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for epidemiology, modelling
and surveillance

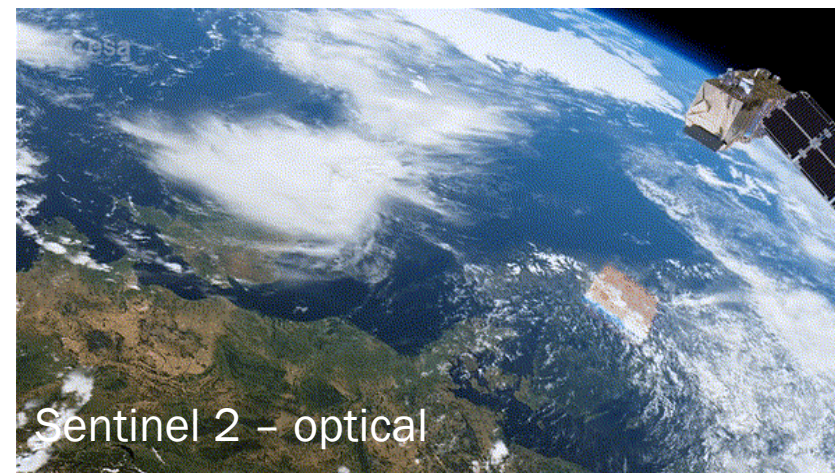
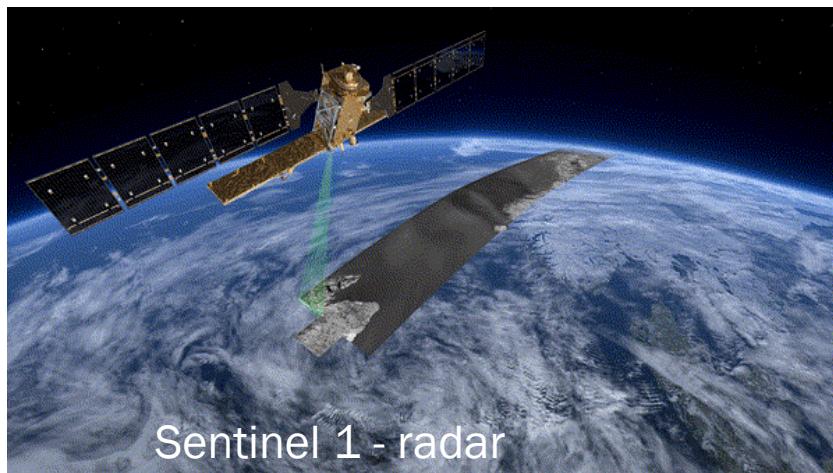


Defining Ecoregions and Prototyping on EO- based Vector-borne Disease Surveillance System for North Africa (PROVNA)

Workshop on: “Towards improved understanding & control of
Vector-Borne Diseases in GCC and the Arabian Peninsula
29-30 July 2024 - UAE

IZSAM - WOAH Collaborating Center for Epidemiology, Modelling and Surveillance
WOAH Office North Africa in Tunis

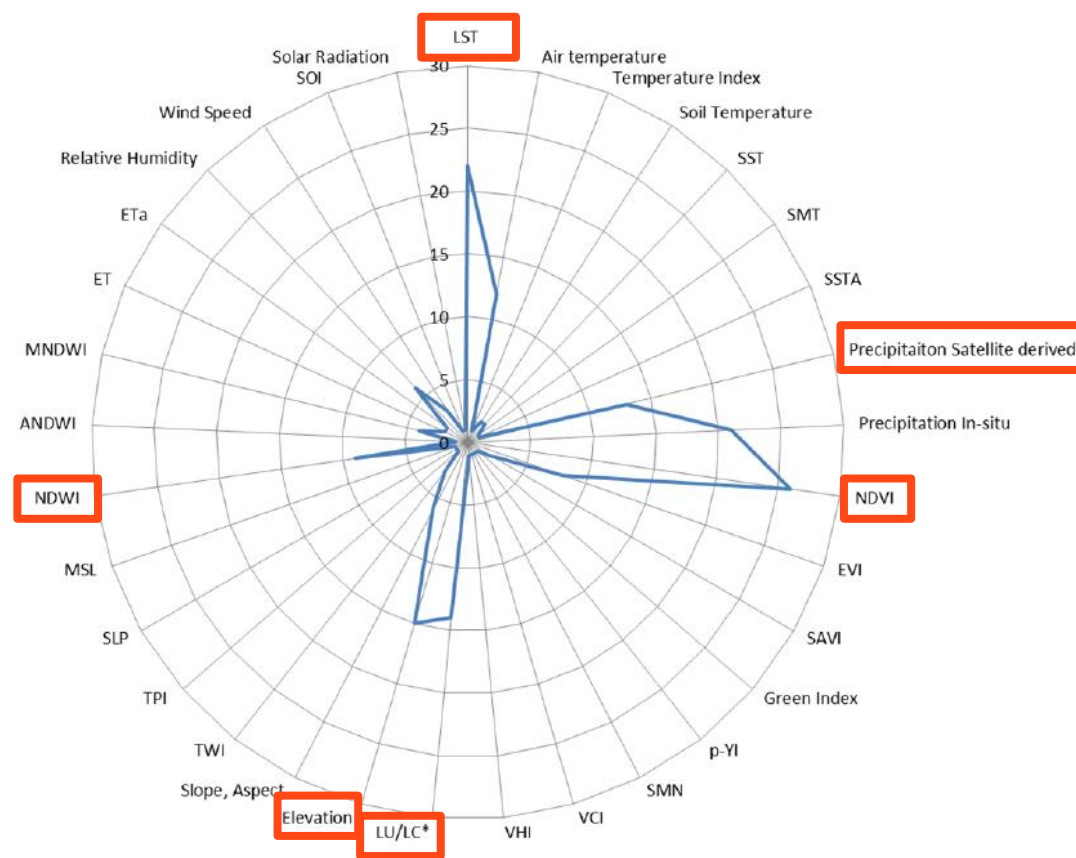
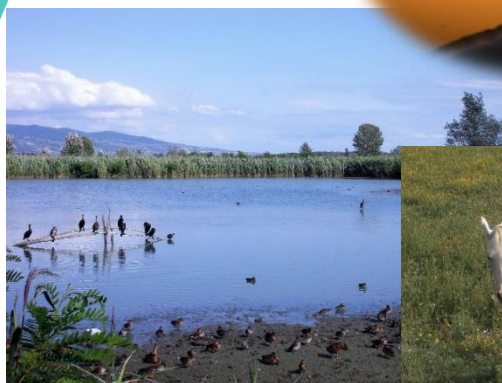
Earth Observation



EO provides:

- **accurate** geo-locations for contiguous target areas;
- **objective**, consistent measurements of physical properties of the Earth and its atmosphere that can be interpreted to define its features and conditions;
- **repeated** coverage to enable detection of changes in features and/or their condition.

Climatic and Environmental variables in vector-borne diseases



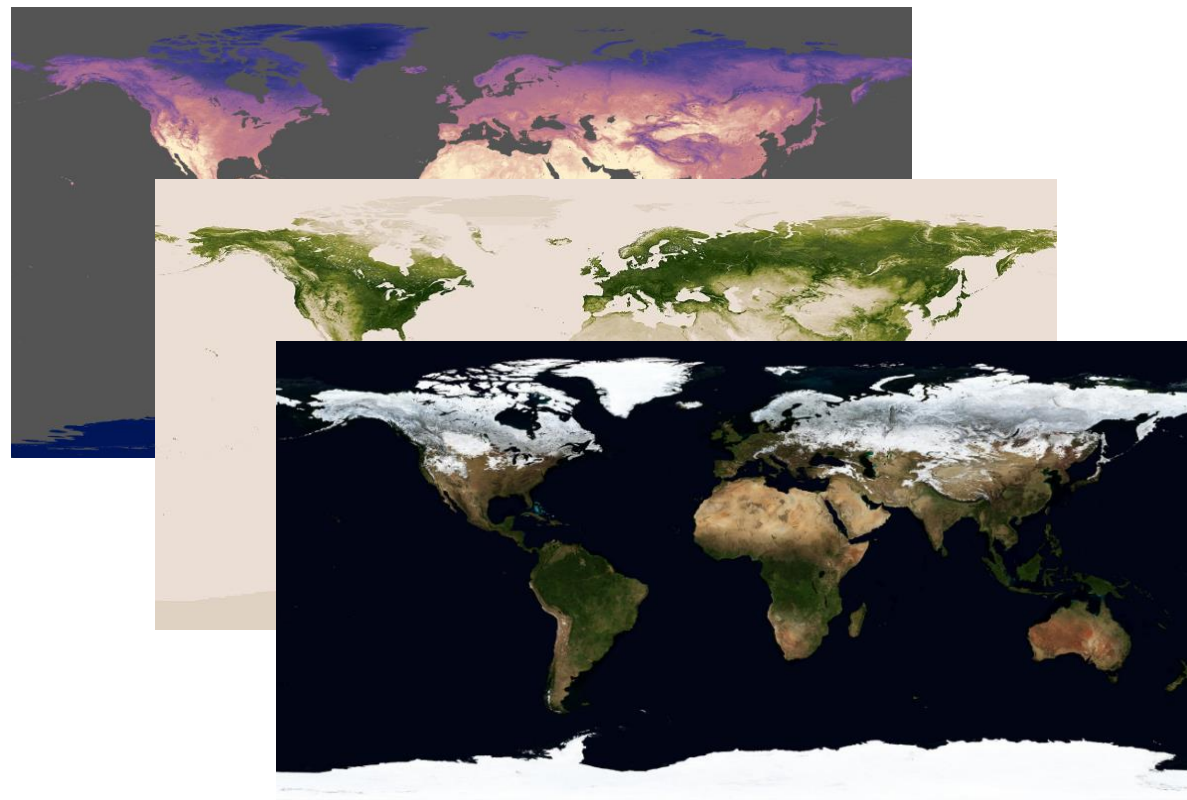
Parselia et al. Satellite Earth Observation Data in Epidemiological Modeling of Malaria, Dengue and West Nile Virus: A Scoping Review. *Remote Sens.* 2019, 11, 1862; doi:10.3390/rs11161862



Terra – Aqua satellites

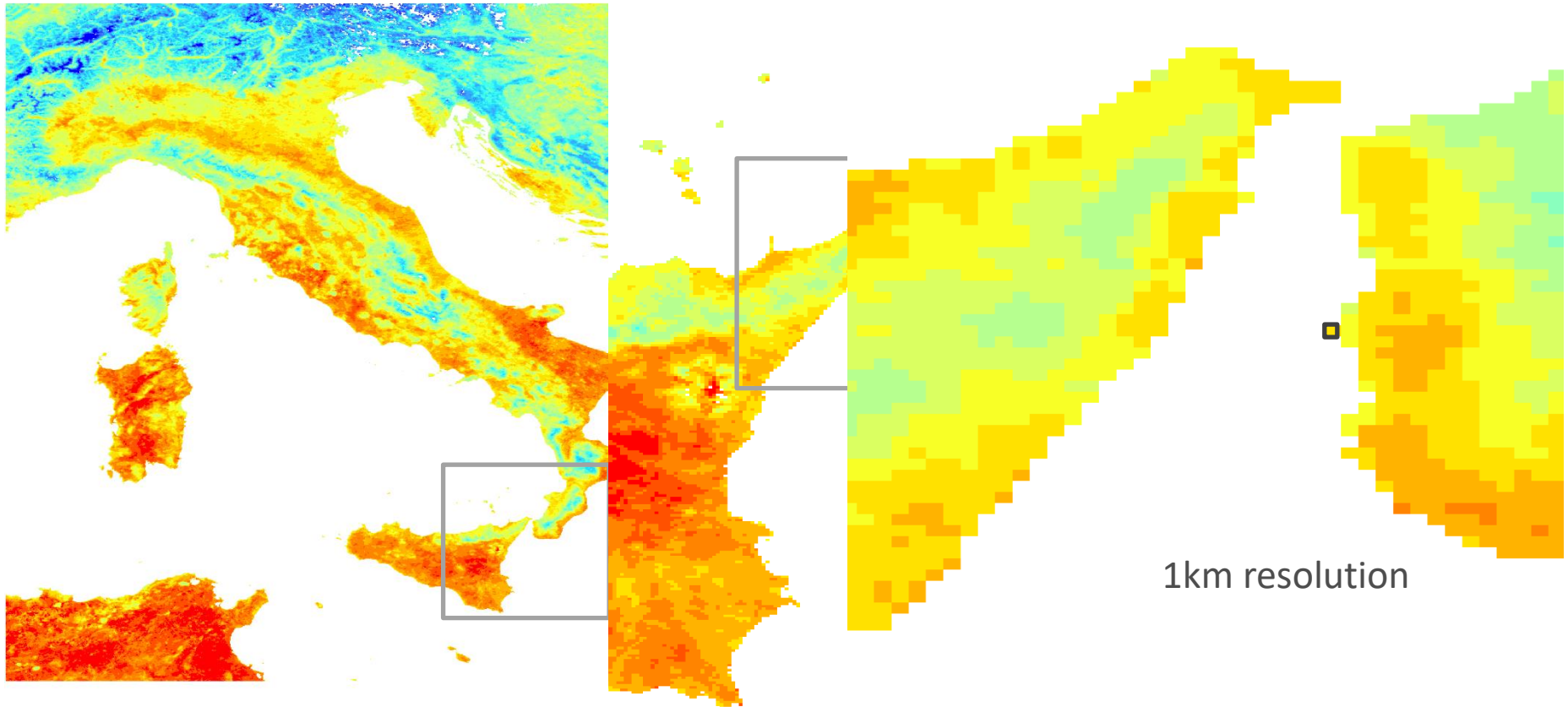
- **Spatial resolution: 250 m, 500m, 1 km**
- **Temporal resolution: 1-2 days**

Earth Observation data



Earth Observation data

Temperature MODIS 1 km



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Spatial resolution S-2:
10 m, 20m, 60m

Temporal resolution: 5
days

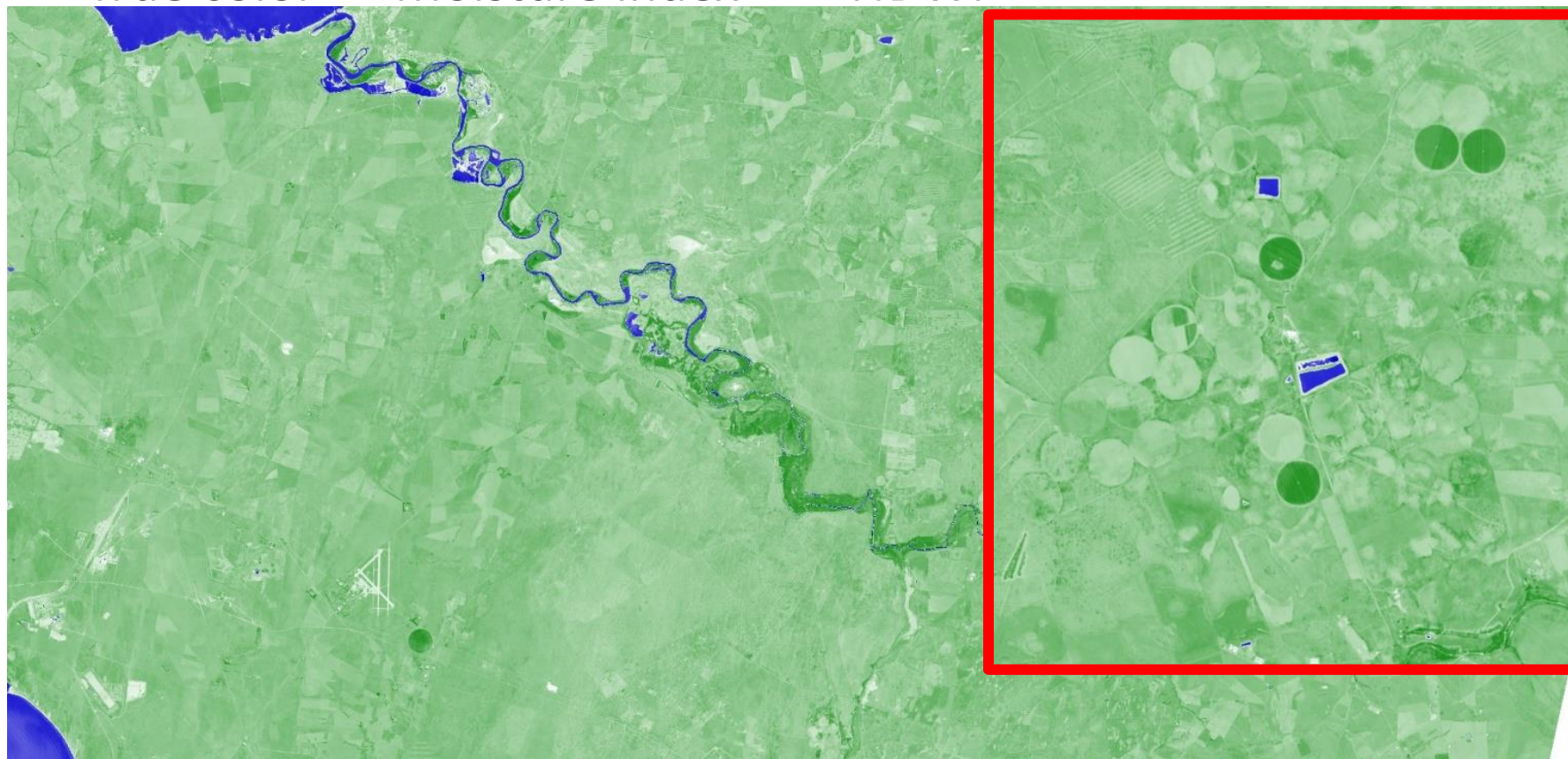


Copernicus programme

True color

Moisture index

NDWI



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Earth Observation data



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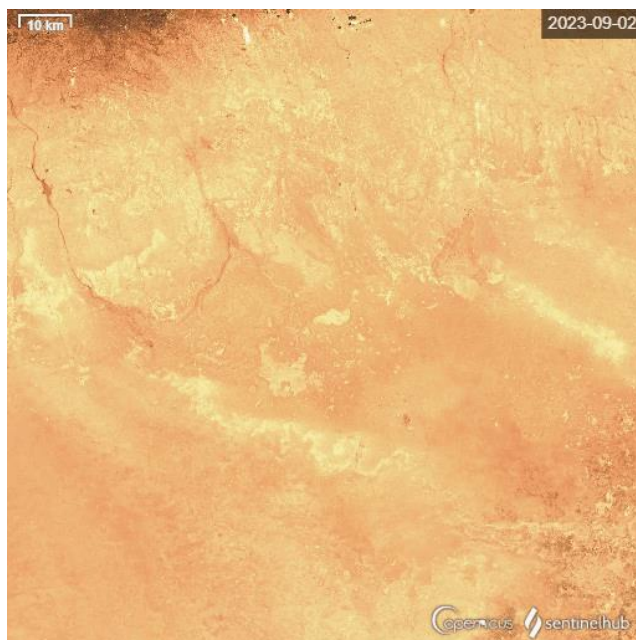
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Earth Observation data

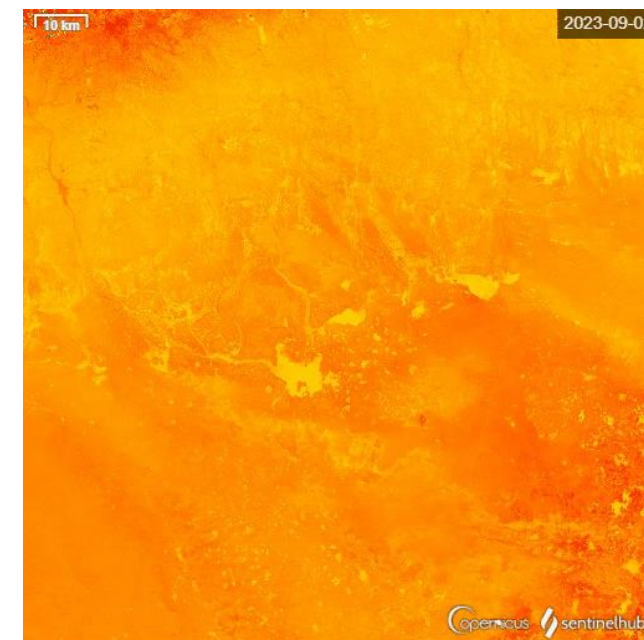
True color



Water Index



Soil Moisture

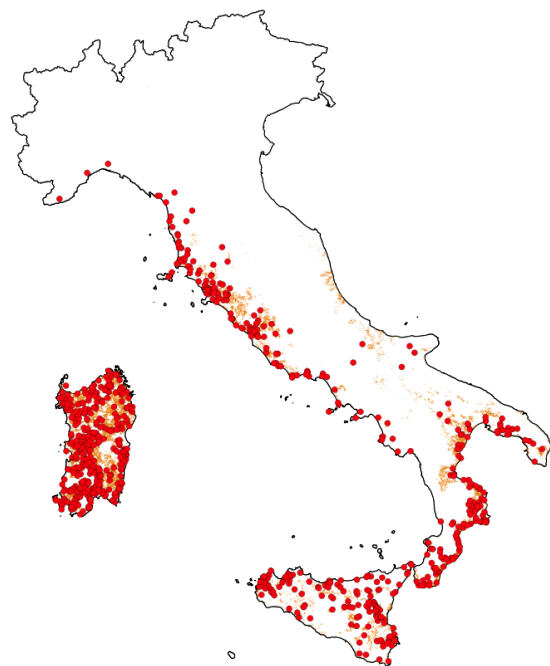


Ecoregionalization

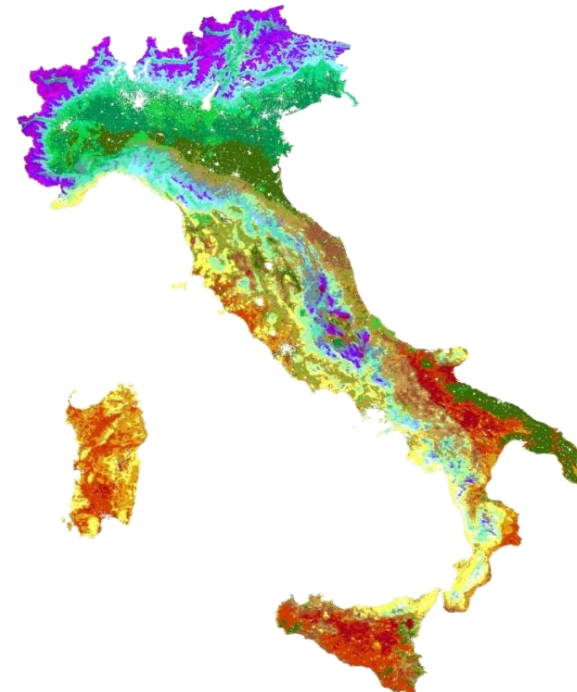
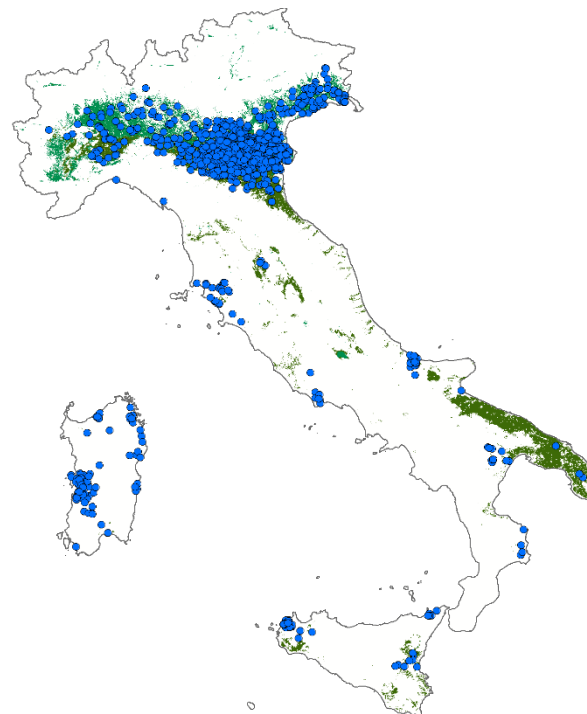
It is the process through which a territory is classified into similar areas according to specific **environmental** and **climatic** factors. The climate and the environment strongly influence the presence and distribution of vectors responsible for significant human and animal diseases worldwide. It is then useful to develop a map of similar eco-climatic regions adopting a data-driven spatial clustering approach using recent and detailed spatial data on climatic and environmental factors.

Ecoregionalization

C. imicola



WNV circulation



PROVNA project

Research objectives

1. to define the “ecoregions” of the North African territory (Mauritania, Morocco, Algeria, Tunisia, Libya and Egypt), each one characterized by distinct environmental and climatic factors, on the assumption that similar areas (in space and / or time) are subject to similar diseases (especially vector-borne diseases);
2. to build a customised prototype application to identify areas at risk for RVF in North Africa region. This system combines static inputs with other EO-dynamic variables like NDVI, rainfall to demonstrate this capability and use by various Veterinary Services in the region.

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Countries



Project phases

26/04/2022

Phase 1. Definition of the requirements

Activity 1.1: literature review

Activity 1.2: definition of EO data

Activity 1.3: definition of system architecture and statistical analysis

Phase 2: EO data preparation

Activity 2.1: data retrieval

Activity 2.2: manipulation and processing of EO data

Phase 3: Statistical model/analyses

Activity 3.1: Super SOM (Unsupervised Neural Network)

Phase 4: Ecoregion map evaluation/validation/application and prototype development

Activity 4.1: disease data/risk areas and ecoregions comparison

Activity 4.2: Web Based Prototype Application Development

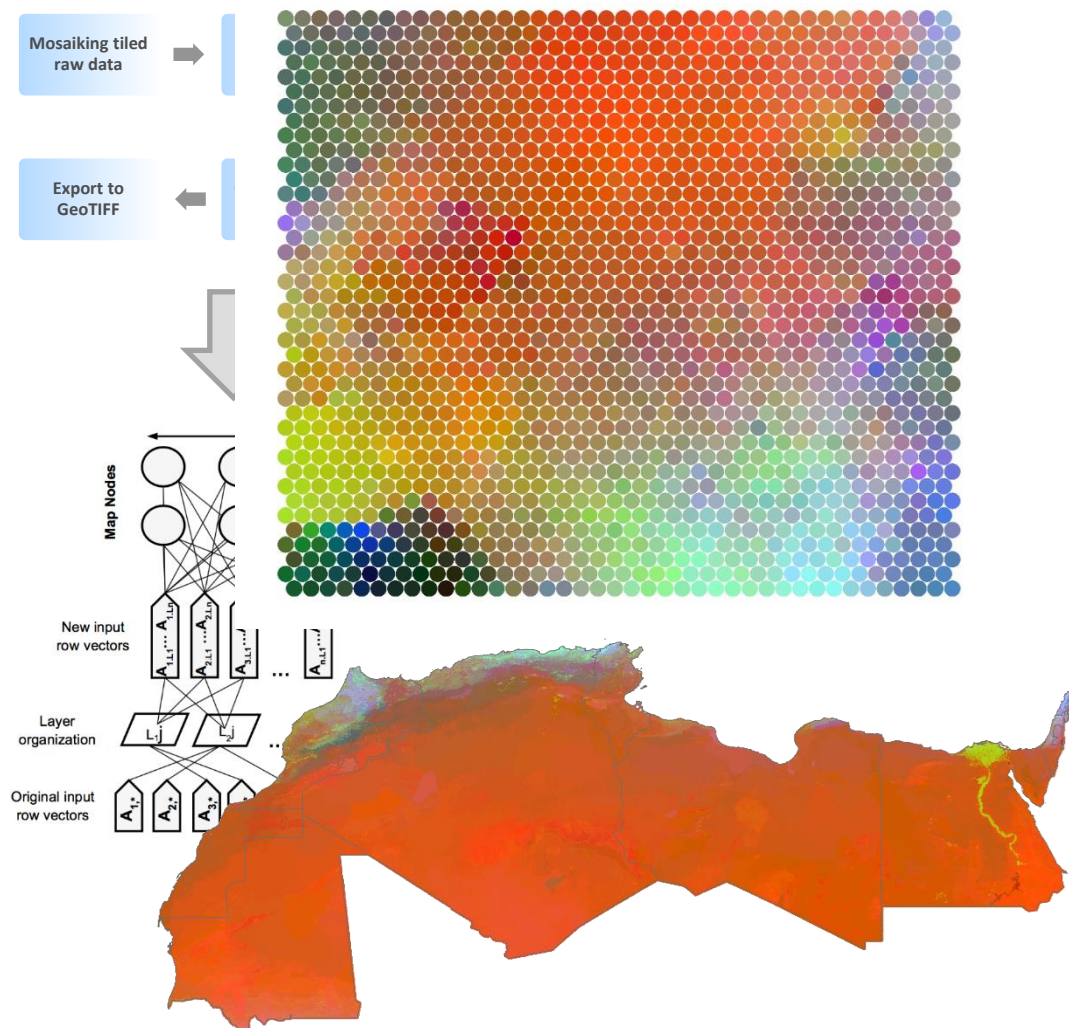
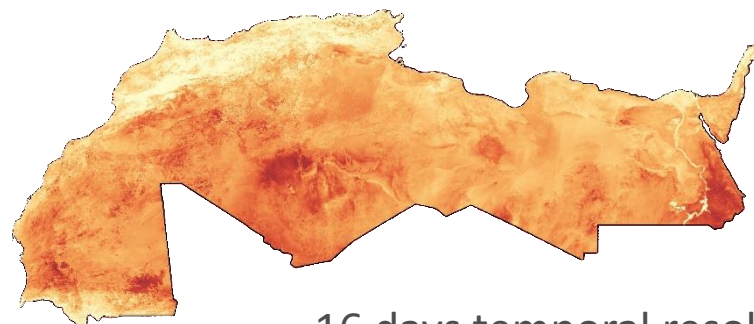
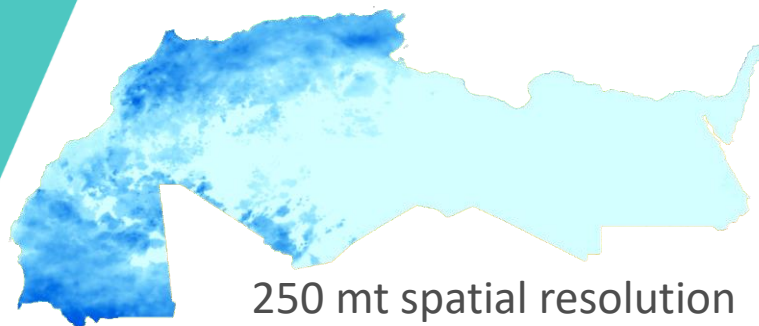
Phase 5: Communication and dissemination

31/06/2024

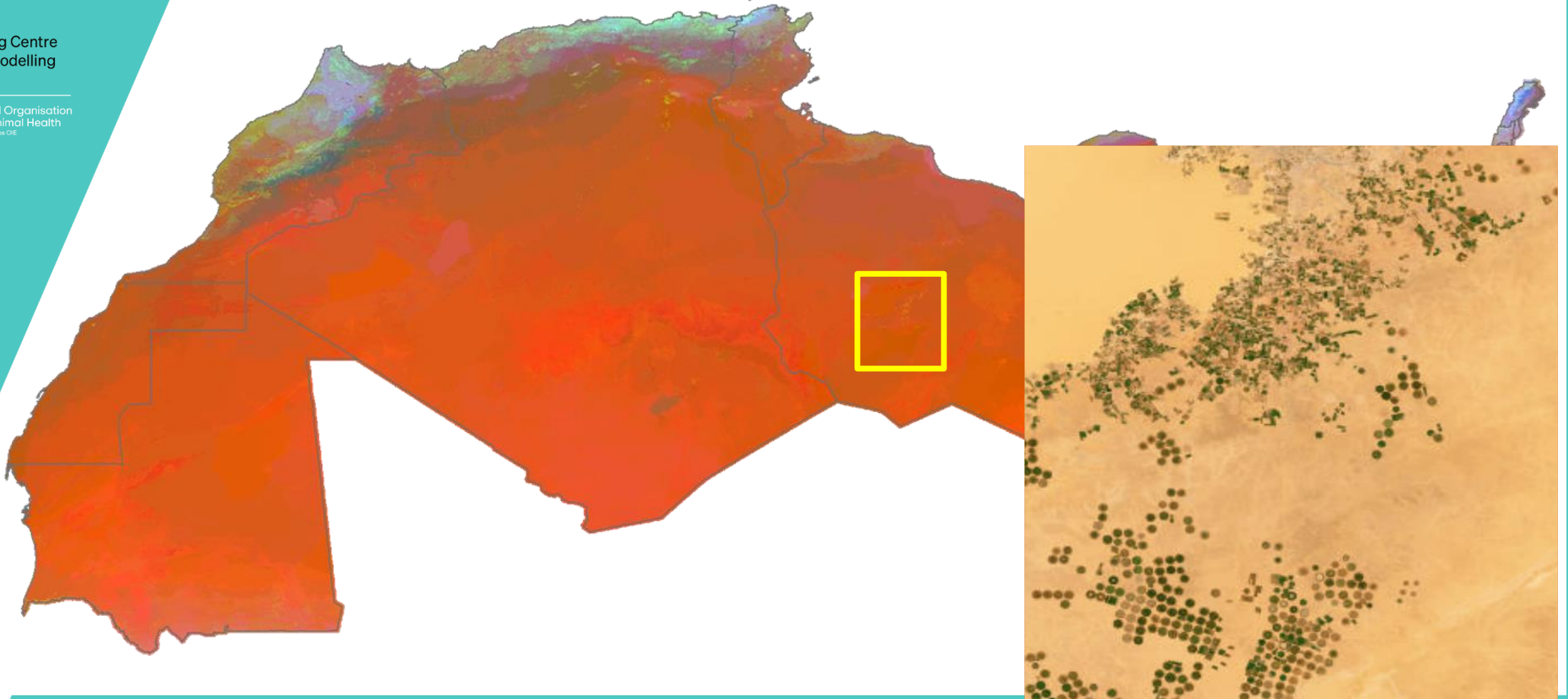
Ecoregionalization in North Africa

Earth Observation data (2018-2022)

rainfall



Ecoregionalization in North Africa



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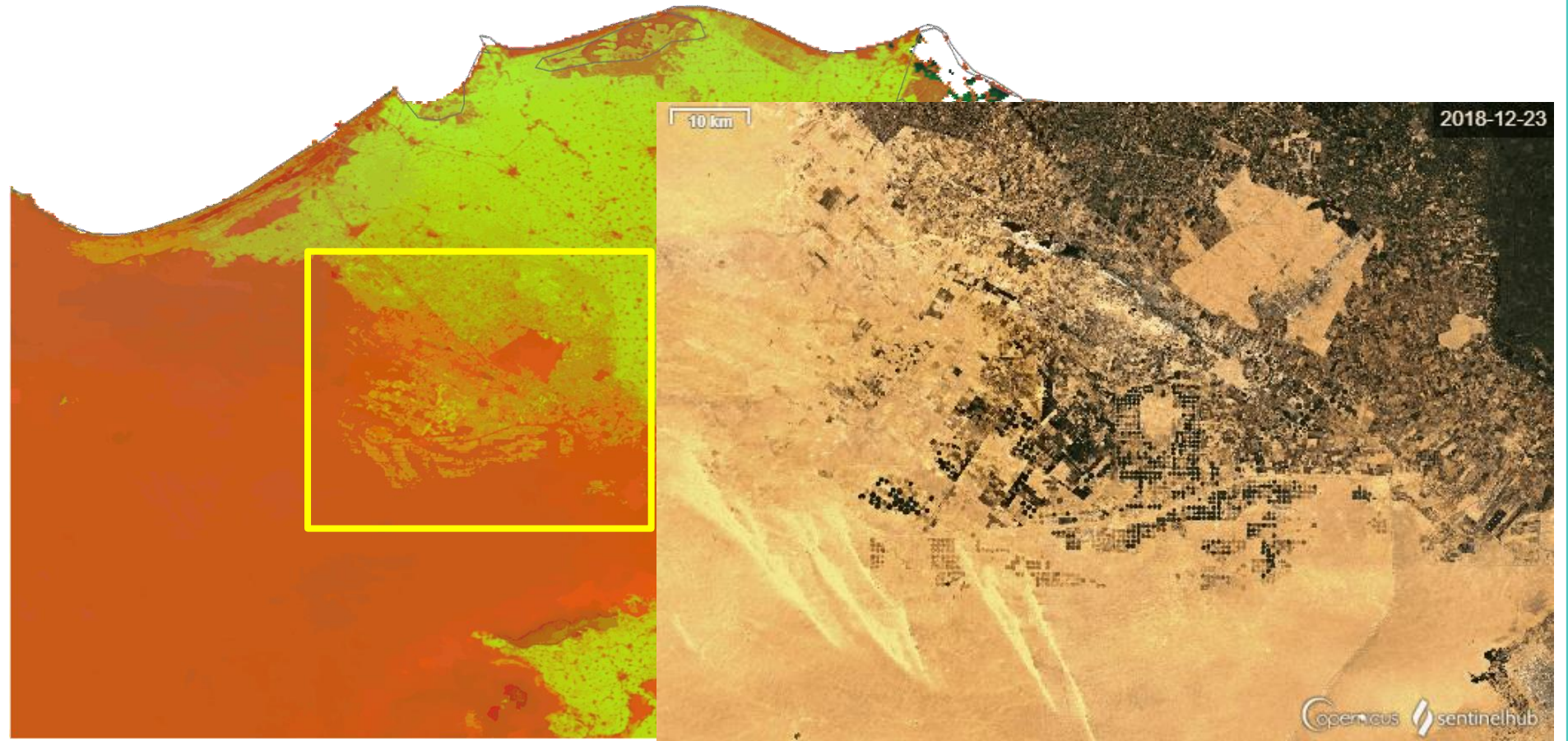
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Ecoregionalization in North Africa

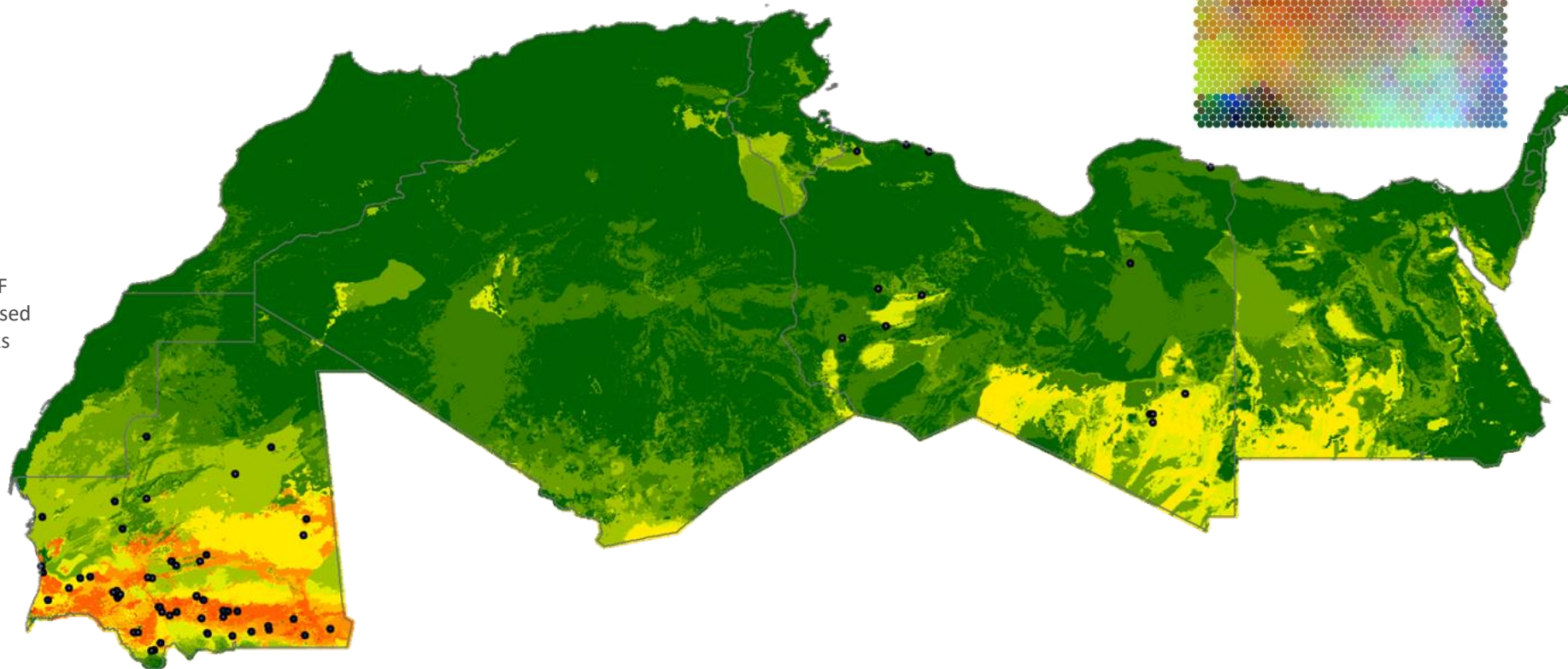
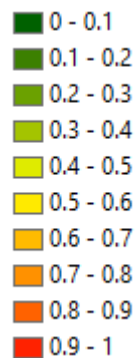
2022



Application of ecoregions in North Africa

RVF outbreaks 2018-2022 - with ecoregions map

Probability of RVF
suitable areas based
on past outbreaks





Thank you

