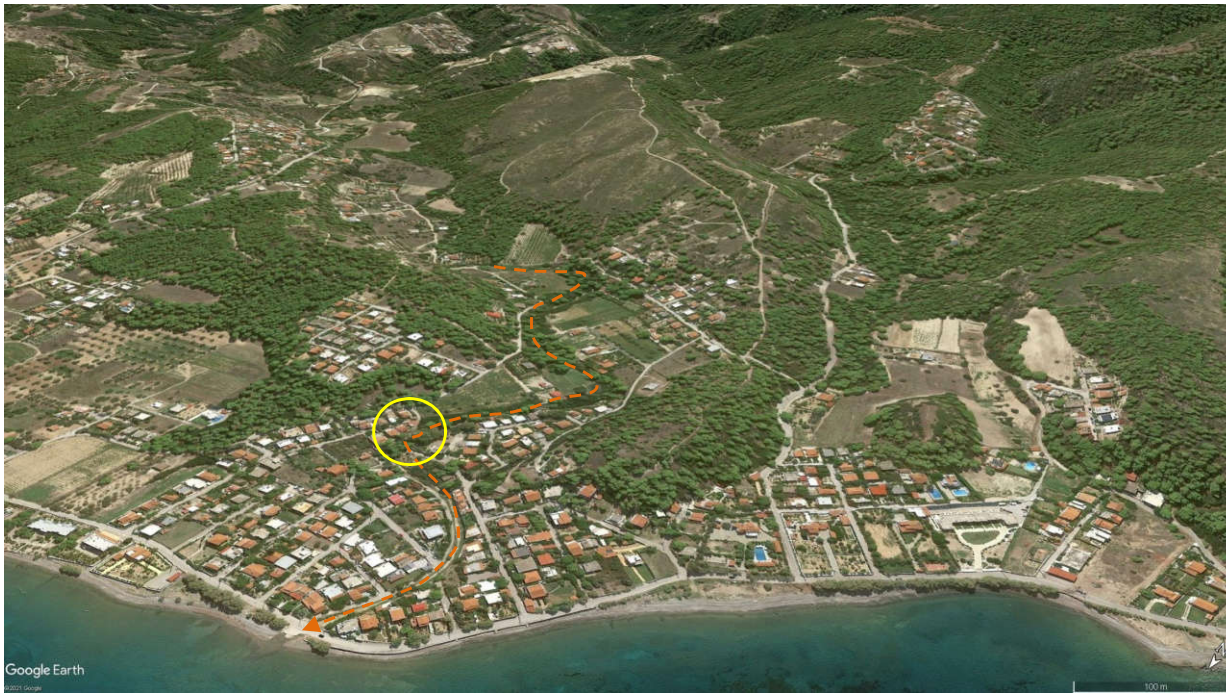
Hmax-Hmin=1325m

Percentage burnt:~40%



▼ Slope map of the area with fan location





Aigirouses

◀ Delta fan of Aigirouses, with large percentage of forest and shrubland burnt during the wildfire. Increased flood hazard and sediment deposition expected. Possible increased vulnerability to floods due to human intervention (e.g. yellow point).

Uphill basin: 35km²

Hmax-Hmin=1090m

Percentage burnt: ~50%



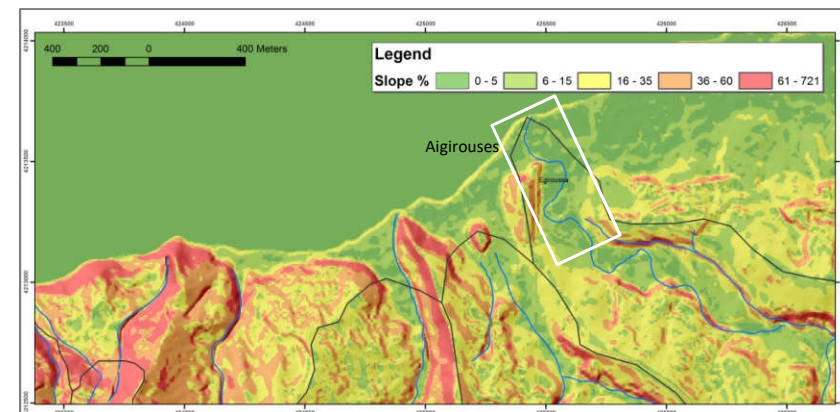
▲ Upstream view (Google Earth Street View)

◀ Streambed crosses with road between residencies, increased flood risk regardless of wildfire.



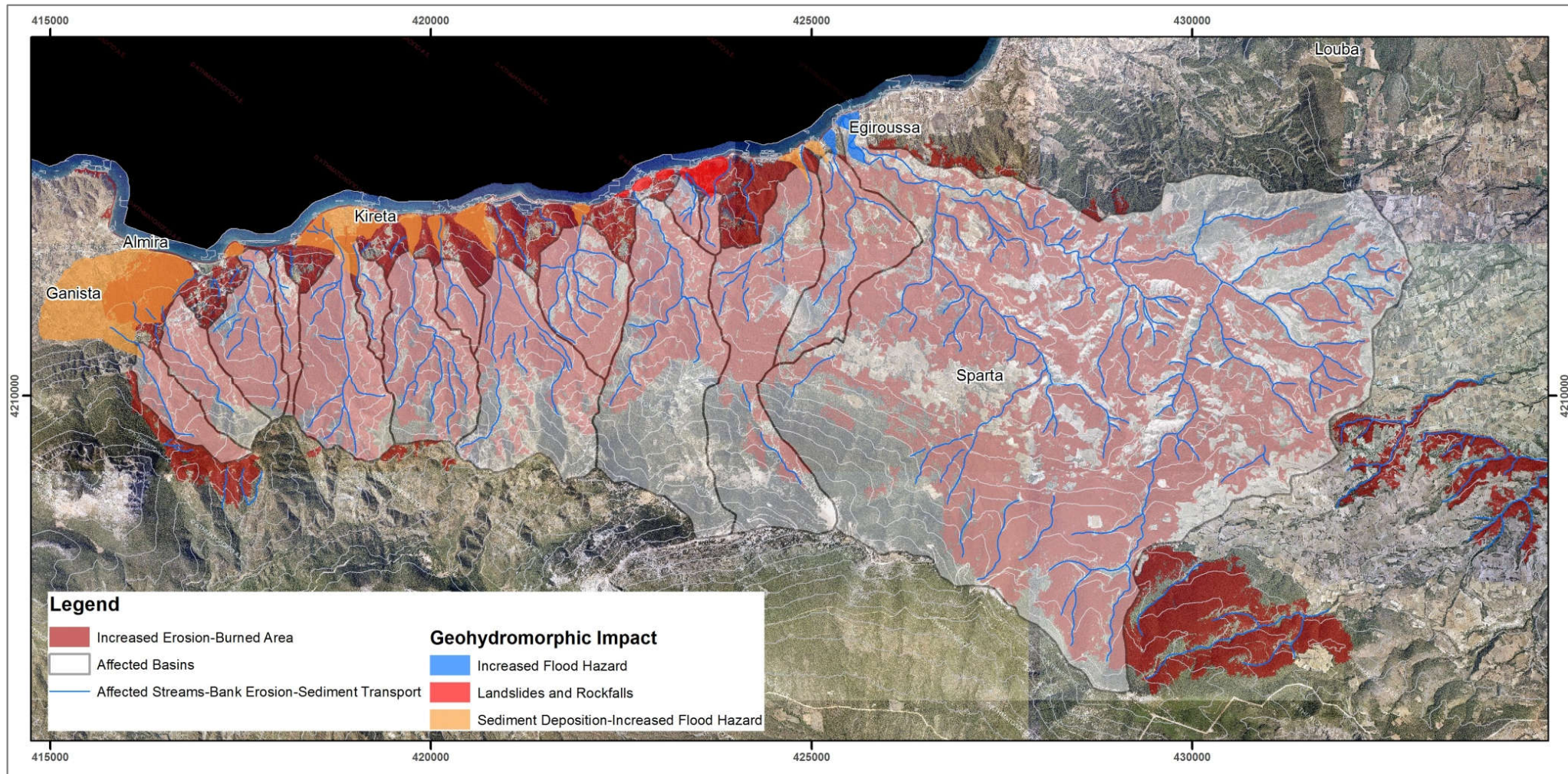
◀ Downstream view (Google Earth Street View)

▼ Slope map of the area with fan location





VULNERABILITY TO LANDSLIDE PHENOMENA **HIGH RISK POINTS & AREAS**





EFFECTS OF THE 2021 FOREST FIRE ON MASS WASTING EVENTS



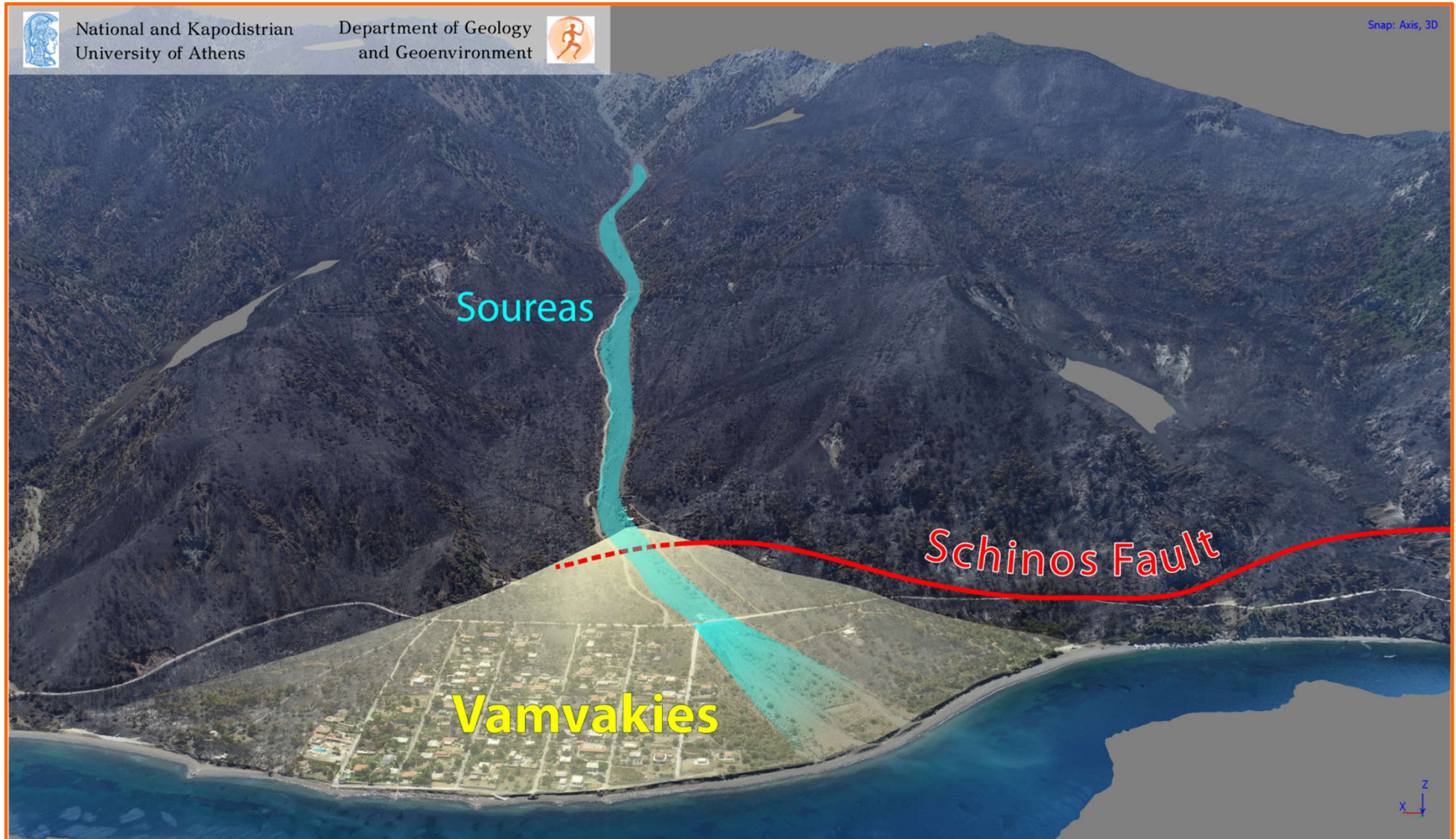
The faulted landscape on the northern slopes of Mt Geraneia is characterized by high relief and steep slope gradients, a result of the tectonic uplift caused by the active faults that control the northern margin of the mountain range. This morphological configuration, coupled with the poor quality of the rock-mass has resulted in successive active mass wasting events, mainly rockfalls and debris flows. The former occur at the road stretch between Alepochori and Mavrolimni, where it runs at the base of the slope that hosts the intensely fractured and brecciated limestones. From Mavrolimni and to the west, the highly tectonised and weathered outcrops of the ophiolite suite have been feeding debris flows, which follow the course of the torrents that discharge into the Gulf of Alkyonides. Approximately one-third of the area (c. 17 km²) burnt in the May 2021 forest fire corresponds to this northern slope of the range front. This is bound to significantly increase the risk of the mass wasting events that have been taking place there, not only during the following rain periods, which are associated with debris flows, as rockfalls have been taking place throughout the year.



3D relief model
of the Soureas torrent. View from N.



DRONE DATA PROCESSING **VAMVAKIES 3D MODEL**



3D relief model of part of the northern slopes of Geraneia Range, at the hamlet of Vamvakies, built on the inactive portion of the fan fed by Soureas torrent. View from N.



DRONE DATA PROCESSING **VAMVAKIES FAN AND SOUREAS TORRENT**



October 2020



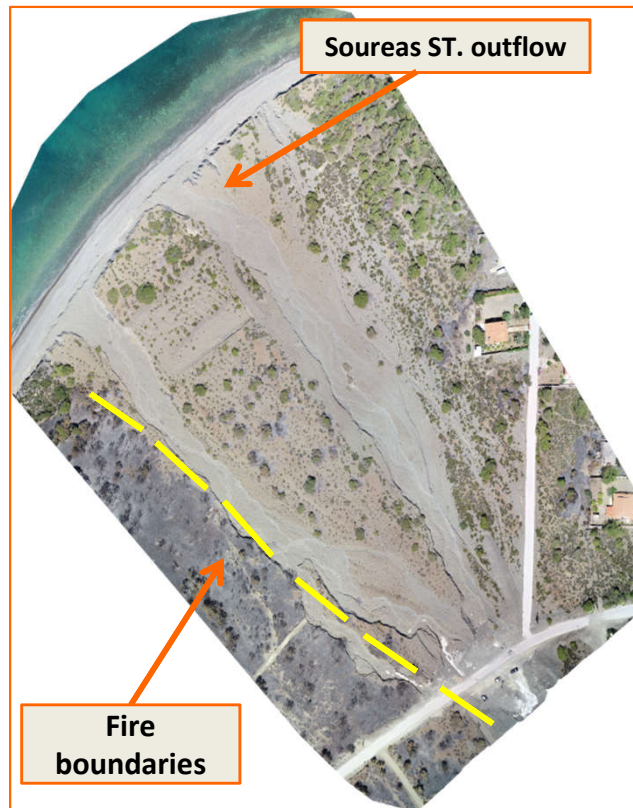
May 2021



The “Soureas” torrent at Vamvakes develops on weathered ultramafic rocks of the ophiolite suite. The active Vamvakes fan is fed by the torrent, which is a 2nd order stream with a catchment area of c. 3.5 km³. Despite its small drainage basin, the torrent has repeatedly flooded and produced massive debris flows. Its latest flooding event occurred during the 2018 Mediane, when it transported great amounts of debris, destroyed the Schinos – Alepochori road and rejuvenated its coastal fanlets. In December 2013, after a short torrential downpour, debris covered almost entirely a church that had been built some years before on its active streambed (see [page 7](#) for closer view of the impact on the church).



DRONE DATA PROCESSING **VAMVAKIES FAN AND SOUREAS TORRENT**



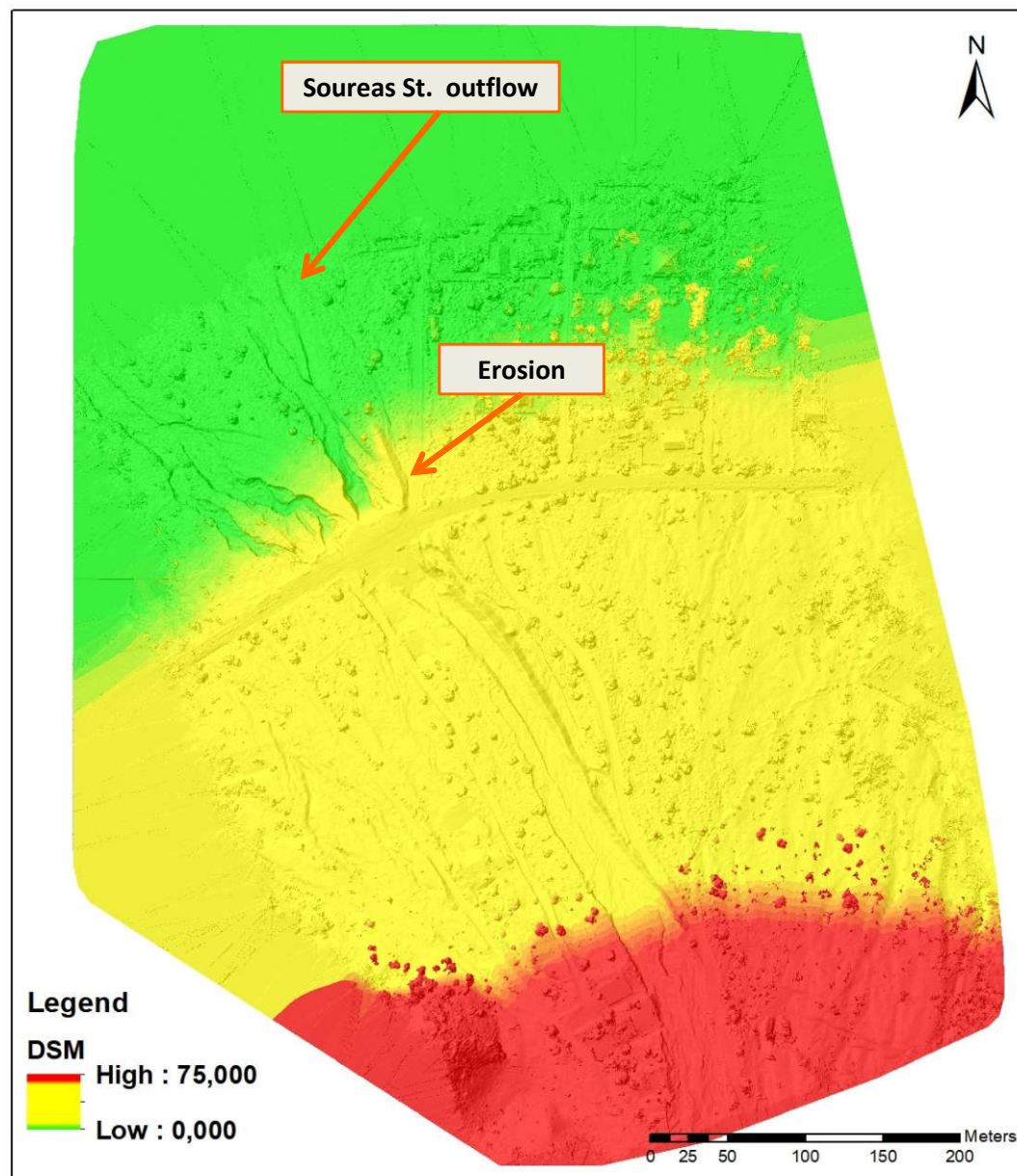
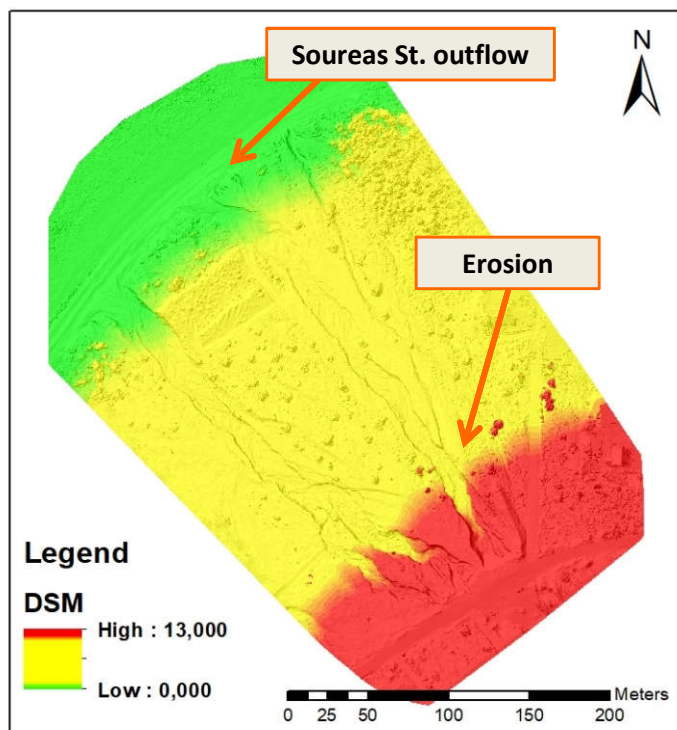
Orthomosaic of Vamvakes
settlement with the use
of Pix4D software and
UAV (Drone) footage
imagery



DRONE DATA PROCESSING VAMVAKIES FAN AND SOUREAS TORRENT



Digital Surface Model (DSM) of Vamvakes settlement with the use of Pix4D software and UAV (Drone) footage imagery.





CONCLUSIONS

1. The fire that started on the 19 May 2021 near the village of Schinos, moved quickly eastwards along the Schinos – Alepochori area due to the prevailing E and NE directed winds in the area burning predominantly forests and some agricultural land.
2. The fire damage on property and infrastructure was fairly limited compared to past fire events in Attica (Kineta 2018, Mati 2018).
3. The fire lasted for more than 5 days burning in total around 4700 hectares in areas with high and very high inclination at the north slopes of Geraneia Mt.
4. The high slopes are developed through the high neotectonic activity and the active faults. This geodynamic regime has led to very active hydrological and geomorphological processes leading to high intensity flooding, debris flow and landslide phenomena.
5. Based on our preliminary findings, an intensification of hydro-geomorphic activities is expected, that will lead to an increase in flood, debris flow and landslide frequency and the relevant hazard levels. Similar increases have been found in post-fire environments in other areas of Greece.
6. Based on field survey findings and the relevant literature the area is a very active natural laboratory of geological, geomorphological, hydrological and hydrometeorological processes.
7. The increase in hydrogeomorphic hazards is expected to focus in the coastline, along the Schinos-Alepochori axis, and its settlements (Vamvakies, Mavrolimni, Kato Alepochori, Aigeiresses).
8. Our field survey indicates that it is important to examine thoroughly the post-fire risks and the best strategy to mitigate them, especially along the coastline.
9. It is important to carry out a systematic training and provide information to the local society on the post-fire risks and post-fire treatment of the environment.
10. Based on the first evaluation of the burned area we predict that the potential natural regeneration of the burned Aleppo pine (*Pinus halepensis*) forest is very high, provided that no other disturbance will take place on the site (grazing, wood cutting).



ΣΥΜΠΕΡΑΣΜΑΤΑ

1. Η πυρκαγιά που ξεκίνησε από την περιοχή του Σχίνου στις 19 Μαΐου 2021 κινήθηκε ανατολικά κατά μήκος του άξονα Σχίνου-Αλεποχωρίου και ακολούθως νοτιοανατολικά λόγω των δυνατών ανέμων που επικρατούσαν σε αυτές τις διευθύνσεις, πλήττοντας κυρίως δασικές εκτάσεις και δευτερευόντως εκτάσεις θαμνώδους βλάστησης και καλλιέργειες.
2. Από την πυρκαγιά επλήγησαν κυρίως εκτάσεις φυσικής βλάστησης και λιγότερο κατοικίες και περιουσίες συγκριτικά με άλλες πυρκαγιές στην περιοχή της Αττικής (π.χ. Κινέτα 2018, Μάτι 2018 κ.α.).
3. Η πυρκαγιά είχε διάρκεια μεγαλύτερη των 5 ημερών και έκαψε περί τα 47.000 στρέμματα βλάστησης στα βόρεια και βορειοανατολικά πρηνή των Γερανείων, σε περιοχές με υψηλή έως πολύ υψηλή μορφολογική κλίση.
4. Οι έντονες μορφολογικές κλίσεις της περιοχής οφείλονται σε έντονη νεοτεκτονική δραστηριότητα και ενεργά ρήγματα, που έχουν δώσει και πρόσφατους σεισμούς και έχουν οδηγήσει σε έντονες υδρολογικές και γεωμορφολογικές διεργασίες, δηλαδή υψηλής έντασης πλημμυρικές ροές, κατολισθήσεις, λασποροές και καταπτώσεις βράχων.
5. Η περιοχή με βάση τις παρατηρήσεις και τη βιβλιογραφία αποτελεί ένα πολύ ενεργό εργαστήριο γεωλογικών, γεωμορφολογικών, υδρολογικών και υδρο-μετεωρολογικών διεργασιών.
6. Οι παραπάνω υδρο-γεωμορφολογικές διεργασίες αναμένεται, με βάση τα ευρήματα της έρευνάς, και σε άλλες περιοχές της Ελλάδας, να έχουν μεγαλύτερη ένταση και να γίνουν πιο συχνές στην περιοχή, και κατά συνέπεια αναμένεται να αυξηθεί ο κίνδυνος πλημμυρών, κατολισθήσεων και λασποροών στην περιοχή.
7. Η αύξηση των κινδύνων αυτών αναμένεται να πλήξει κυρίως τον παραλιακό άξονα μεταξύ Σχίνου και Κάτω Αλεποχωρίου, τις υποδομές και τους οικισμούς, που βρίσκονται σε αυτόν (Βαμβακίες, Μαυρολίμνη, Κάτω Αλεποχώρι, Αιγειρούσες).
8. Είναι σημαντικό να αναλυθεί και να εκτιμηθεί ο μεταπυρικός κίνδυνος και η βέλτιστη στρατηγική για την ανάπτυξη μέτρων μείωσης των κινδύνων στον παραλιακό άξονα.
9. Είναι σημαντικό να γίνει συστηματική ενημέρωση και ευαισθητοποίηση των πολιτών της συγκεκριμένης, αλλά και της ευρύτερης περιοχής που έχει πληγεί από σειρά καταστροφών και να ενισχυθεί ο τοπικός σχεδιασμός πρόληψης και η ετοιμότητα.
10. Από την προκαταρκτική εξέταση προκύπτει ότι η περιοχή έχει πολύ υψηλές πιθανότητες για φυσική αναγέννηση, αρκεί να μην επιτραπεί η βόσκηση και να μην γίνουν εργασίες απομάκρυνσης δέντρων και θάμνων, τα οποία βοηθούν σε αυτή τη διαδικασία.



The May 19, 2021 Schinos [Greece] forest fire

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Schinos, 2021