Remote sensing data in support to sustainable development

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MEEO

SISTEMA
ENVIRONMENTAL INFORMATION MINING

Ferrara, IT, 2004

Vienna, AT, 2009

Ferrara – Vienna ~ 40 People

Global Market – Continuous Evolution

International Team

Brands & Web & Socials

adamplatform.eu

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www.meeo.it

www.sistema.at

Mission

we develop tools to access, process, and translate the huge amount of available environmental data into useful insights

EO-based products lifecycle

adamplatform.eu
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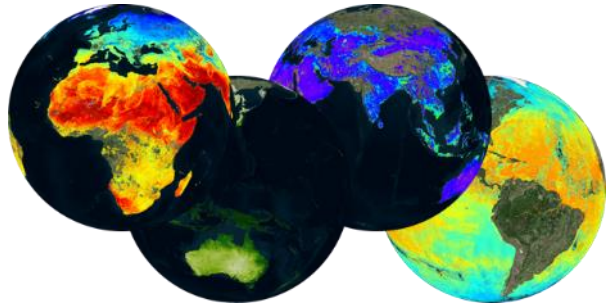
ADAM in one slide

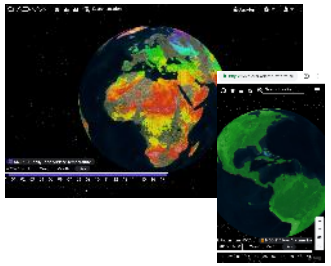
ADAM implements to concept of 'Digital Earth' (Gore 1999)

multi-resolution, 5D representation of the planet → find, visualise and make sense of vast amounts of geo-referenced information



ADAM is connected to the biggest existing data facilities (>40 PB data) and will be a core asset for future missions

- ADAM exposes a variety of interfaces



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Agriculture

Urban Environment

Atmospheric applications

Marine applications

Education

Planetary Science

Public Health

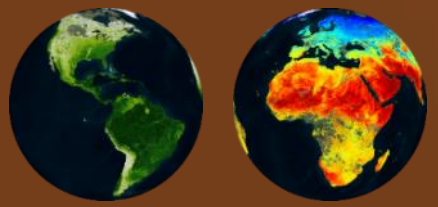
Climate Change

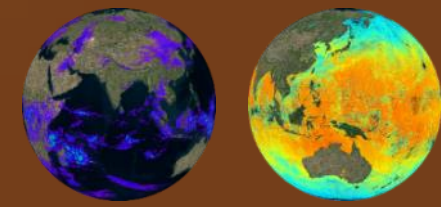
Forestry / Vegetation

Cultural heritage

Infrastructure monitoring

Data infrastructure and Security





Food (in)security

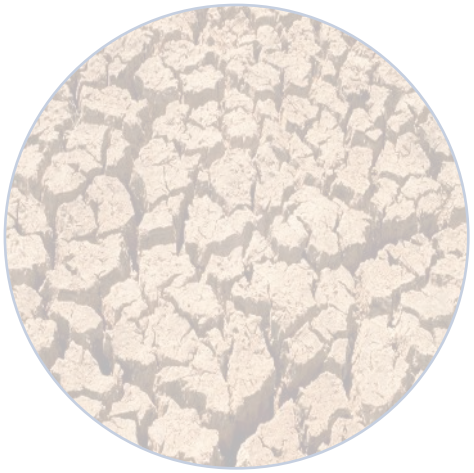
2 ZERO HUNGER

Topics

Abandoned fields

Farming advisory

Pests risk assessment



Drought warning

Abandoned fields

- **Scope**: to identify changes in managed crop fields to assess food availability risk on a seasonal / yearly basis

- **Problem**: cloud coverage over winter / spring months

- **Solution**: use active and passive satellite sensors and ML-based to homogenize vegetation tenure information

UKRAINE - KHERSON

The map is showing an agricultural area located in east part of the city of Kherson and north of Crimea. Since the begining of the conflict in 2022, the area is located in an "hostile" zone opposing both sides. The map has for objective to show the agricultural activity over the area, comparing year 2021 (on left) and 2022 (on right).

The images are corresponding to super resolved composite images of NDVI (Normalized Difference Vegetation Index) over the agricultural season between January and end of August of each year.
Vegetation is use here as a proxy to define the agricultural activity, the composite image is structured as so : respectively high vegetation response in end of season in red (June - September), middle of season in green (April - June) and begining of season in blue (January - April). The method is named as 3 times scan, giving the possibility to identify active / abandonned fields. Darker fields signified no or minimum vegetation evolution between each part of the season, letting the hypothesis that the defined field is not exploited. In the contrary, red fields are corresponding to high vegetation response in the end of the season, letting the hypothesis that it is following a "normal" agricultural trend with a maximum value in the end of season.

By comparing both year we identify a darker tone over the year 2022, hypothetically determined by the fact that people fled the area with the start of the war, meaning less activity over the area. Hypothesis that can be supported by the vegetation graph evolution shown in the bottom of the images, showing a lower NDVI values in 2022 than in 2021.

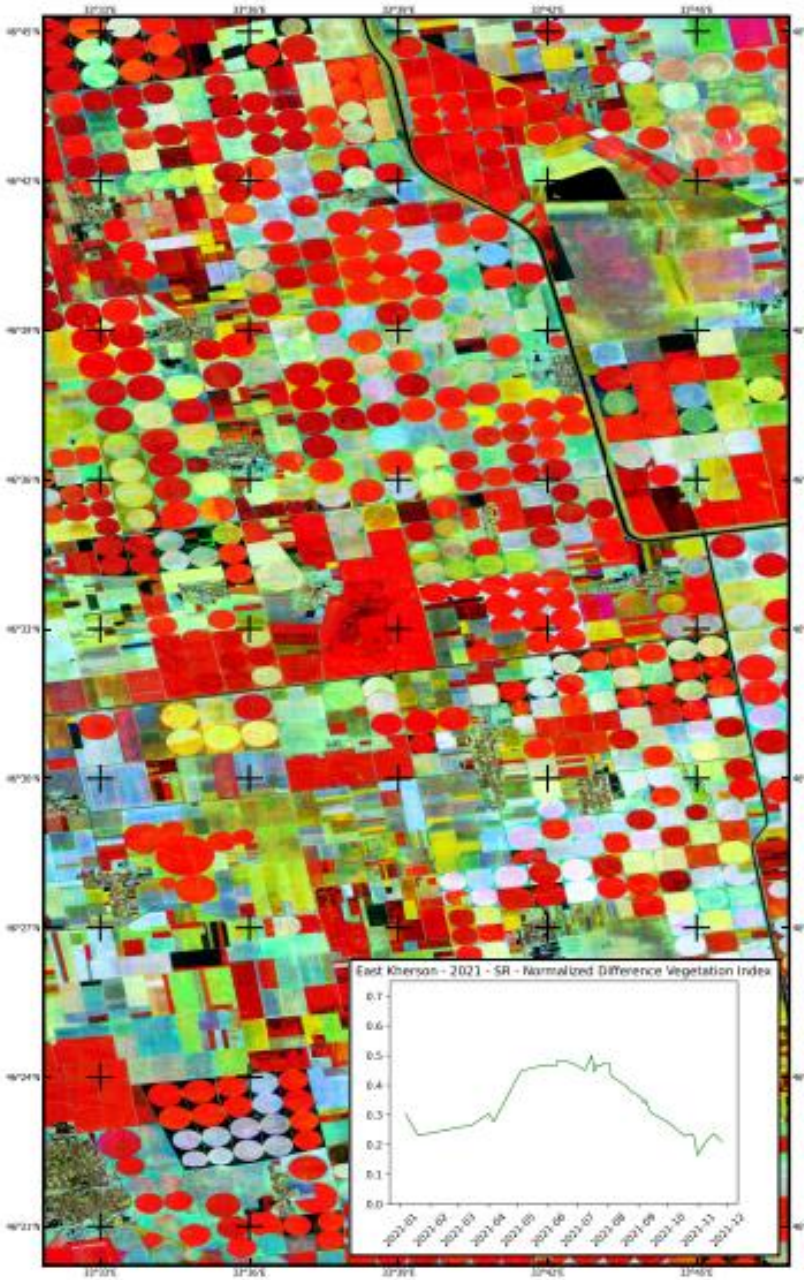
The area is corresponding to ~880km² of agricultural fields, the identification of low activity fields (hypothetically abandonned) is measured at ~125km² in 2022, compare to ~10km² measured in 2021. Corresponding to almost 15% of the area not cultivated.

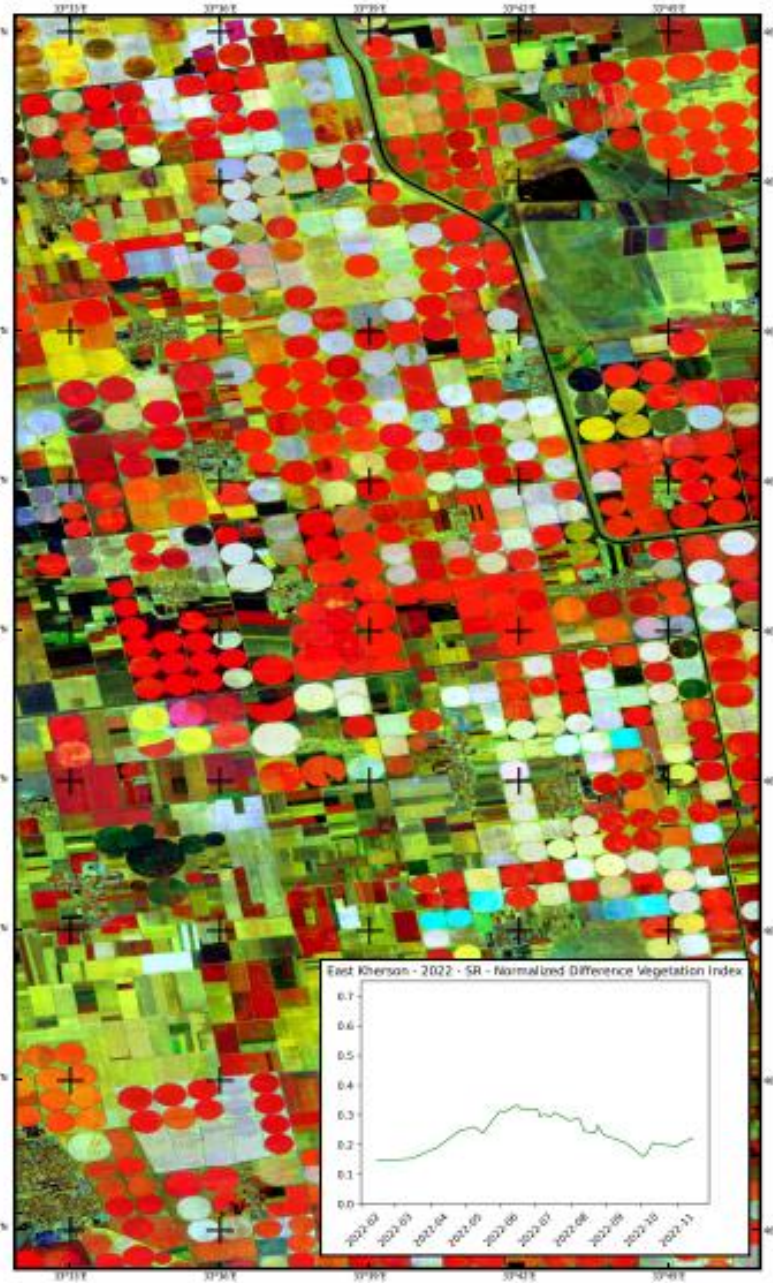
The map and results were developed in the context of the project SR4C3. Given information are extracted from modified satellite data (super resolution), accuracy of the analysis depends on the quality of the images. Ground verification is necessary for validation purposes.

LOCATION

SOURCES

Dataset : Sentinel-2
SR modification (3m spatial resolution)
Acquisition : Temporal serie of 2021 - 2022
Institution : ESA - European Space Agency





N
0 1 2 3 4 km
Tick mark : WGS 84 geographical coordinate system

Map produced by : SISTEMA GmbH /info@sistema.at

~880km² fields
~10km² in 2021
~125km² in 2022

Agriculture advisory services

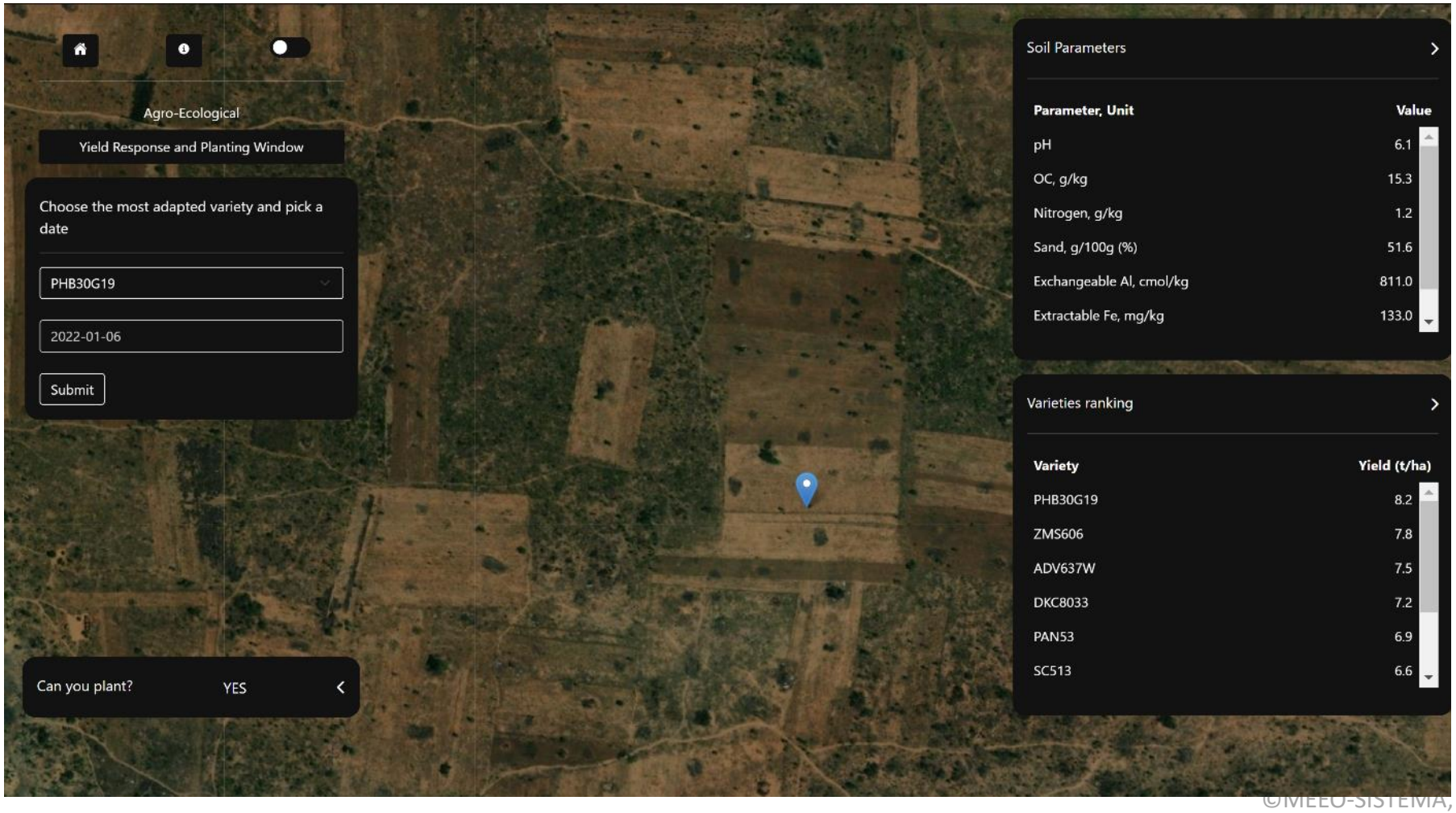
- **Scope**: support farmers and FAO staff on crop management activites

- **Problem**: to provide on a point basis the following features:
  - The soil chemical parameters
  - The most productive maize variety
  - The optimal planting date

- **Solution**: use of ground, satellite and weather forecast data and provide a very simplified tool (web / mobile app)

The Plan-T platform

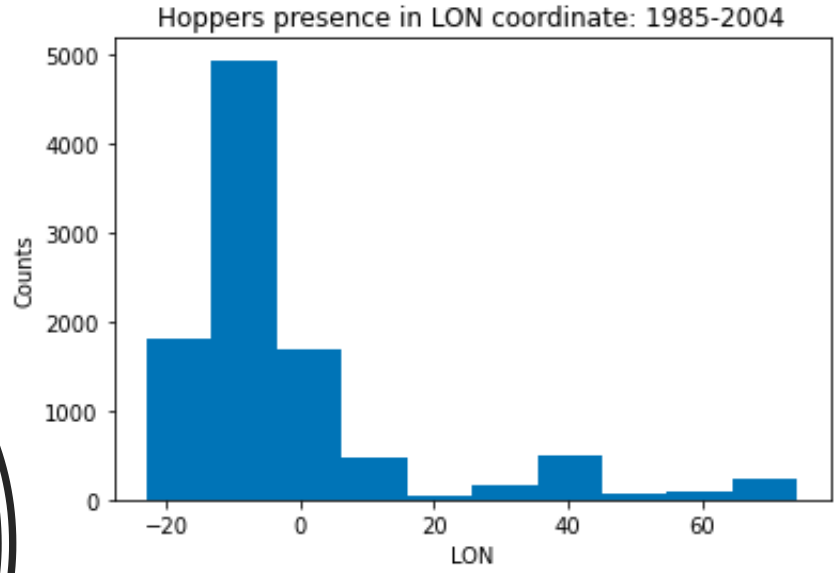
1. Define the field you want to get information on (coordinates / click)

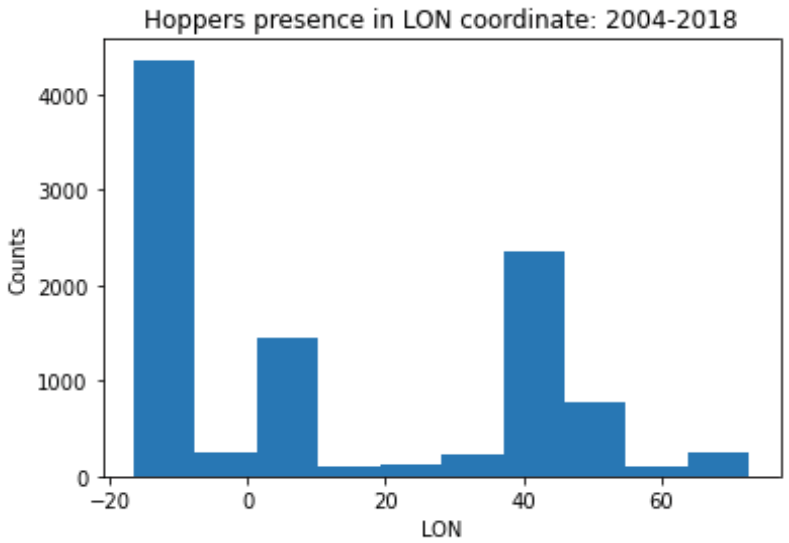


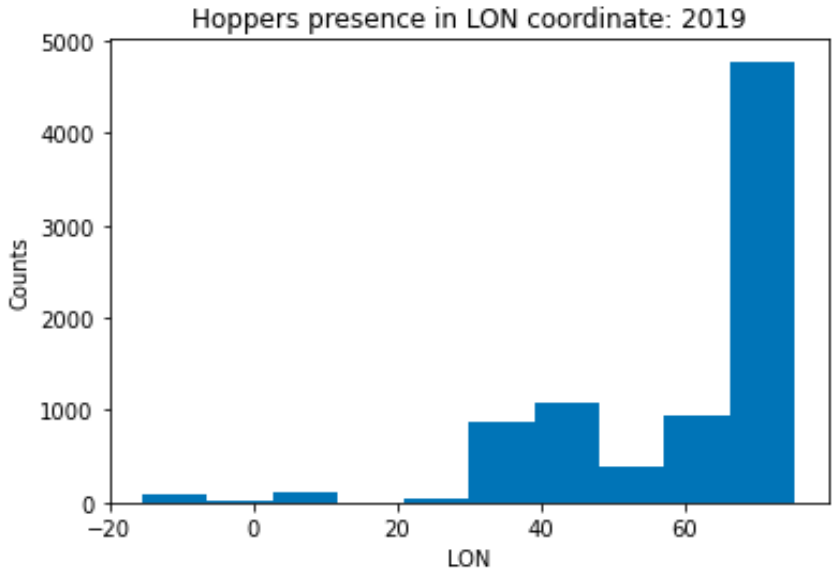
2. Obtain soil characteristics and productivity information

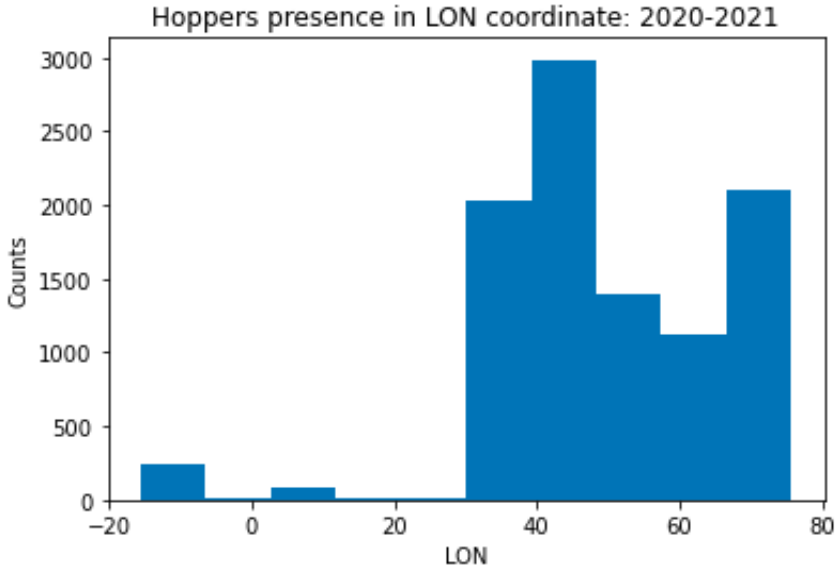
3. Check the optimal seeding date

Locusts evolution over time







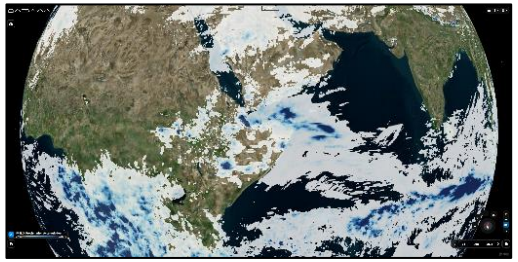


Pests risk assessment

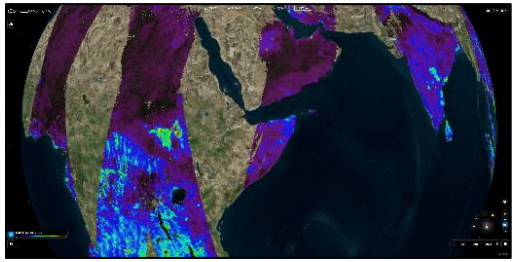
Hoppers monitoring

- Suitable ecosystem identification
- Occurence estimation

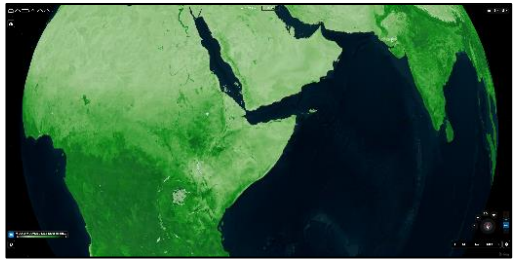
Next breeding location



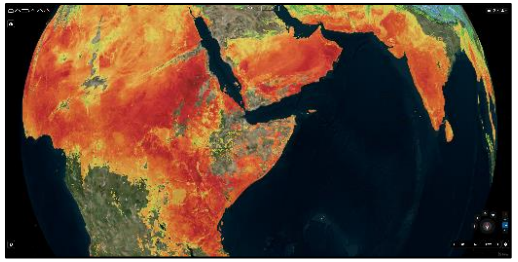
Precipitation



Soil Moisture



Vegetation



Temperature

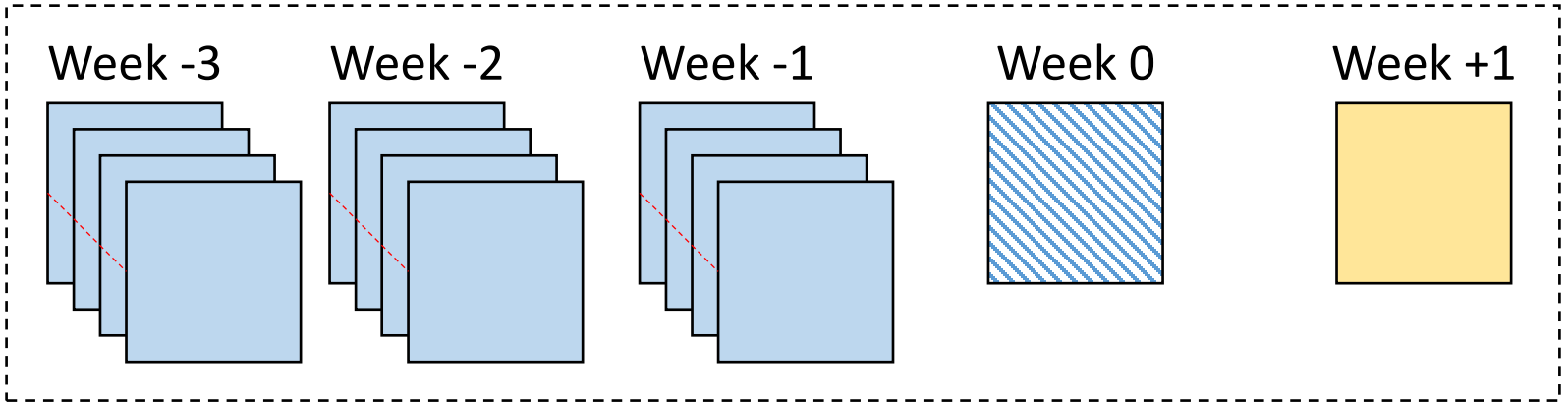
Forecast (max 10 days)

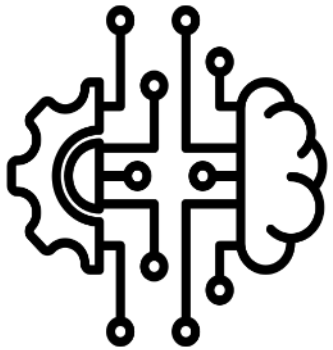
Seasonal (~ 6 months)

Projections (yearly, scenarios)

Occurence estimation

Dataset





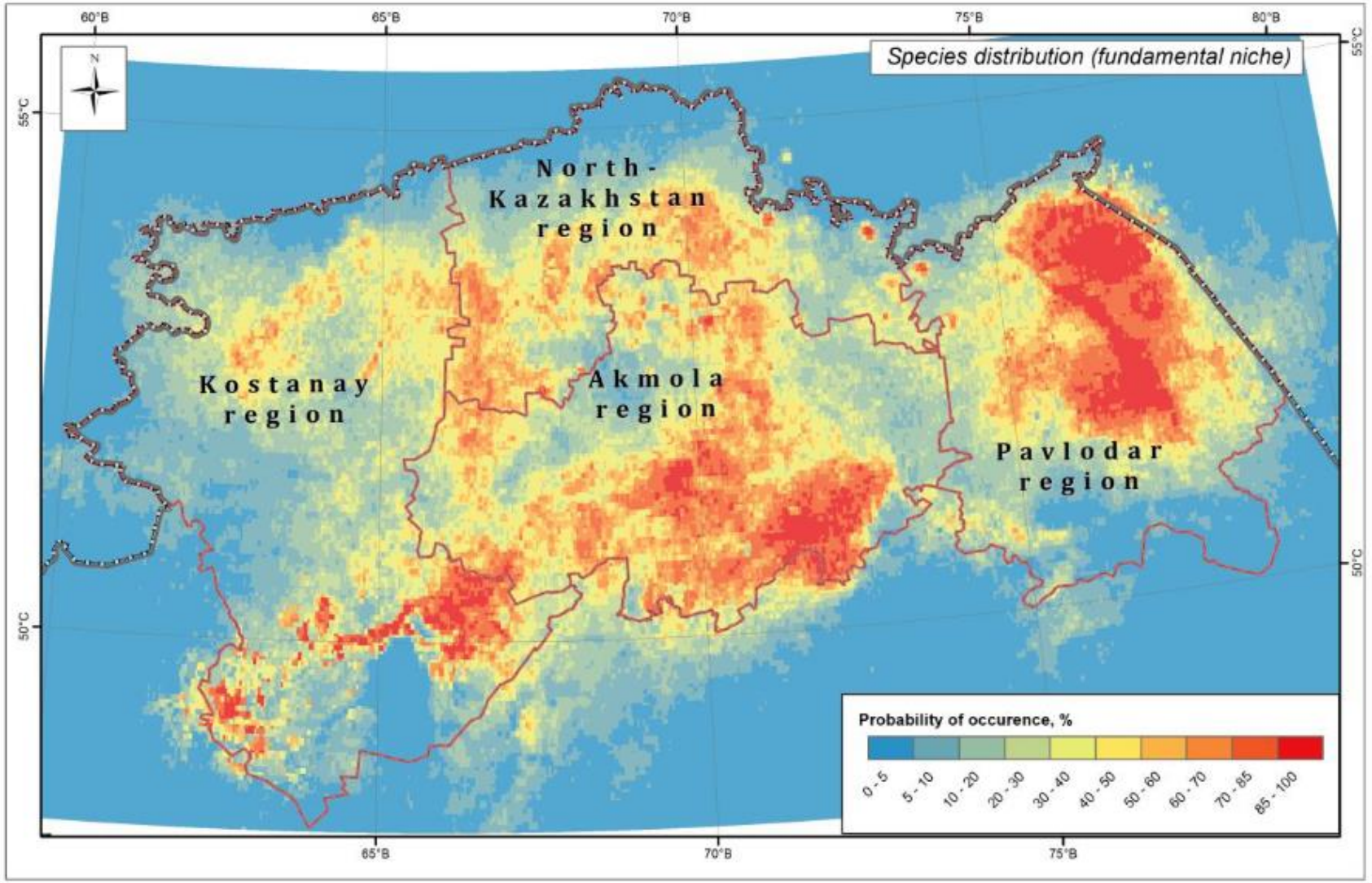
Classification with LSTM
(Long Short Term Memory)

Desired output

Prediction of suitable ecosystem
for locust breeding one week in advance

Occurence estimation

« GIS-Based Potential Distribution Modeling for Harmful Non-Gregarious Locusts in Agricultural Areas of Northern Kazakhstan to Improve Preventive Pest Management ». In PASEW-22, MESSH-22 & CABES-22 April 19-21, 2022 Paris (France). Eminent Association of Pioneers, 2022. https://doi.org/10.17758/EARES11.EAP0422106.



Thanks for your attention

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