DEVELOPING TAILORED SERVICES FOR THE AGRO-INSURANCE SECTOR OVER NORTHERN GREECE: THE CASE OF RODOPI / COTTON CROP

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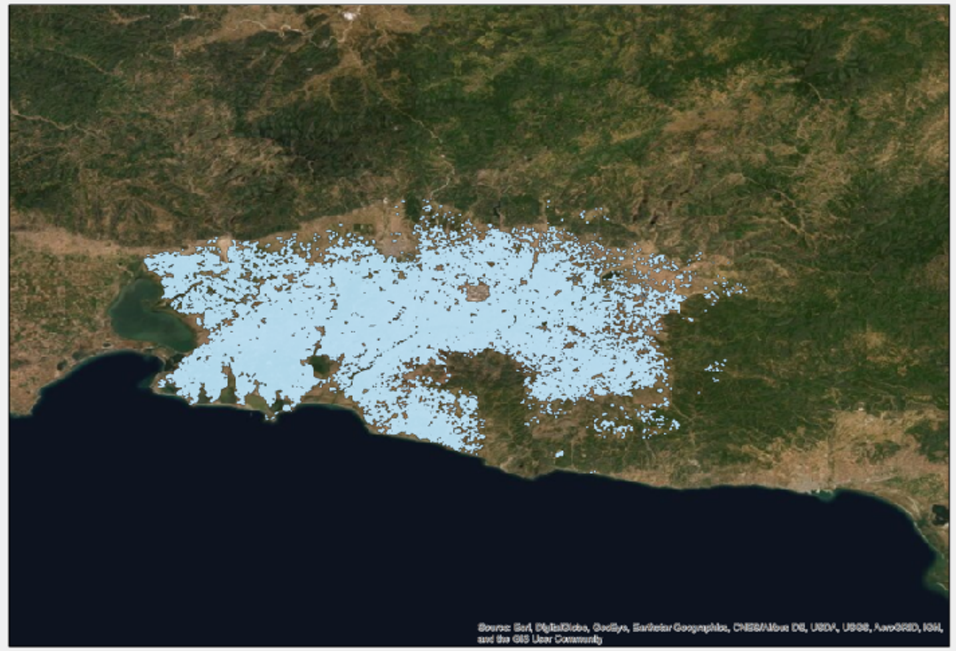
The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852

AREA OF STUDY

Rodopi is a regional unit of Greece, in the Northeast part of the country.
It has an extent of ~2500 km², a big part of which features cotton crop.
The area is included amongst the regions of Greece with the highest cotton yield production.



Cotton classification from Sentinel

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PROBLEM STATEMENT

ROOT CAUSE

- Data scarcity in radar scans and in-situ observations.
- Current need to physically evaluate all reported damages with agronomists.
- Limited amount of information in terms of early warning.

RESULT

- Uniform insurance rates over a region/ crop type.
- Payout delays after a destruction, part of the crop needs to remain intact.
- Difficult to efficiently consult the users in order to take necessary actions.

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THE CHALLENGE

The effective combination of climatological, earth observational, in-situ and numerical weather prediction data towards a more sophisticated monitoring of the agricultural needs.

THE CO-DESIGNERS

- **Interamerican:** One of the largest private insurance companies in Greece. Established in 1969, it has a clientele of more than1 million customers, both individuals and companies.
- **Gaia Epicheirein:** A company that incorporates 71 farmer associations together with financing and technological solutions, with an aim to efficiently consult and provide innovative services to users/farmers.

THE 3 PILLARS:

1. Past: Adverse selection tool (Historical Risk / Hazard / Vulnerability)
2. Present: Damage Assessment and High Level Monitoring
3. Future: Hi-resolution Early Warning System

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1. ADVERSE SELECTION

HAZARD

Lack of in-situ historical data dictated the utilization of 3 reanalysis datasets above Rodopi, the record of which spans over 4 decades (1981-present):

- **Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS):** a validated precipitation product that blends satellite observations with in-situ measurements from rain-gauges.
- **ECMWF's ERA5-land** for 2m Temperature and **ERA5** for wind gusts, datasets which combine vast amounts of historical observations into global estimates using advanced modelling and data assimilation systems.

VULNERABILITY

Vulnerability maps are produced from an analysis of a 10-yr record of damages in cotton crop over Rodopi region, provided by Greek Agricultural Insurance Organization (ELGA).

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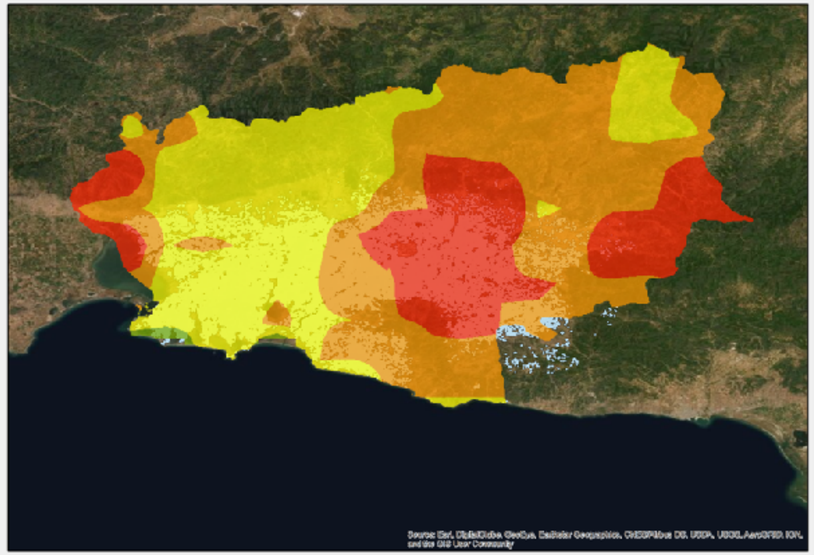
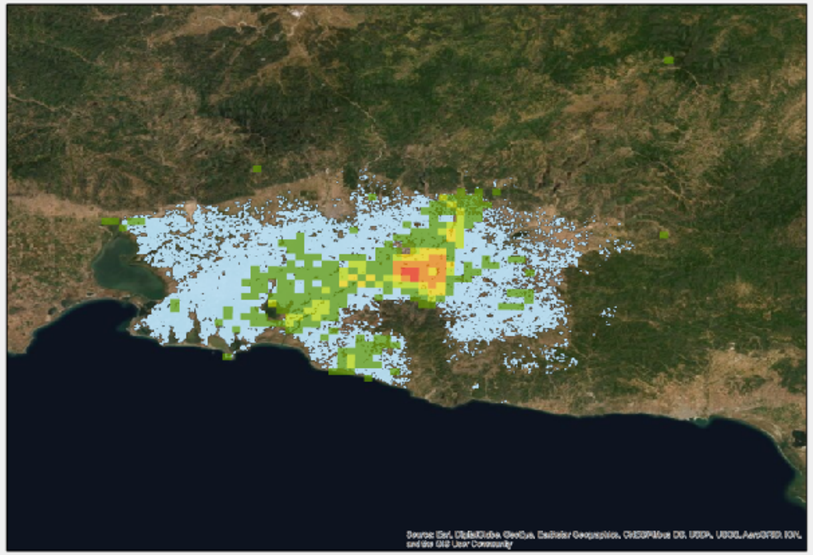
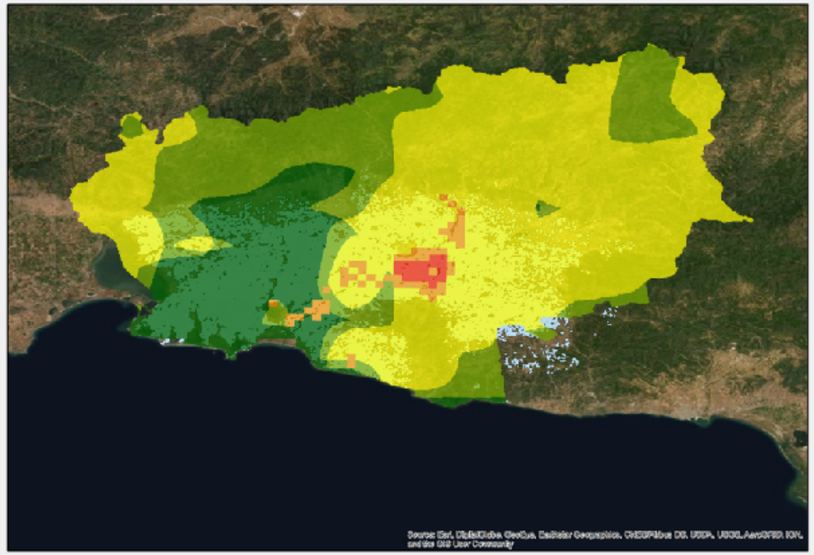
1. ADVERSE SELECTION



Heavy Precipitation
Combined Hazard



Flood from Heavy Precipitation
Vulnerability



HPE/Flood Risk

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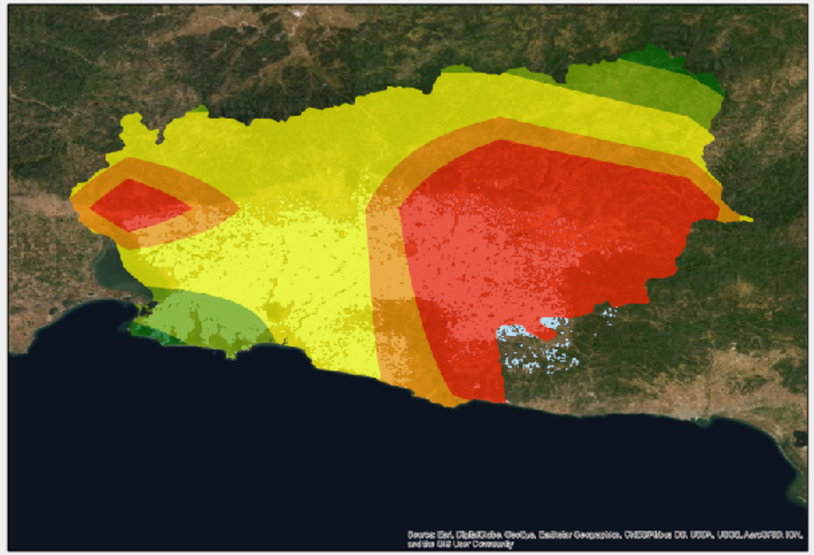
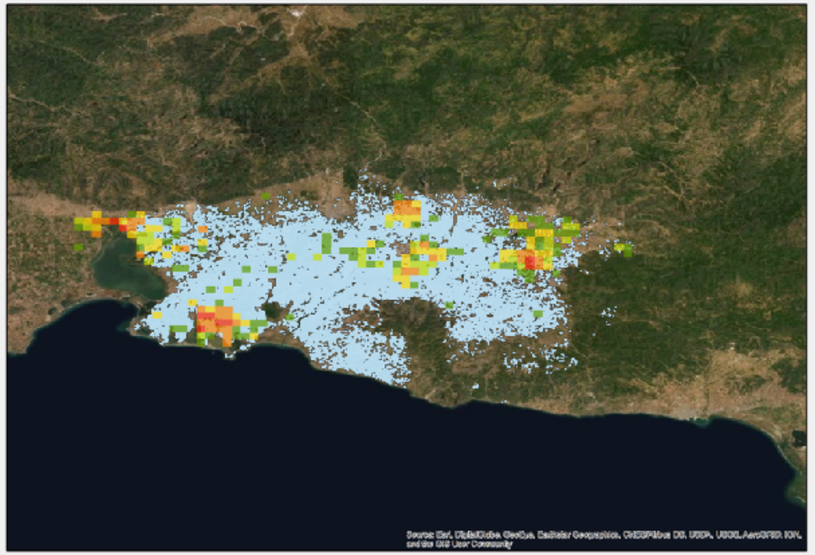
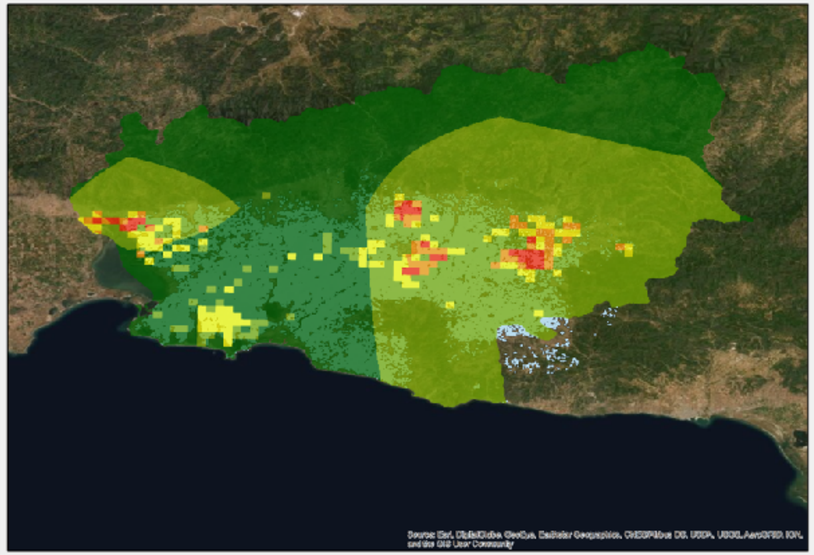


Gale Wind Hazard



Gale Wind Vulnerability



Gale Wind Risk

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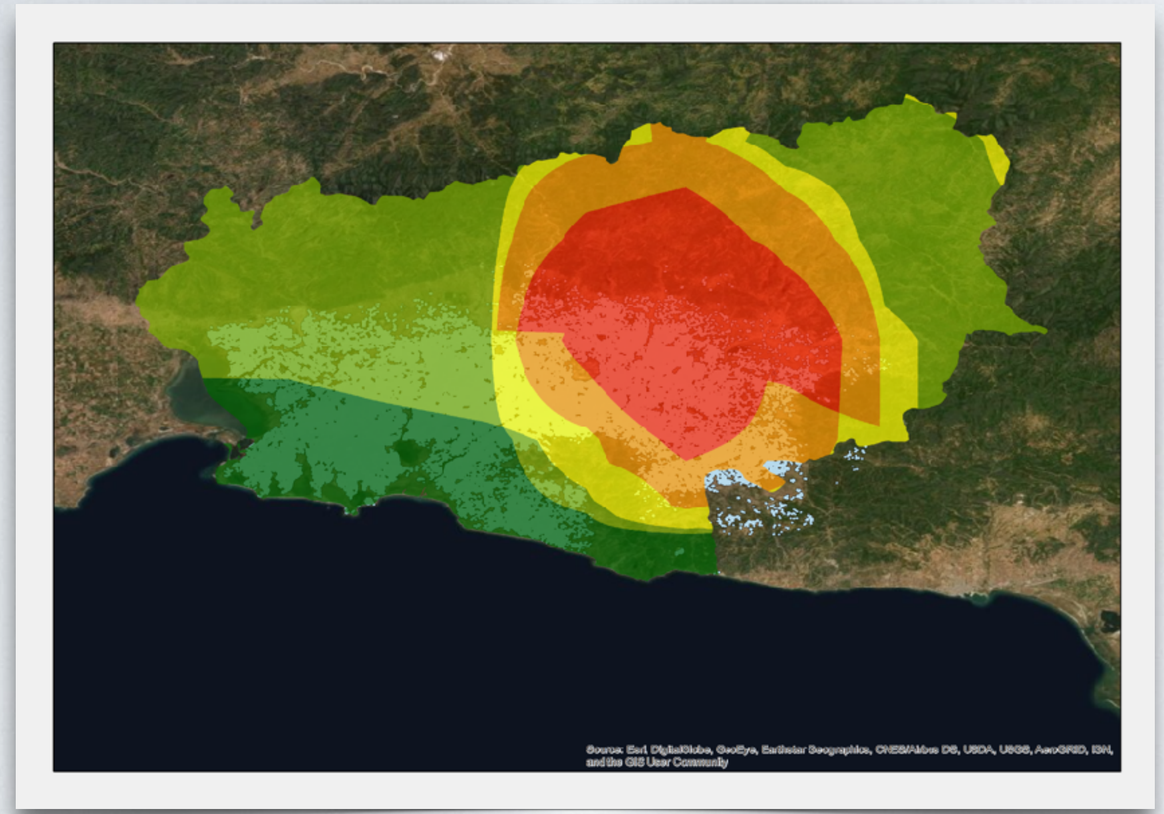
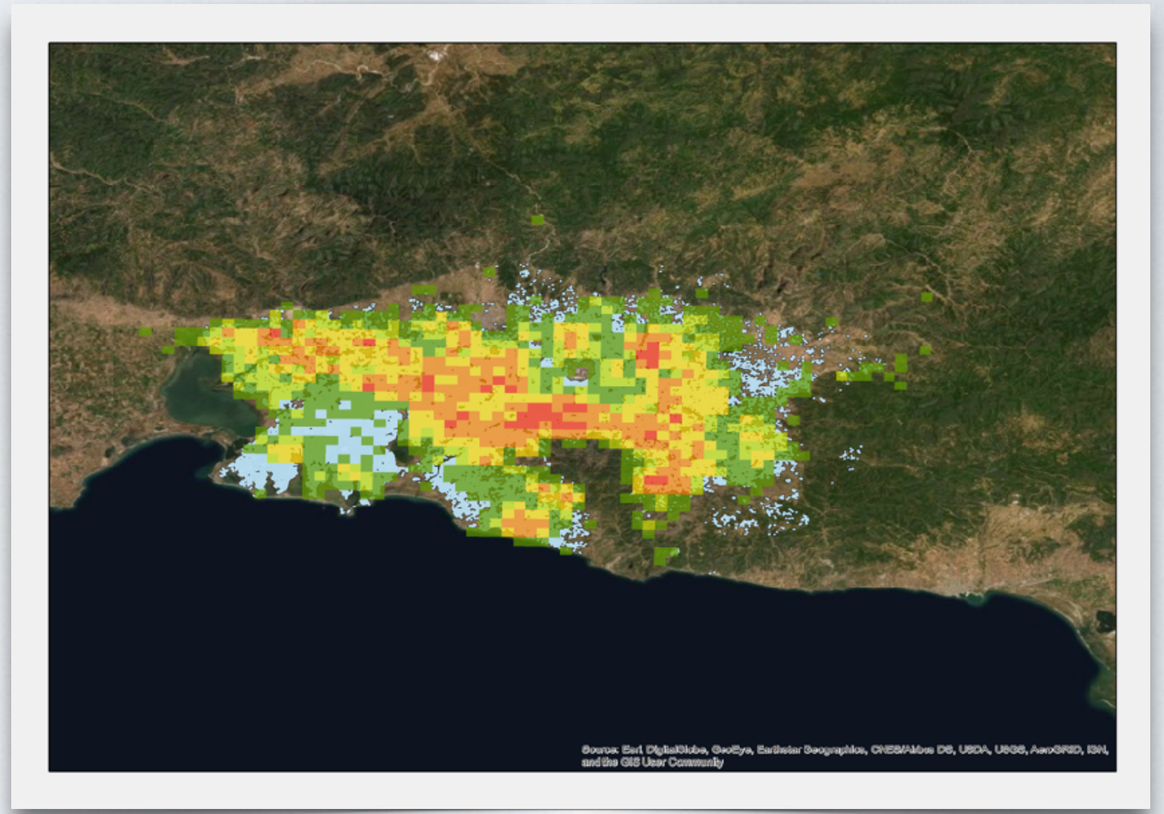


Temperature Combined Hazard



Hail Vulnerability

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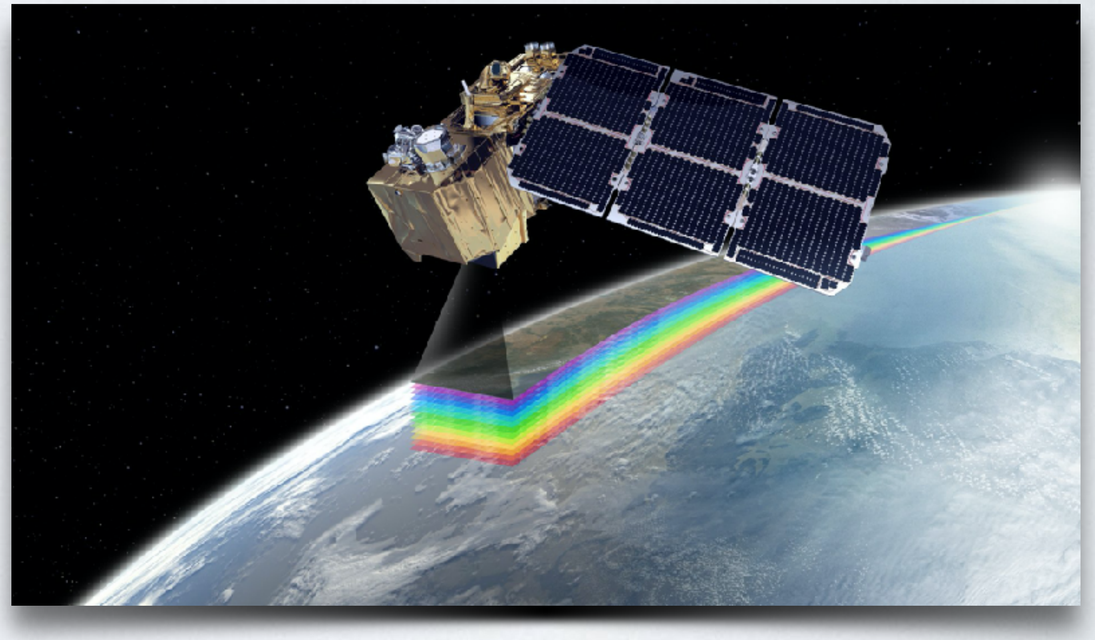
2. DAMAGE ASSESSMENT

A quick estimation of the affected areas after a destruction is feasible through a combination of:

- Observations from a sufficiently dense network of GAIASENSE smart in-situ stations in the area (9 over Rodopi, 255 nation-wide currently)
- High resolution (10m) Sentinel imagery, able to derive NDVI measurements at a parcel scale.



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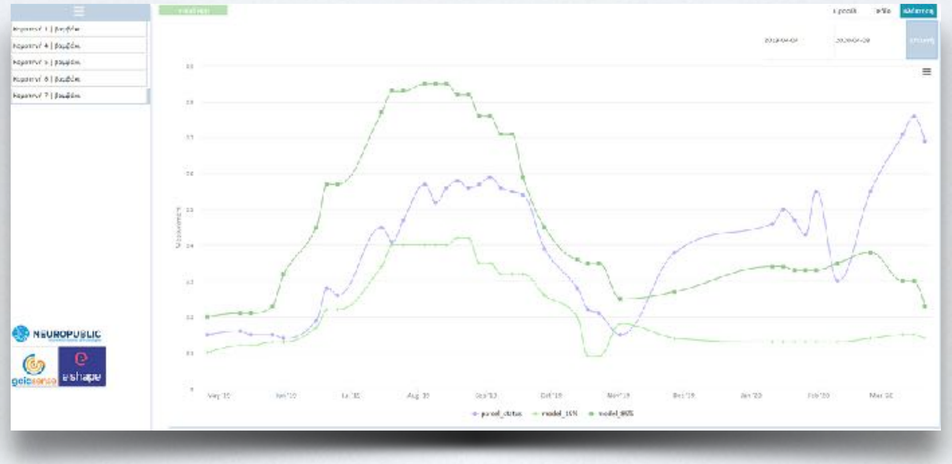
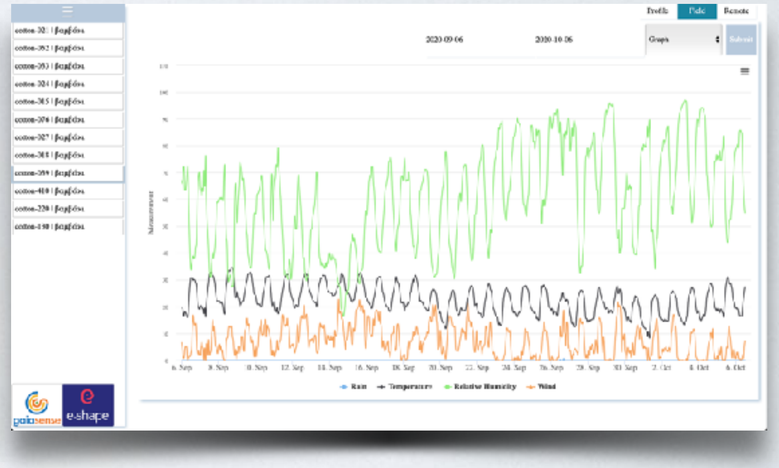
2. DAMAGE ASSESSMENT

The damage assessment tool is implemented in Neuropublic's GAIASENSE platform and provides:

1. A high level overview of the parcel status, displayed in an interactive map, based on the current NDVI index.
2. Meteorological, leaf and soil parameters from the corresponding in-situ sensors available on click
3. The fluctuations of the NDVI index plotted against a historical statistical range (20th-80th percentiles).





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3. EARLY WARNING SUITE

A state-of-the-art NWP forecasting model has been implemented on two dedicated HPC servers (160 cores).

The Advanced Research WRF (ARW) model is a configuration of the Weather Research and Forecasting (WRF) model. WRF-ARW v.4 runs operationally and provides high-resolution forecasts over Europe (6-km) and Greece (2-km) for 60 forecasting hours.

Initial and boundary conditions are provided by NCEP GFS 0.25-degree analyses and forecasts (12Z cycle).

GFS forecasts are also exploited as a longer-term forecast (10 days), that despite its coarser spatial resolution serves as a valuable first estimate to denote proximity to extreme conditions.

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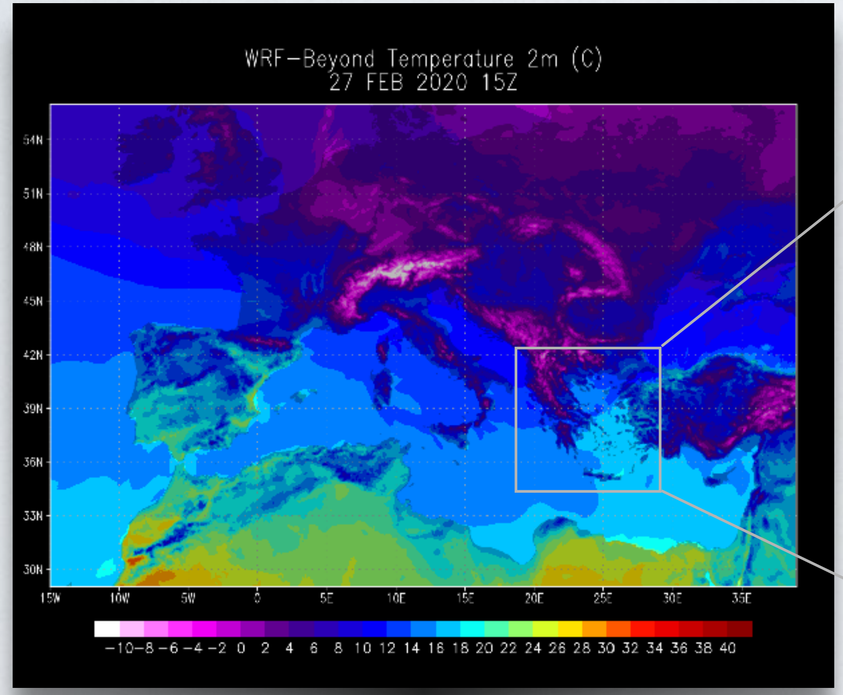
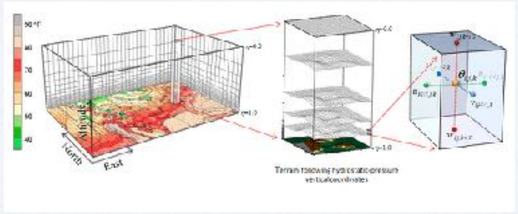
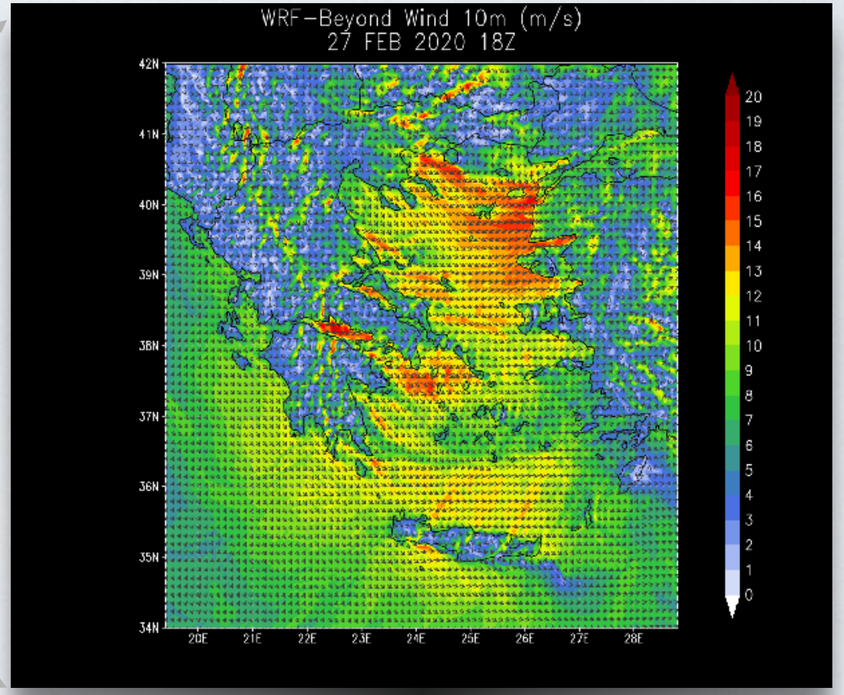
3. EARLY WARNING SUITE



6x6 km grid spacing

1000 x 650 x 40
grid points





2x2 km grid spacing
(convection resolving)

500 x 500 x 40
grid points

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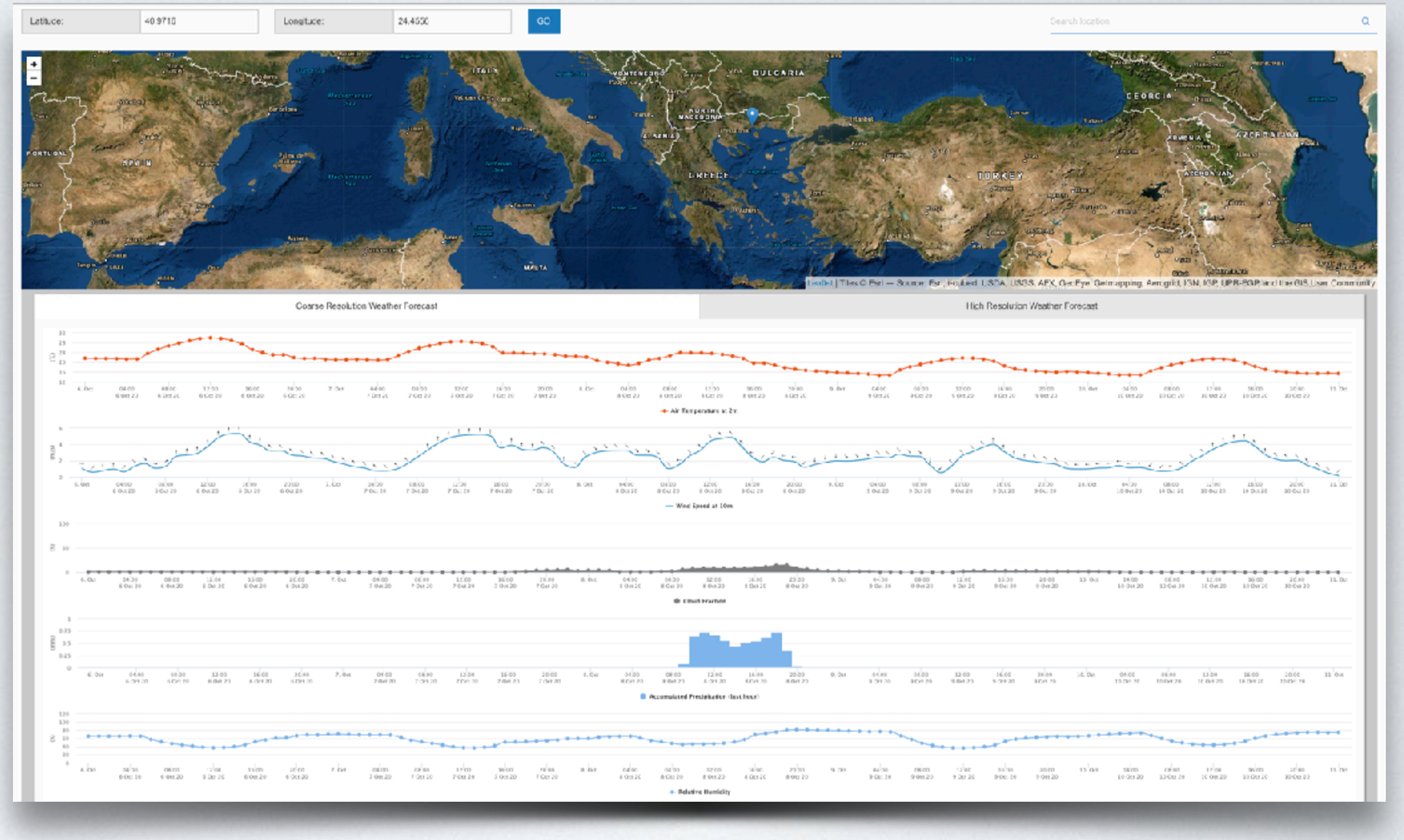
3. EARLY WARNING SUITE

A newly developed WebGIS front-end displays the data of the model outputs for every location within the model grid.

Point selection is available by entering coordinates, name, parcel ID or by manual cursor drag.

Crop-specific thresholds per weather peril will clearly denote alarming conditions.



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CONCLUDING REMARKS

- Through the ongoing research under the framework of e-shape EU project, services that provide detailed information to the insurance sector as well as farmers' associations emerged over a prior data poor region.
- Future insurance products can be tailored upon each parcel's unique characteristics.
- An early warning system that provides advance information on extreme conditions can be a valuable tool in the hands of agronomist consultants and farmer's associations.
- Combined with the research of e-shape Showcase1 Pilot 2 that provides the current phenological stage of the crop, that can fuse into an integrated tool that will denote optimum seeding, fertilizing, irrigating and harvesting conditions.

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THANK YOU
FOR YOUR ATTENTION

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