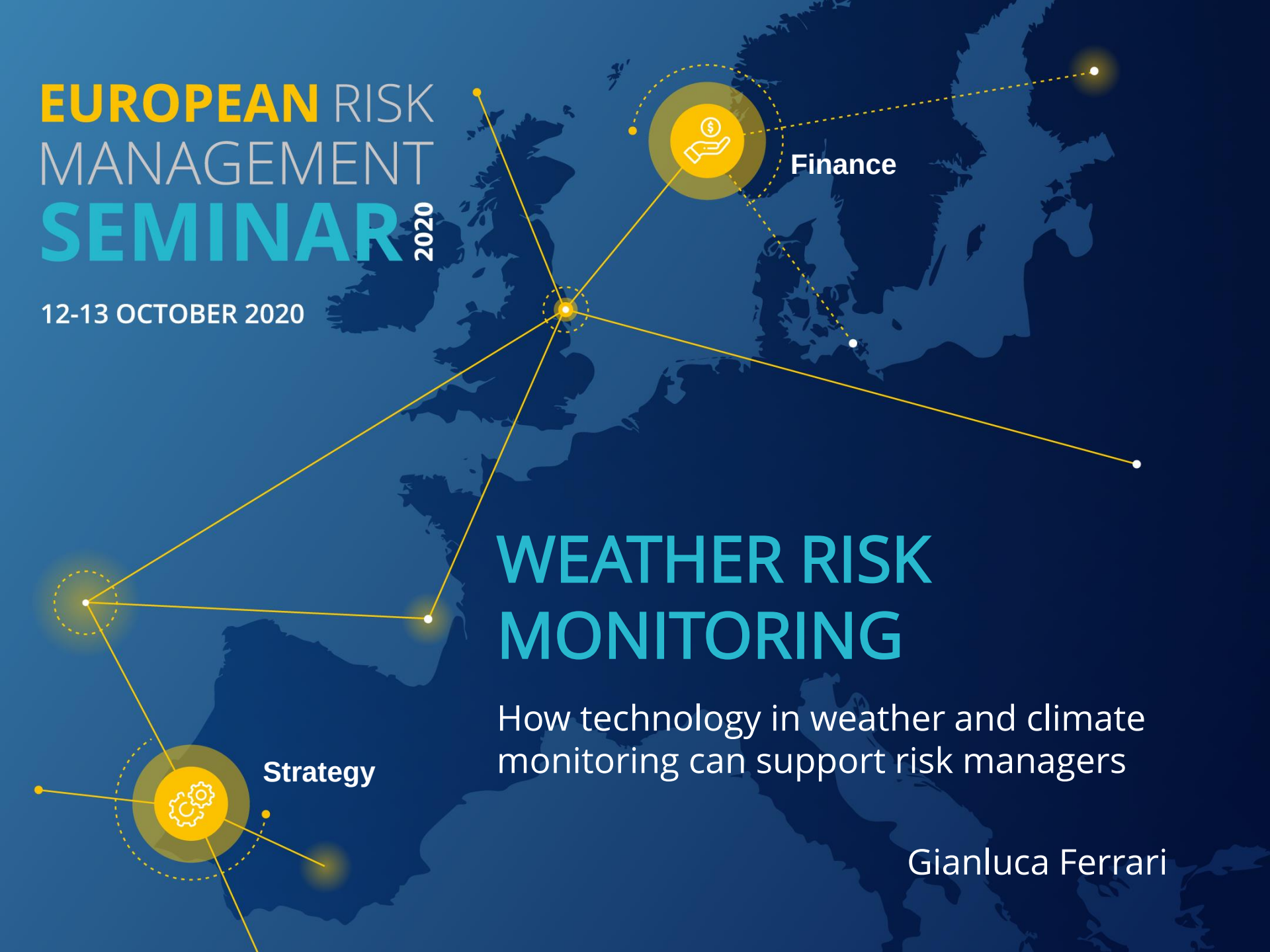
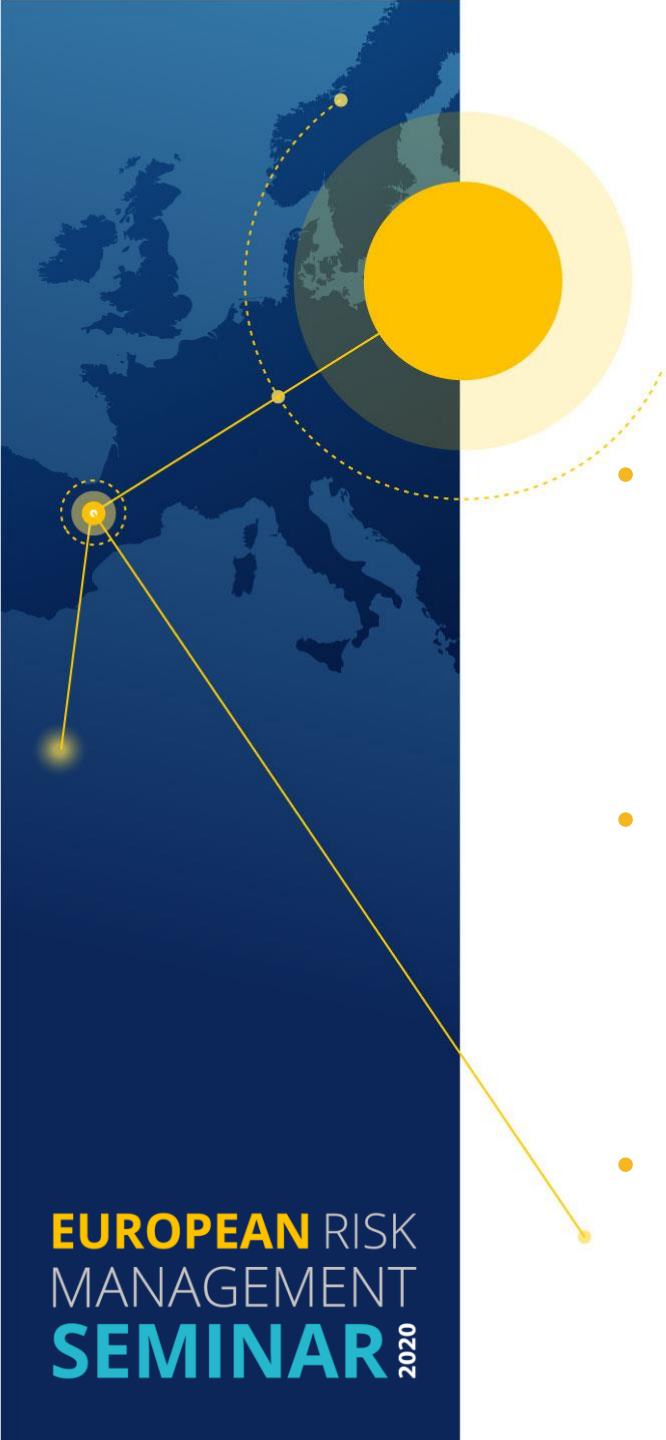

EUROPEAN RISK MANAGEMENT SEMINAR 2020
12-13 OCTOBER 2020
Finance
Strategy
WEATHER RISK MONITORING
How technology in weather and climate monitoring can support risk managers
Gianluca Ferrari

01

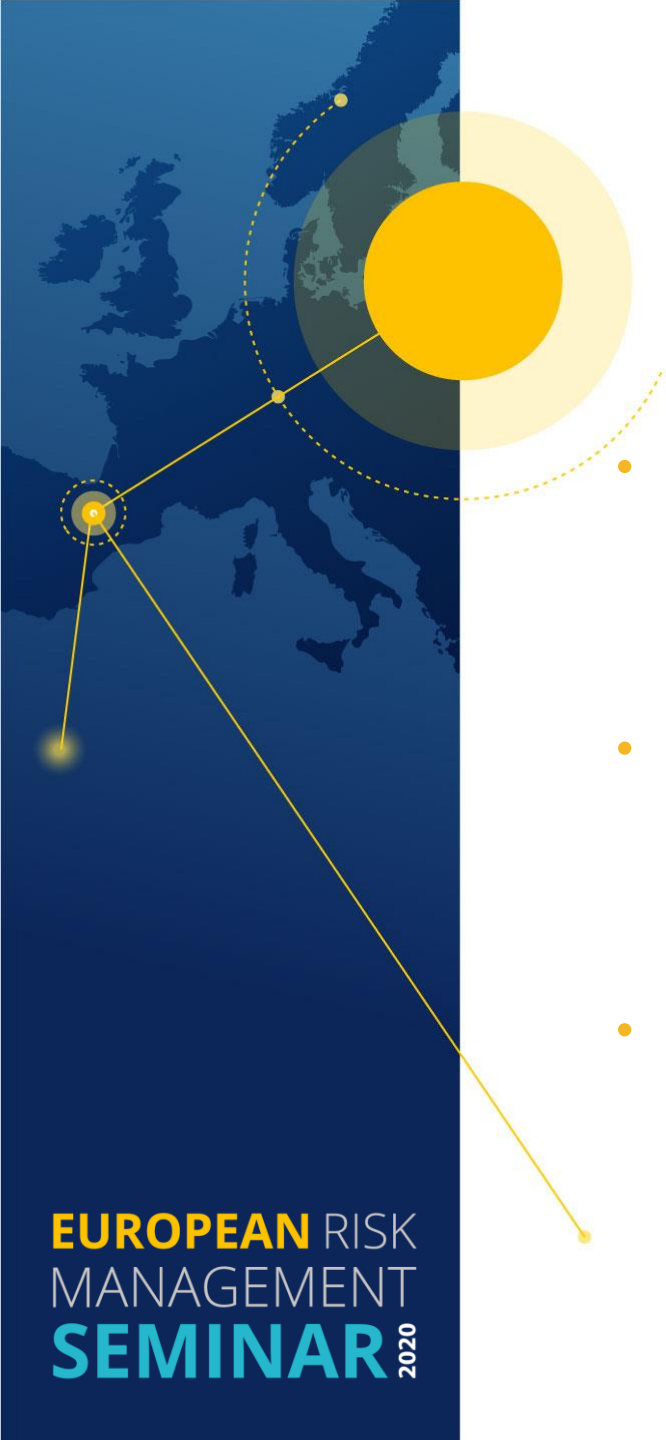
PRECISION METEOROLOGY

State of the art of weather and climate monitoring technology for risk management applications



What is precision meteorology?

- In the context of **climate change**, risk managers demands **quantitatively detailed weather and climate information**.
- Meteorology is therefore called upon to be part of a growing number of decision-making processes and itself assumes a professional connotation.
- In order to meet the needs of risk managers, **innovative solutions must be born**.

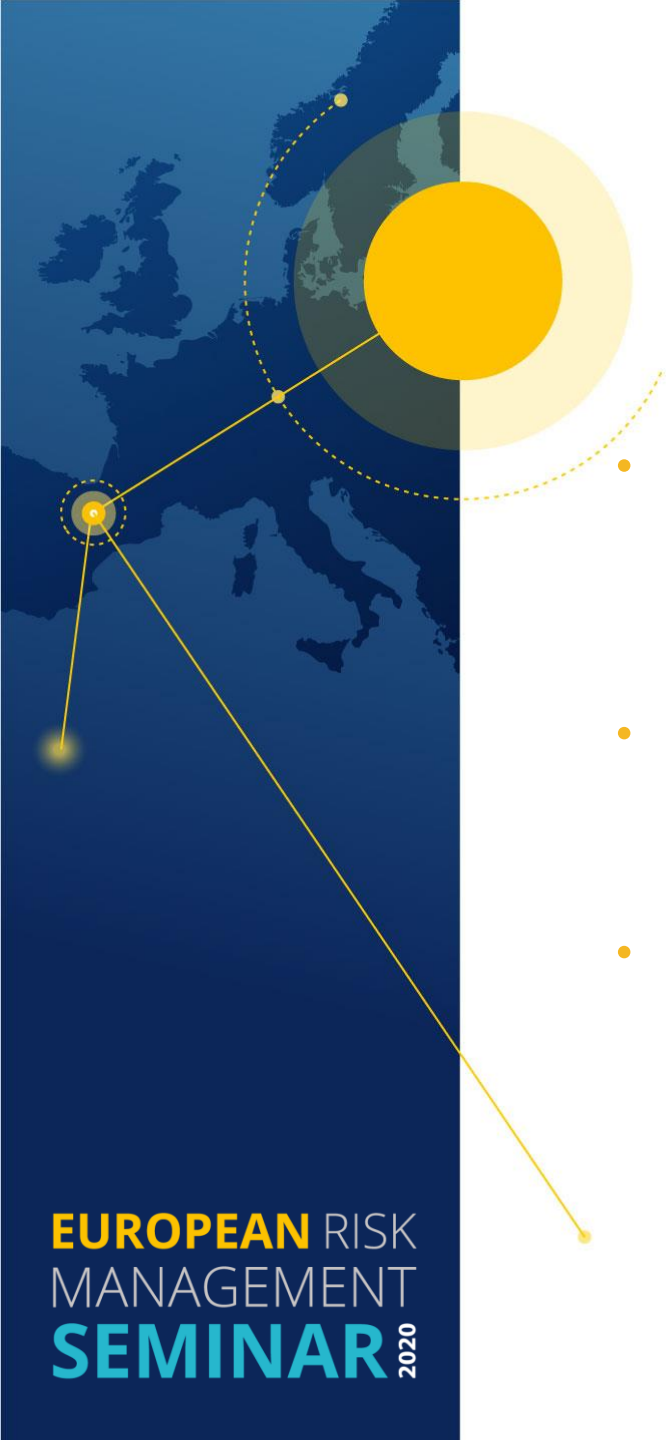


What is precision meteorology?

- Precision meteorology must therefore make use of data acquired with a **strong technical background**, with **consolidated technologies**, in full **transparency.**

- **Meteorological data becomes the terminal of a process shared by the various actors**, through a legal kit that also establishes its content.

- Precision meteorology is the fundamental approach to address this new perspective in which the **weather data enters in significant terms in our life and its quality, and therefore in economic, social and political processes**.

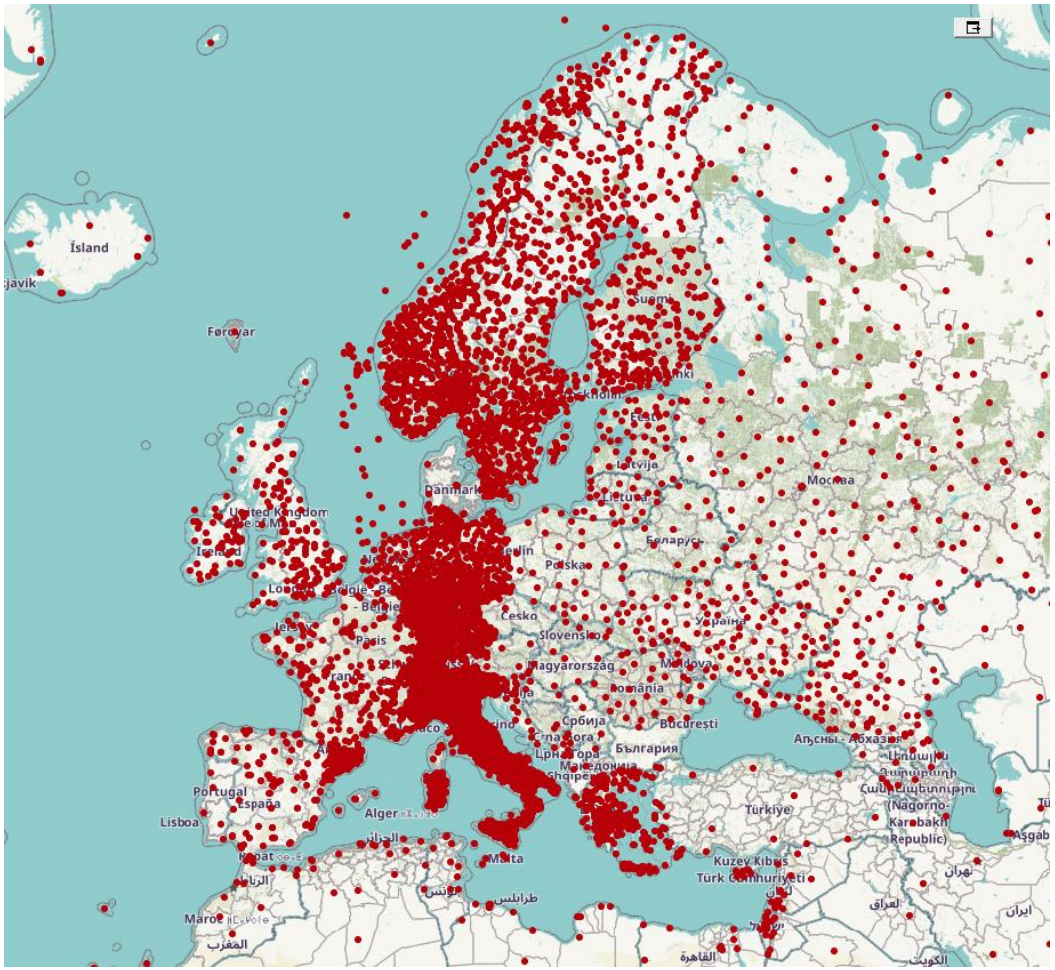


What is precision meteorology?

- **Weather data** constitutes a layer with **its own rules**, dimensions and dynamics, which **often do not coincide with those of the systems on which it integrates.**
- To achieve the required detail, the **integration and merging of multiple meteorological data sources is essential.**
- The precision approach consists in the **production and use of meteorological data** and their series, both historical and forecast, **according to consolidated, defined and shared procedures**: the goal is to **consolidate credibility and acceptance** through an adequate metadata-production process.

Data integration & reanalysis

Conventional in-situ weather observations



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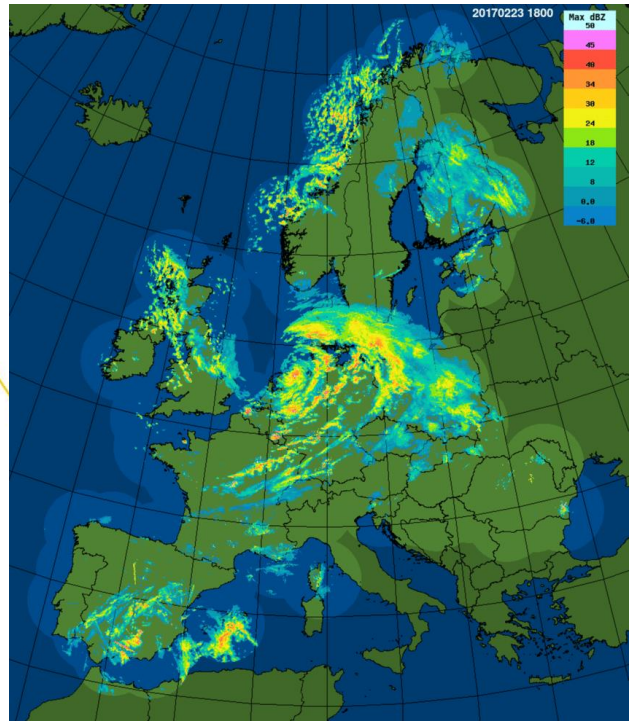
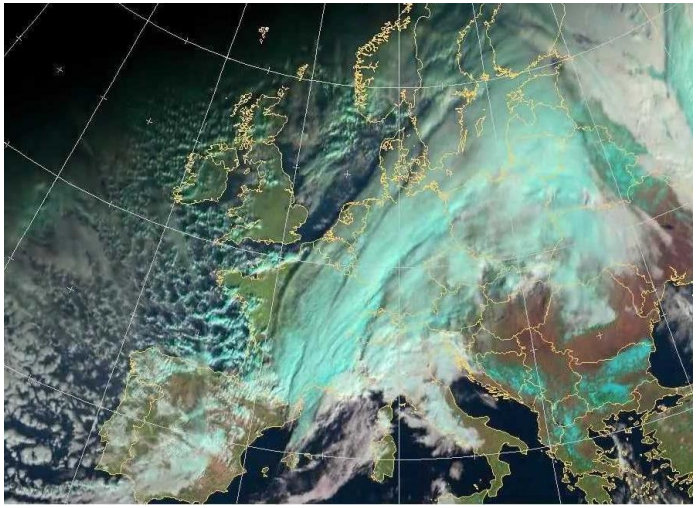
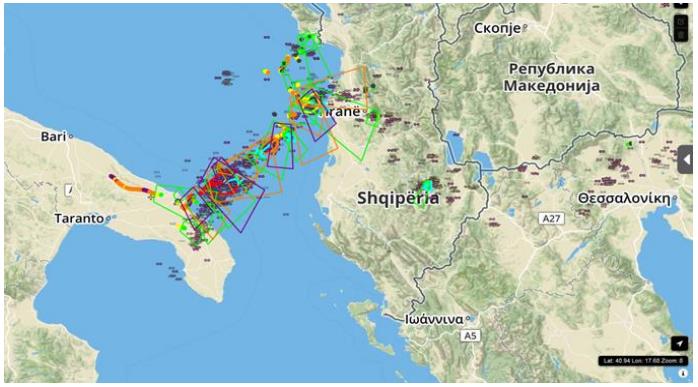
Data integration & reanalysis

Remote sensing weather observations

- Weather-radar
- Satellite
- Lightning







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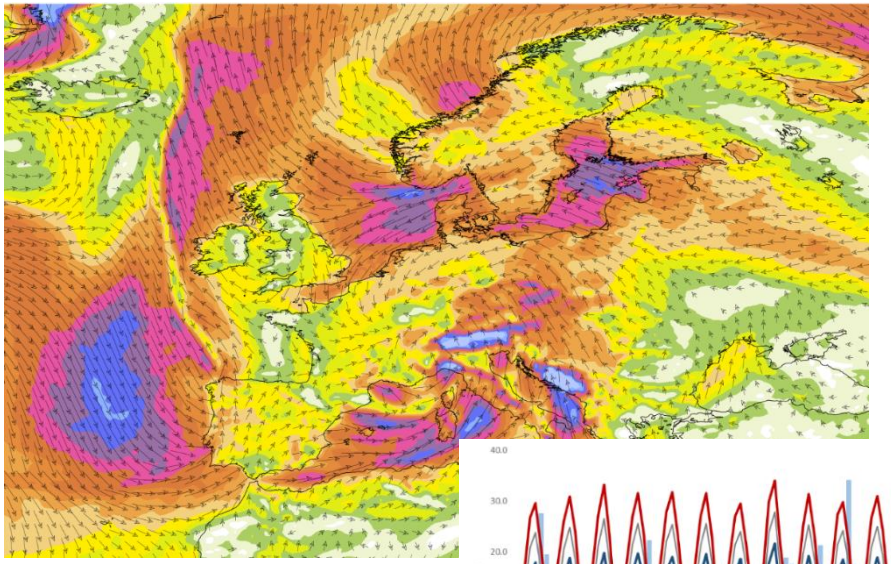
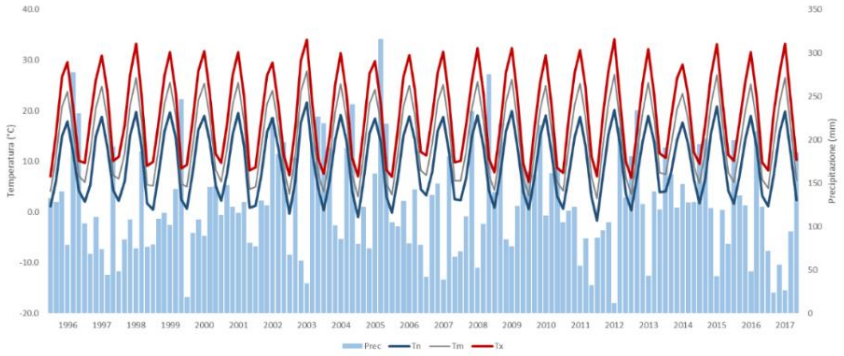
Data integration & reanalysis

Weather reanalysis

Using numerical weather prediction model to ingest observation and create homogeneus historic weather datasets





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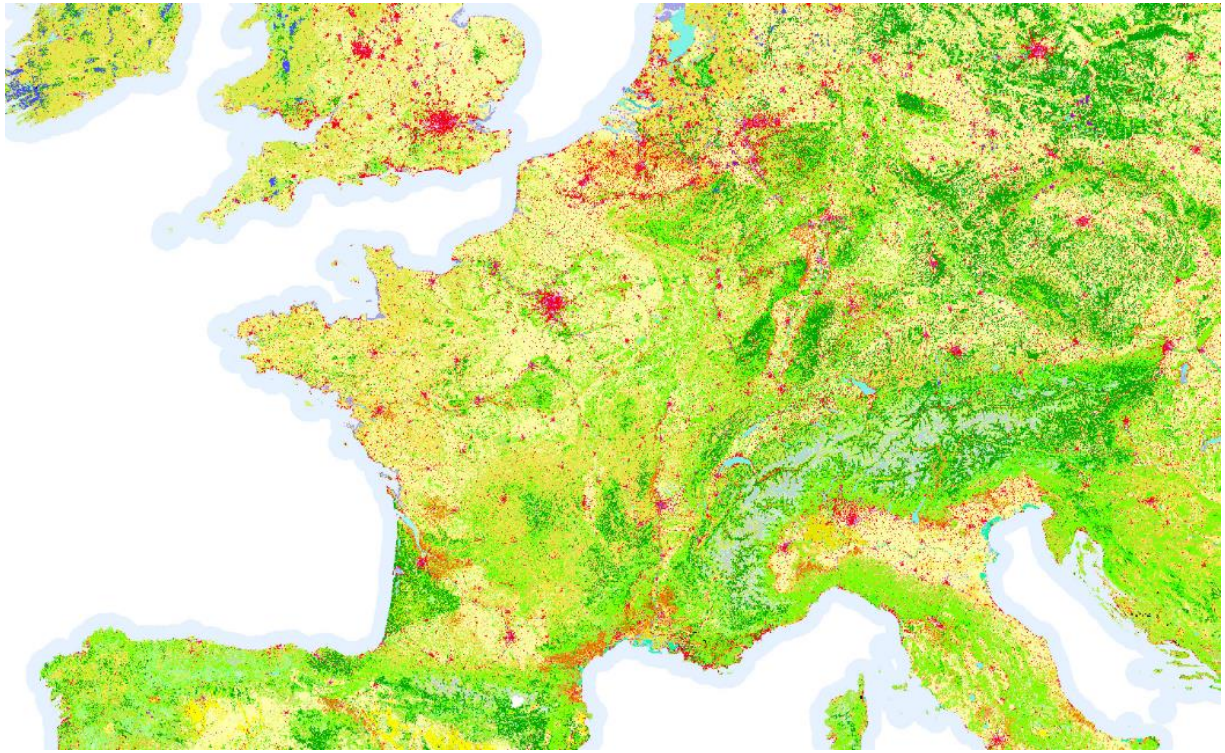
Data integration & reanalysis

Auxiliary variables for post-processing

- High resolution DEM – Digital elevation model
- Land cover



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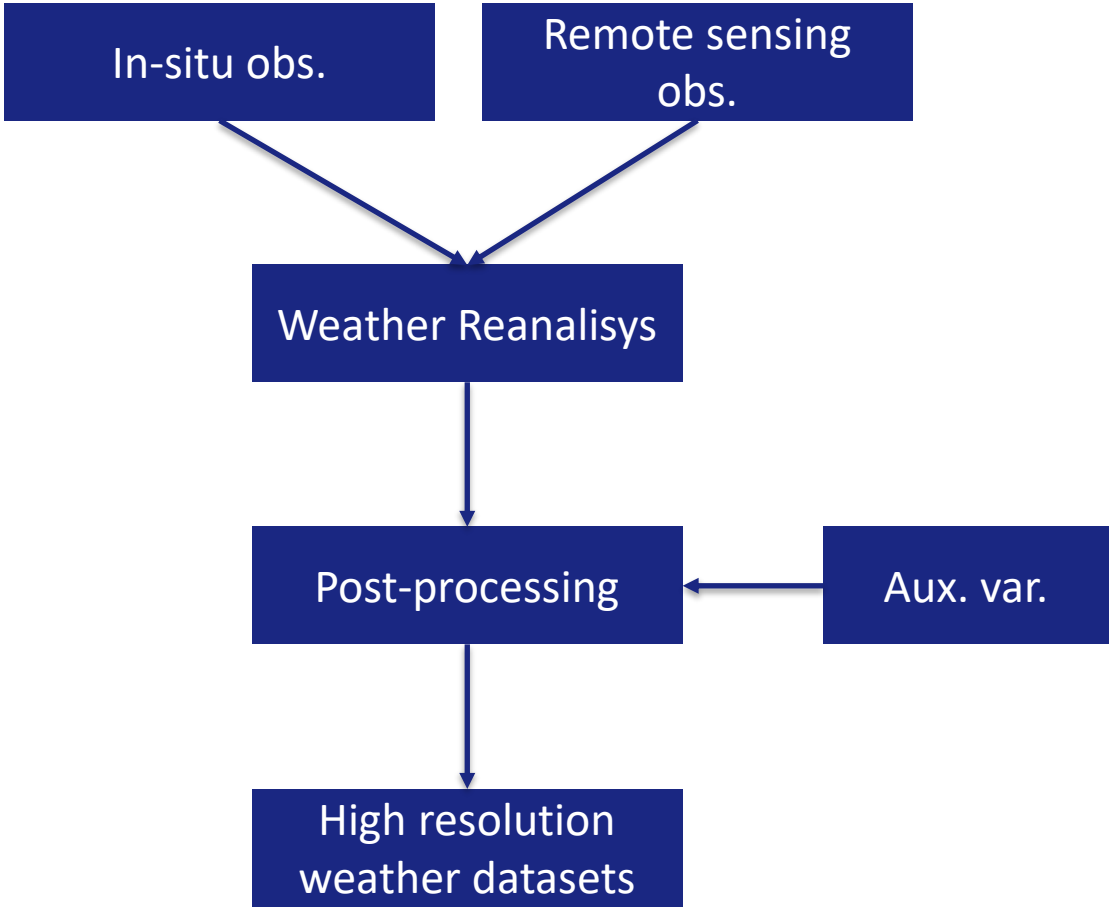
Data integration & reanalysis

Output characteristics

- High spatial resolution (up to 1 km)
- High temporal resolution (up to 1 hour)
- Complete and homogeneus time-series (up to 30 years). Daily/hourly updates.
- Basic variables:
  - temperature
  - precipitation
  - wind speed and direction
  - maximum wind gusts
  - solar radiation
- Advanced variables:
  - hail probability
  - extreme precipitations probability
  - extreme wind probability

Data integration & reanalysis

Synthesis of the process



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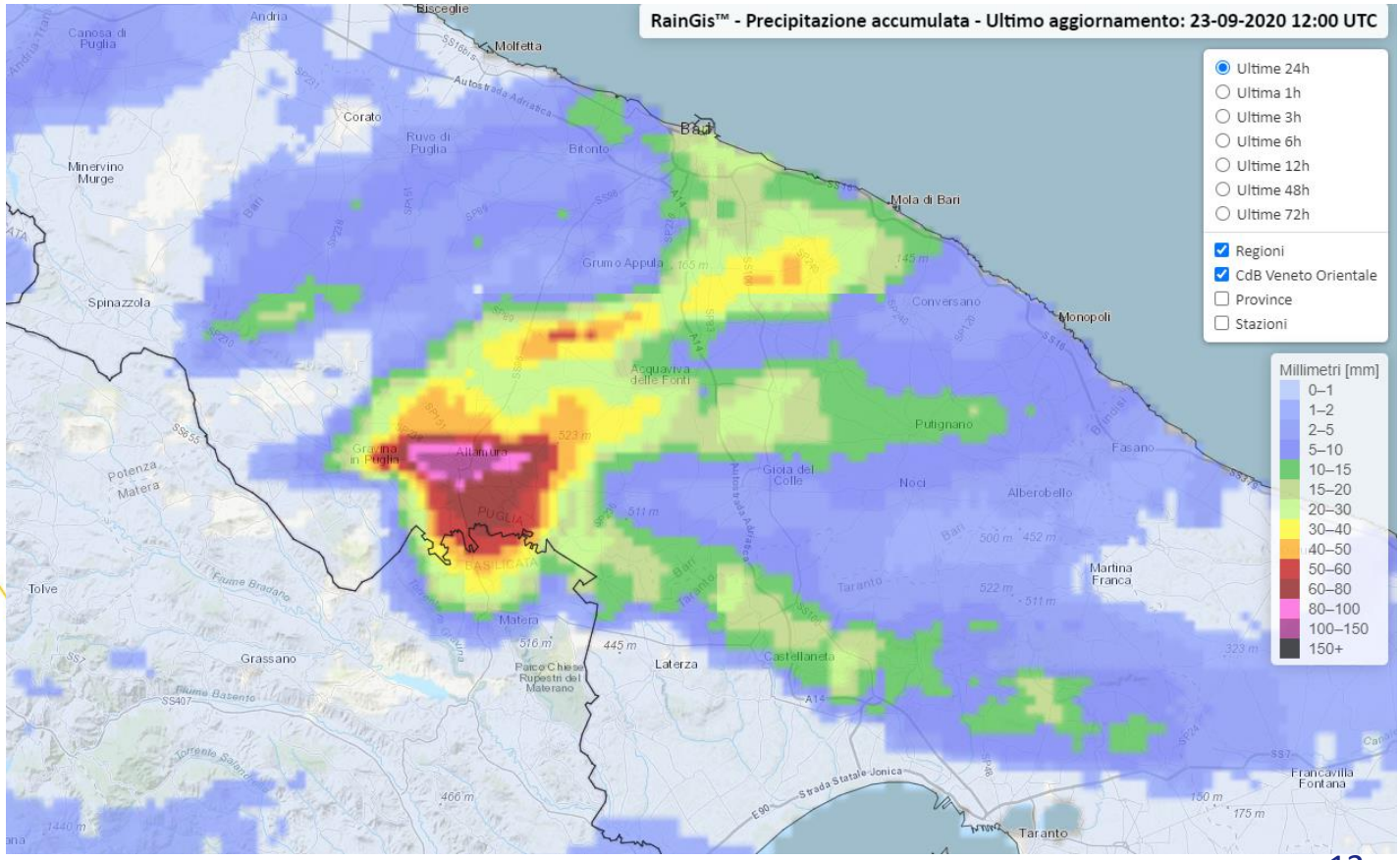
Data integration & reanalysis

Example: precipitation in convective situation (localized thunderstorms)

Difference of more than 100 mm in less than 5 km



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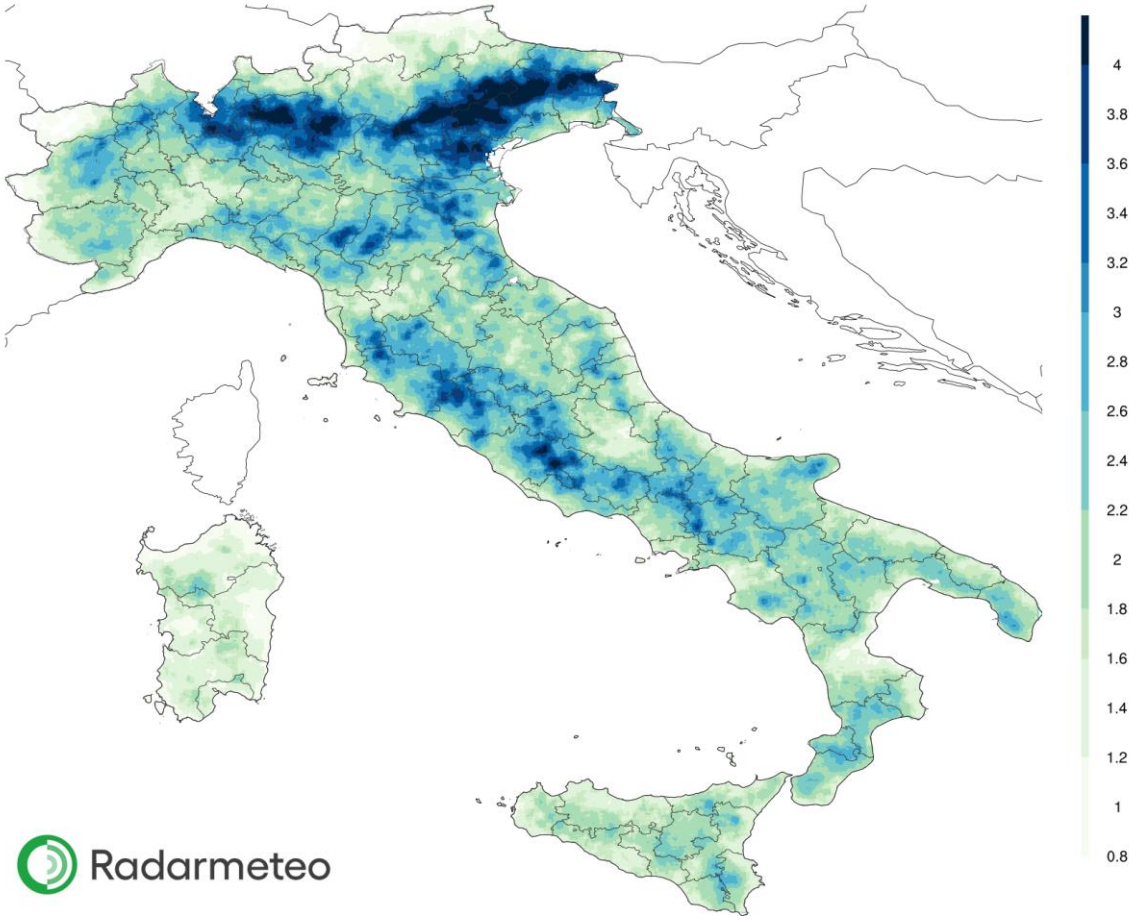
Data integration & reanalysis

Example: historic hail probability

Number of expected days with hail per year



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02

WEATHER-DRIVEN PARAMETRICS INSURANCE

A case study of parametrics insurance application in Italy driven by hig-resolution weather dataset

Weather-driven Parametrics Insurance

Generali Italia's "Attiva Raccolto Parametrica"

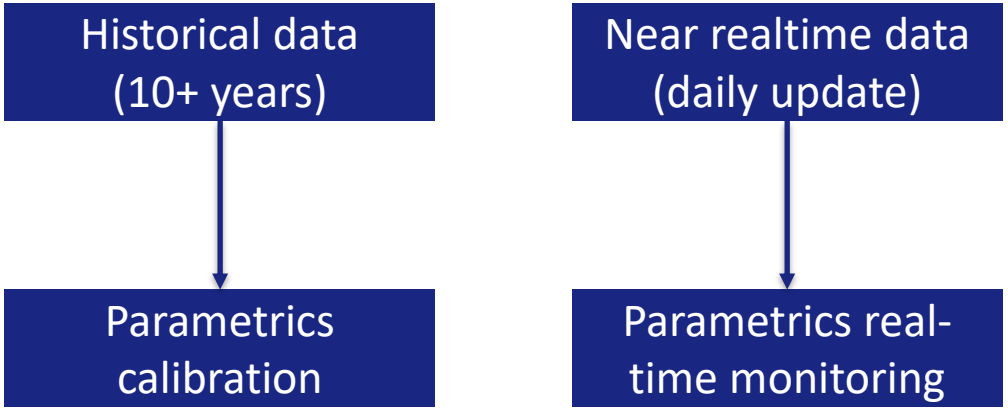
GENERALI

- Agricultural crop insurance
- Protects against loss of production following the adverse effects of atmospheric events which will be recognized based on the deviation of specific meteorological indices
- It protects against two types of weather adversities:
    1. critical low temperatures
    2. high temperature combined with water-deficiency stress

Weather-driven Parametrics Insurance

How weather datasets enter the process

- Weather variables: minimum daily temperature, maximum daily temperature, daily precipitation,
- Data is provided “punctually” for single crop fields properly georeferenced as if there was a weather station installed on site -> “virtual weather station”



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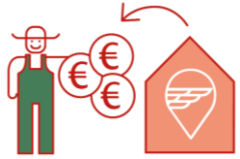
Weather-driven Parametrics Insurance

Mechanism scheme

Weather event	Claims management	Insurance compensation
		
An adverse weather occurs	Crop model quantify the damage based upon weather data provided by high-resolution near real-time weather datasets and other site-specific parameters (e.g. type of terrain)	Generali reimburses the farmer on the basis of the damage estimated by the crop-model in a completely automated way

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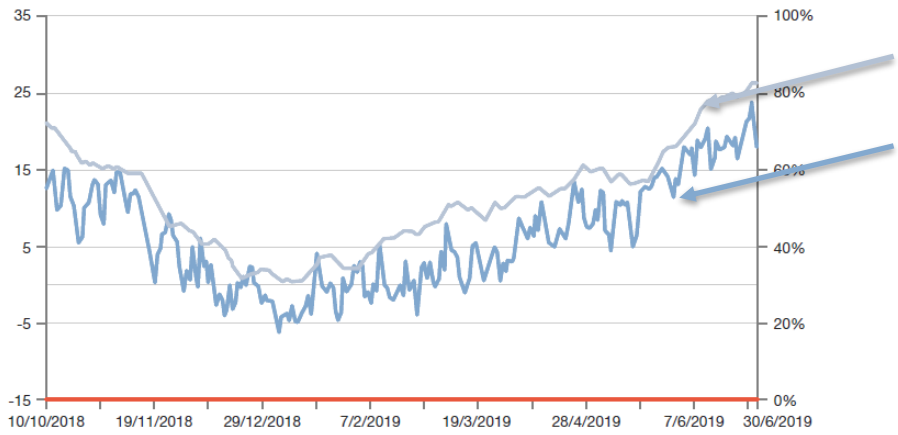
Weather-driven Parametrics Insurance

Report examples

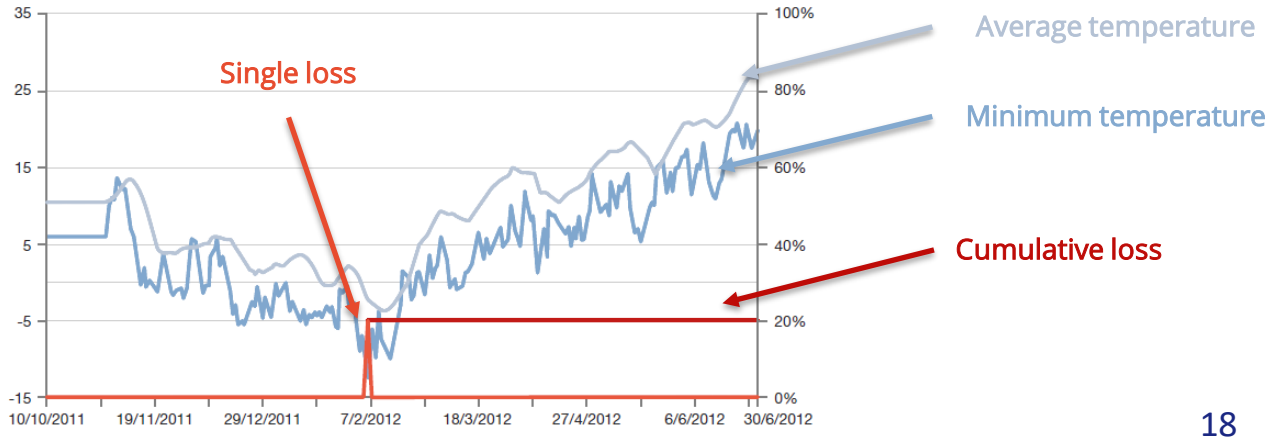
Reports are made:

1) To show the policyholder past parametric behavior;
2) every two weeks during the validity period to update the insured on the progress of the policy

2019



2012



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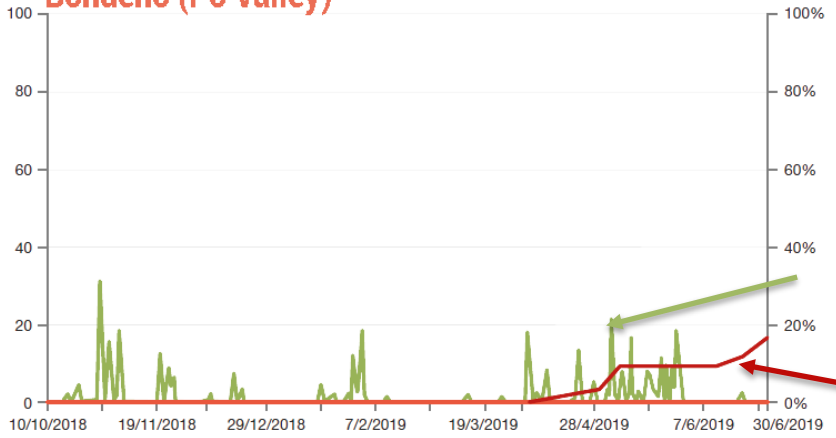
Weather-driven Parametrics Insurance

Report examples

2019

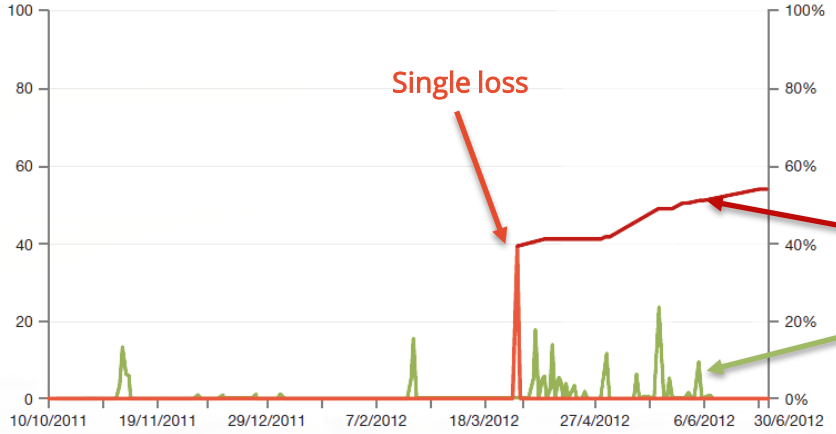
2012

Water deficiency stress and high temperatures
Bondeno (Po Valley)



Daily precipitation

Cumulative loss



Single loss

Cumulative loss

Daily precipitation

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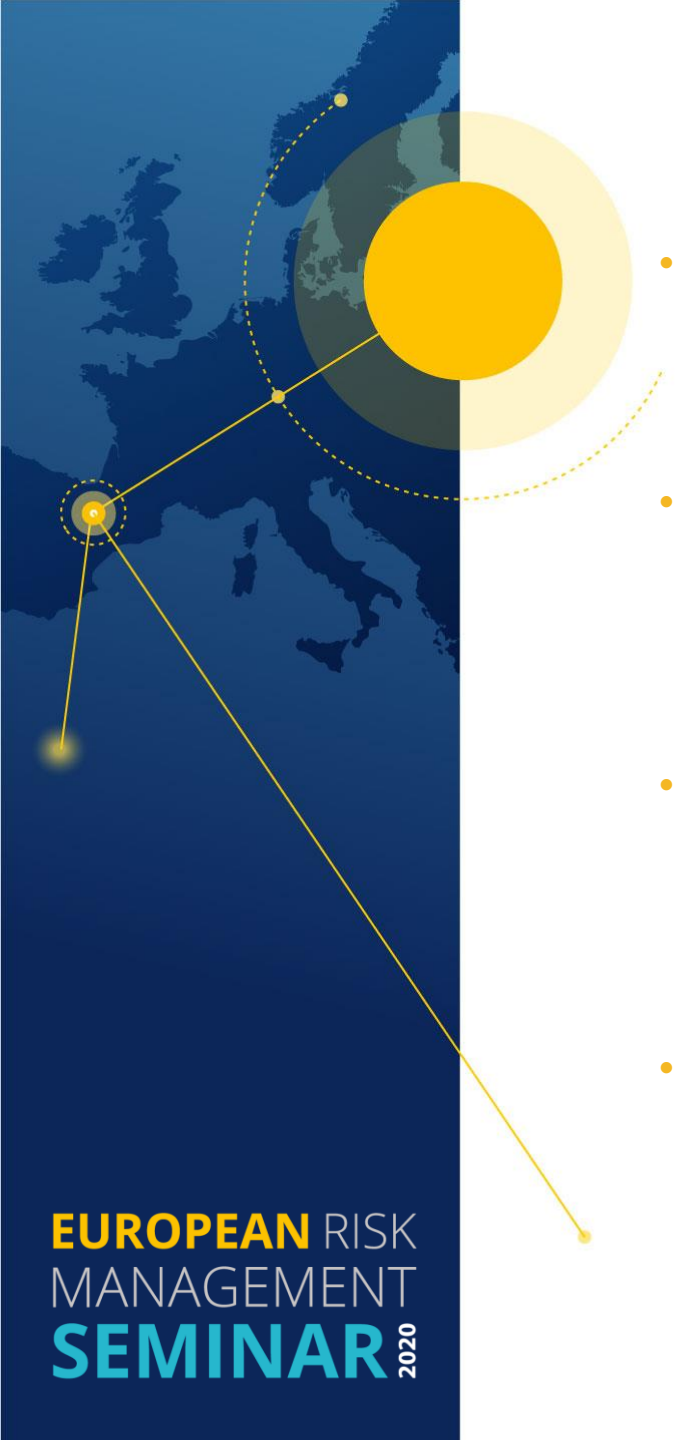

Sum-up

- High Precision meteorology arises from the needs of the world of risk managers to quantify impact meteorological events for activities on very small spatial and temporal scales.
- The integration of meteorological data from different sources with the reanalysis method allows to obtain datasets with high spatial resolution and representativeness in support of risk managers activities.
- However, the meteorological scale is not always compatible with the scale of professional application, so the set of rules of the game must be defined and accepted by various actors (i.e. risk managers, insurance companies, policy holders).
- In Italy, with Generali Italia, the first parametric policy in agriculture based on high spatial resolution datasets was tested: the choice was somewhat obligatory due to the characteristics of the Italian territory and the high fragmentation of agricultural enterprises.