Drought in Italy - 2022

use case demonstrator in DestinE

eodc – Christoph Reimer

2022 drought in the Po Valley

- 50% less precipitation in Northern Italy during spring 2022 compared to the 30 year average
- Po river flow decreased by ~80%, water levels dropped by 3 m below average
- 125 municipalties rationed drinking water, suspending of hydroelectric power plants
- 30 – 50 % output loss for major crops, +30% increase in food costs

What IF scenario

- How could have Destination Earth contributed to support policy makers in risk assessment and decision making
- Use case implementation: Demonstrate the use of DestinE services supporting experts to generate required information
- DEDL EDGE Services for data proximate compute

HARMONISED DATA ACCESS

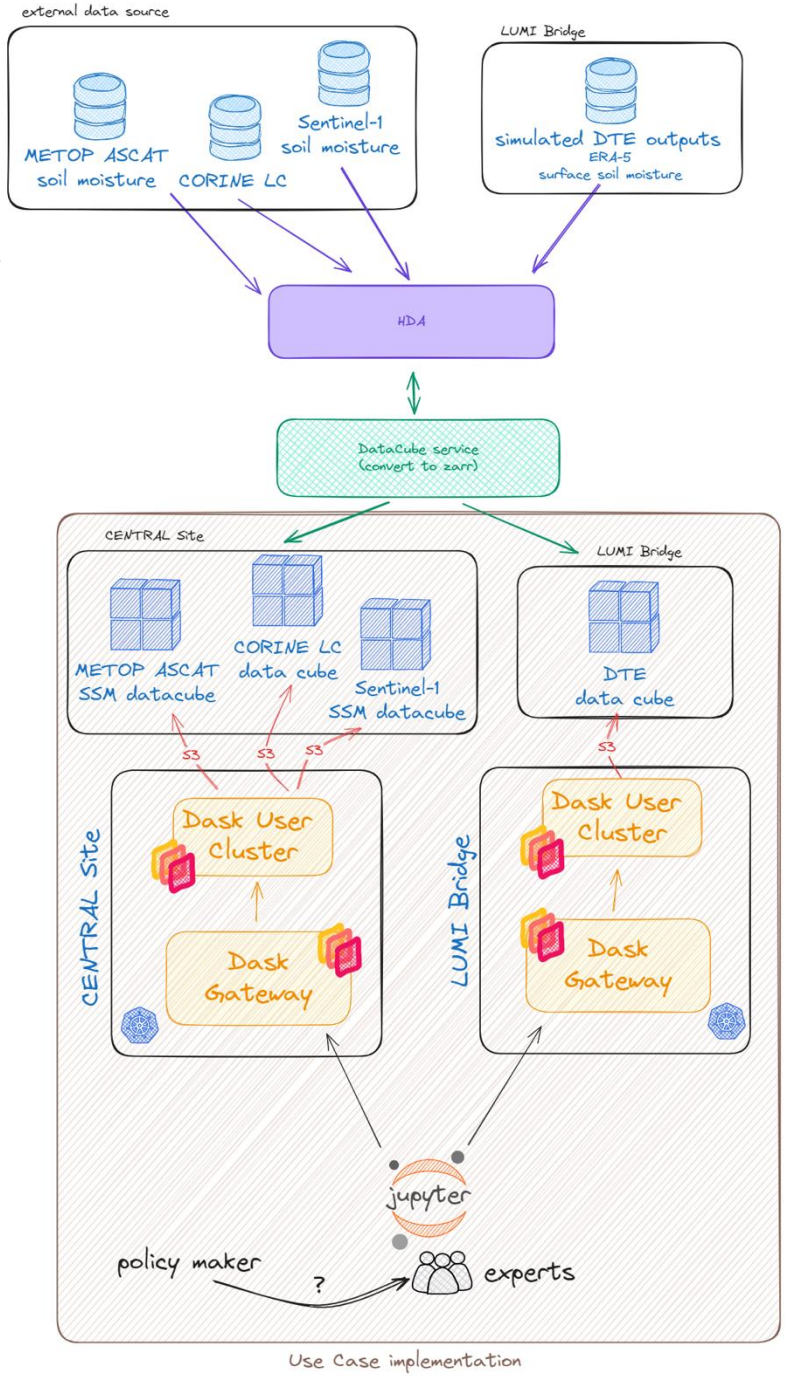
STACK

jupyter

dask

Dataflow

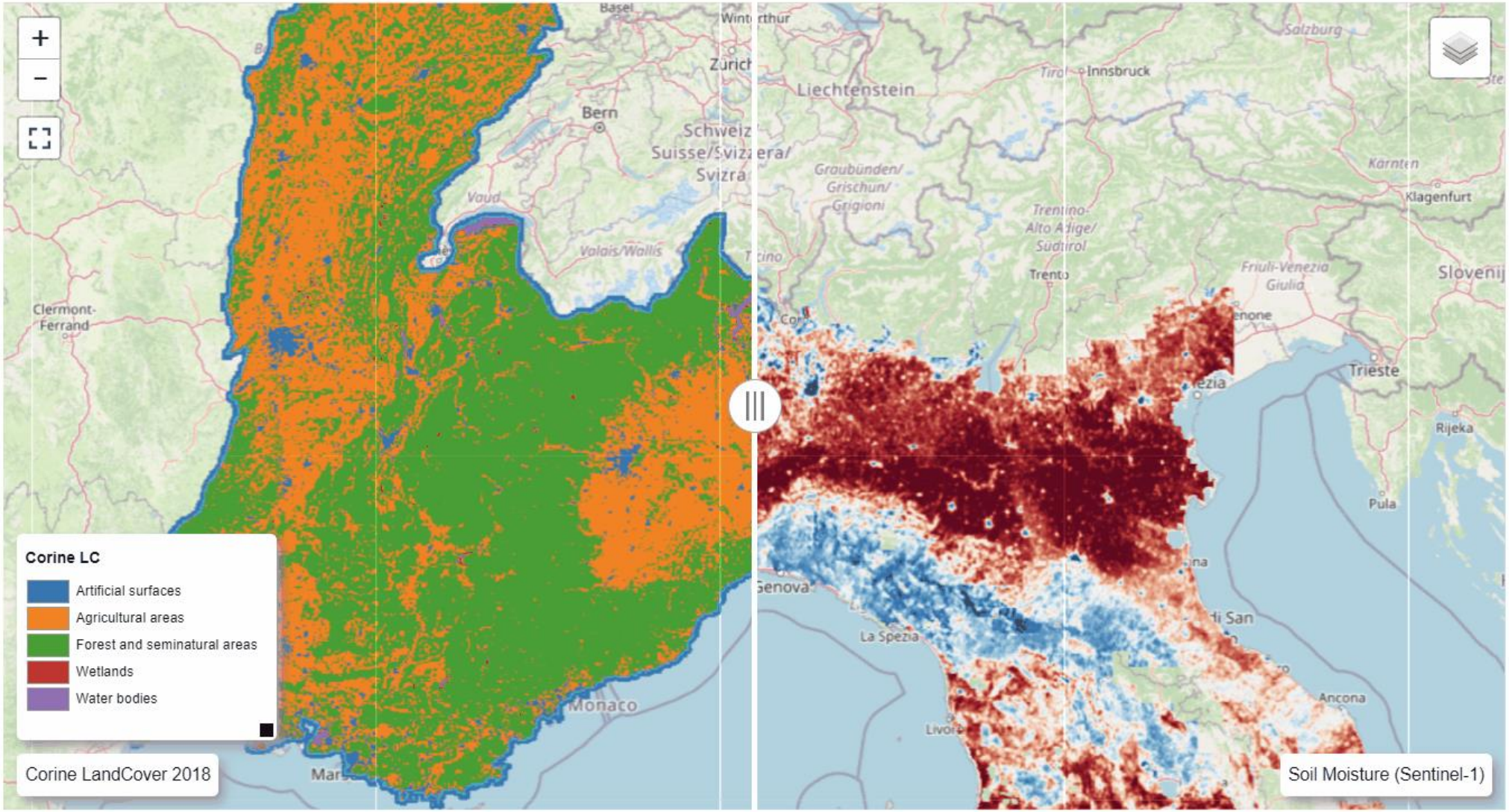
- Soil moisture as proxy for drought condition
- Monitoring of drought conditions via
  - METOP ASCAT
  - Sentinel-1
- Forecast of extreme event via Digital Twin (weather-induced extremes twin) outputs simulated
- Analysis based on generated datacube solution
- Impact per land cover types



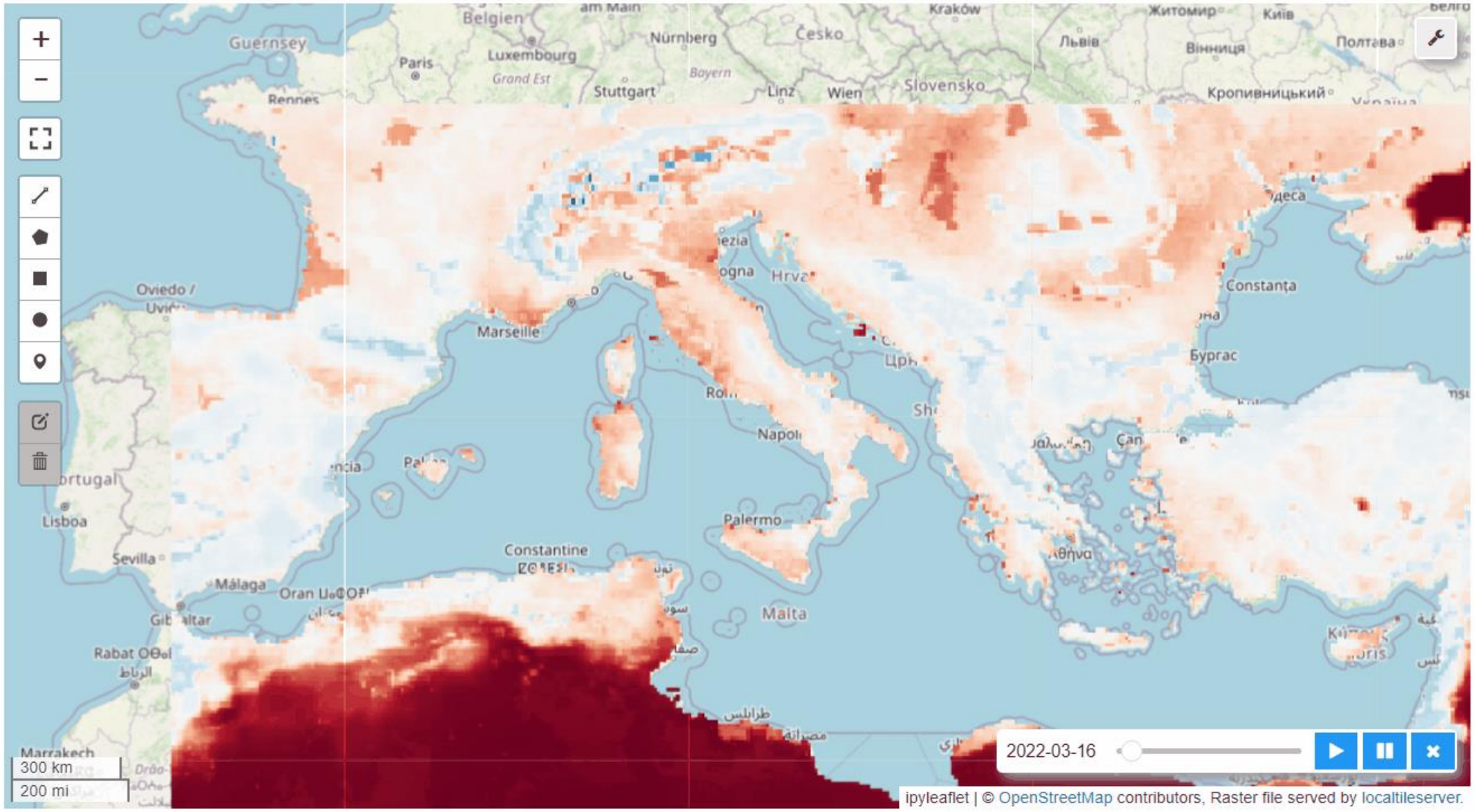
https://github.com/destination-earth/DestinE_EUMETSAT_ItalyDrought_2022

What is the current situation?

March 2022

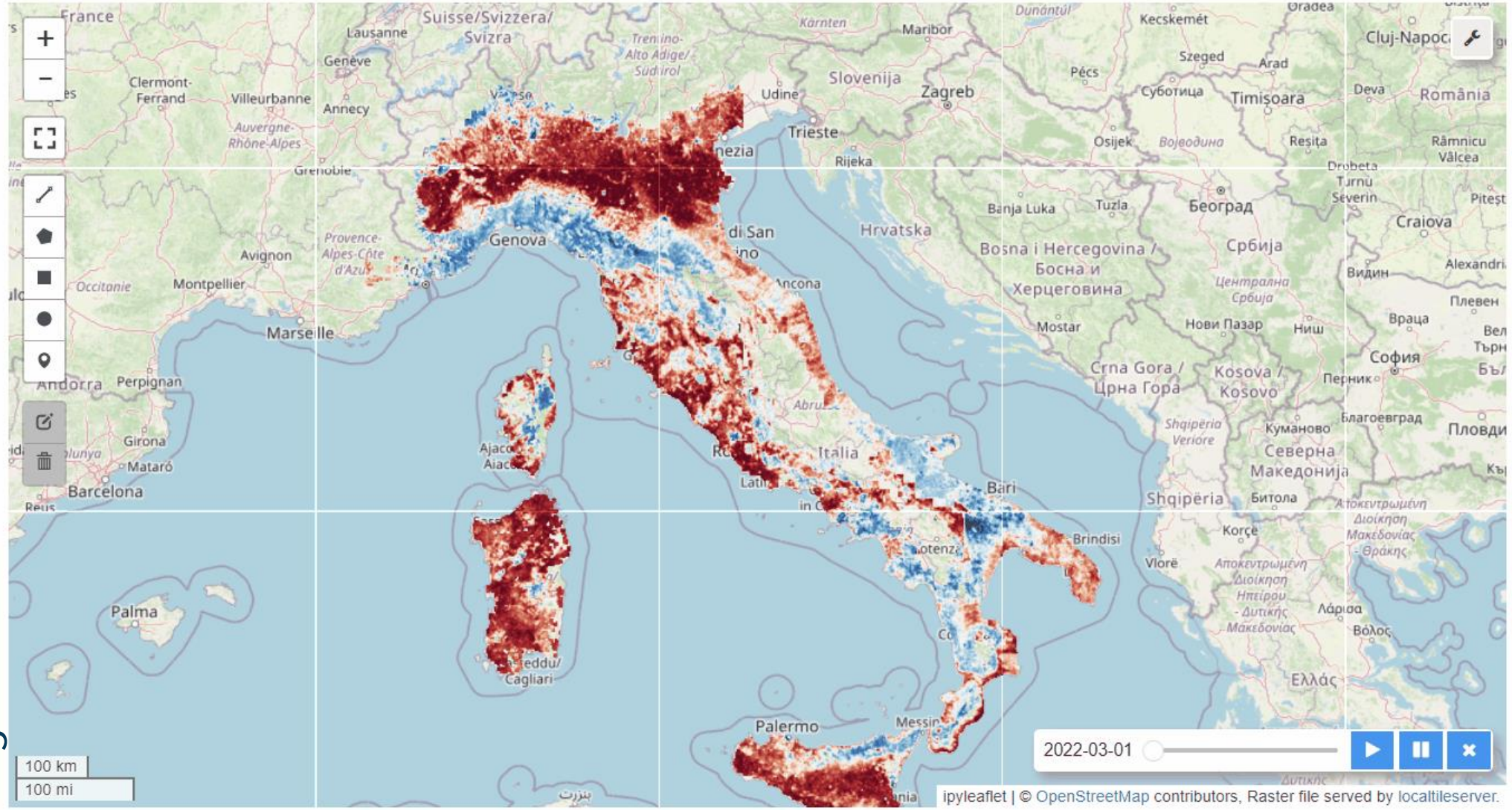


DT outputs – forecast of extreme event



Use monitoring to confirm DT outputs

August 2022



AI/ML for drought risk assessment

- Define objective of the risk assessment
  - Drought monitoring or forecasting, impact assessment or vulnerability mapping
- Common AI/ML techniques
  - Classification: Random Forest, support vector machine (SVM), etc.
  - Forecasting: Long Short-Term Memory (LSTM), Transformers, etc.
  - (Drought) Index predicition: Regression models or neural networks
- Blackbox (neural networks) vs. physical model (DT outputs)
- Feature engineering, lack of curated list of features
  - Combine EO and other data sources (socio-economic, etc.) is critical

AI in the context of DEDL services

- DEDL STACK services – two steps approach
  - Make GPU resources available
  - Provide AI/ML libraries and tools
- Update current service to include GPU resources
  - Users shall be able to request GPU resources on demand
- STACK services - Python ecosystem
  - Provide pre-configured AI/ML environments via Jupyter [scikit-learn, RAPIDS, xgboost, keras, tensorflow, etc.]
  - Enable scalability of AI/ML workloads by utilising Dask
- Integrate DEDL STACK services with other DEDL AI related services

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Translating data
into knowledge