The construction of risk scenarios combining remote sensing and physical models

the experience of the Italian pilot projects

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the paradigm of risk management

pre-vision
Scientists foresee and check among themselves the scenarios of what can happen using scientific jargon

pre-diction
Decision makers understand scientific scenarios and translate them into “perceptible” scenarios and communicate

perception
Individuals, as potential victims, and their representative organizations conceive a mental picture of the impacts on themselves and their community, and take consequent decisions

The role of earth observations

- Earth Observation contribution:
  - Enhance spatio-temporal representation of physical processes
  - Provide additional forcing, boundary and initial conditions
  - Enhance model calibration and validation capabilities
  - Reduce model uncertainty

- Description and communication of scenarios to stimulate/enhance/create risk perception of each individual

- Perception builds on memory
  - “Innervation” of memory through historical records of EO-derived maps
  - Virtual experience of emergencies
pre-vision

models and data

model boundary and initial conditions

earth observation contribution:
• enhance spatio-temporal representation of physical processes
• provide external forcing, boundary and initial conditions
• enhance model calibration and validation capabilities
• reduce model uncertainty
Description and communication of scenarios to stimulate/enhance/create risk perception of each individual

earth observation contribution
features for a-priori, up-to-date element at risk identification
observation of on-going emergencies
Layers for (3-D) real and virtual scenarios
perception

risk perception builds on memory

historic observations

earth observation contribution

“extension” of memory through historical records of EO-derived maps

virtual experience of emergencies
Catalogue of 56 EO-based products for assimilation into models and rapid mapping

some words about OPERA project
**Scene**: is a still image of a specific moment of a disaster.

**Scenario**: is the set of observational data (both in-situ and remotely sensed) and model outputs of a process at a given moment during a disaster.
real time scenarios

Humidity Mdls + GM+ Sat (Variational assimilation)

Flood forecast Mdls + GM+ Sat
Real time scenarios

Water Bodies Monitoring

Water Depths – DAM outflow scenario

Possible Damage – DAM outflow scenario

Flooded areas – Real Scene
building scenarios in real time

Not only a technical problem….

Te – Trigger time
Acquisition validity range

T₀ – Acquisition planning time
availability range

Ti – Acquisition reference time
time range

Td – EO data availability time
Validation range

Re+ – Acquisition validity acquisition

Rd – EO data availability range

Pt – Processing

Rv – Validation range

“Re+” = Range validità acquisizione
“Rd” = Range disponibilità dati EO
“PT” = Processing Time
“Rv” = Range di Validazione

“Rt” (Range Totale)
Quantifying the timing constraints

Target

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- Trigger
- Acquisition request
- First acquisition
- Imagery in OPERA DB
- Fast-ready maps deliv.
- Full products delivery

hours
All the features of OPERA can be managed remotely via Web, including generation of products directly from OWIS. An experienced user decides which instances, among those generated, must be made public. In particular, more remotely, all instances of by-products of OPERA can be published directly on the operational end-user tools (DEWETRA).
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