Big data and drought risk

High-level Panel Debate – UNESCO WWAP Colombella, 22/11/2018

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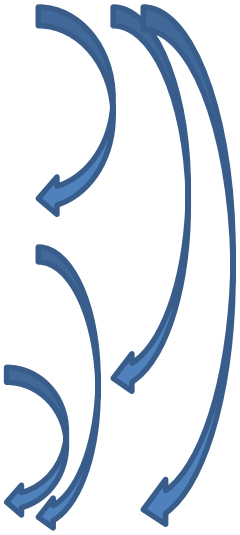
Outlines

- Drought risk
- big data in hazard assessment
- big data in hazard trends assessment
- big data in vulnerability assessment/coping with drought

Introduction

There are several types of water crisis / drought:

- **meteorological**, defined on the basis of a rainfall deficit, in relation to a "normal" quantity or average calculated over a sufficiently long period (at least 30 years), and of the duration of the dry period;
- **agricultural**, when the water reserve in the part of the soil affected by the roots is insufficient to support the development of crops and pastures between a rainy event and the other;
- **hydrological**, caused by insufficient recharge of groundwater, water courses and surface basins and occurs with longer times than the other two;
- **socio-economic**, associated with the demand-supply ratio of goods associated with water.



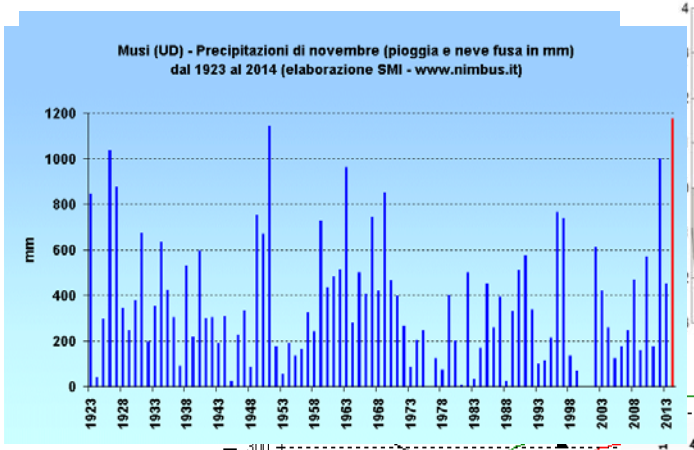
Big data in hazard assessment

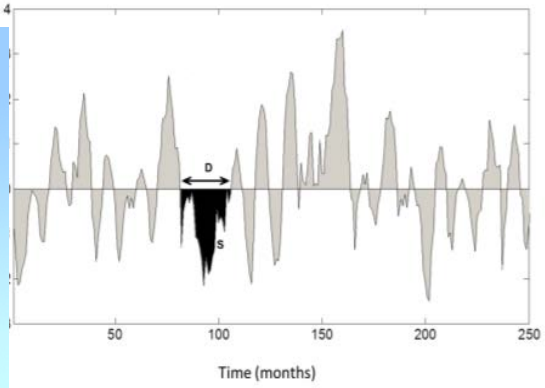
Time series analysis

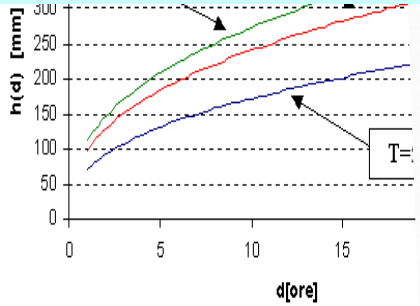
Probability maps

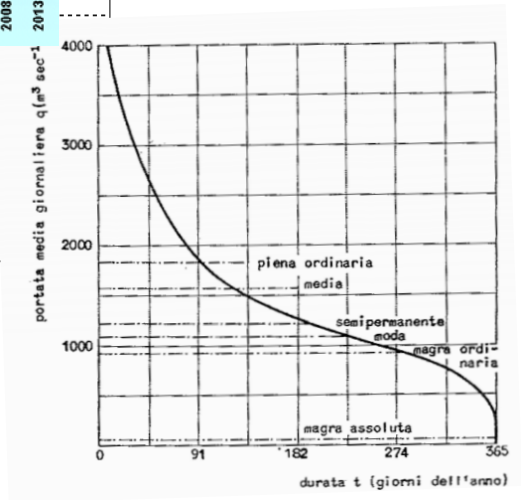
Return time T

Critical rainfall/discharge/deficit









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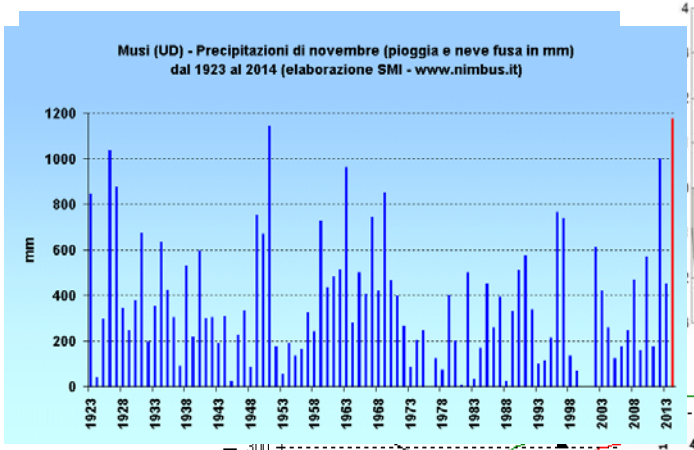
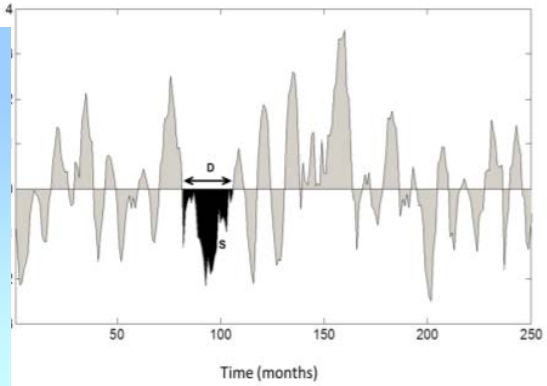
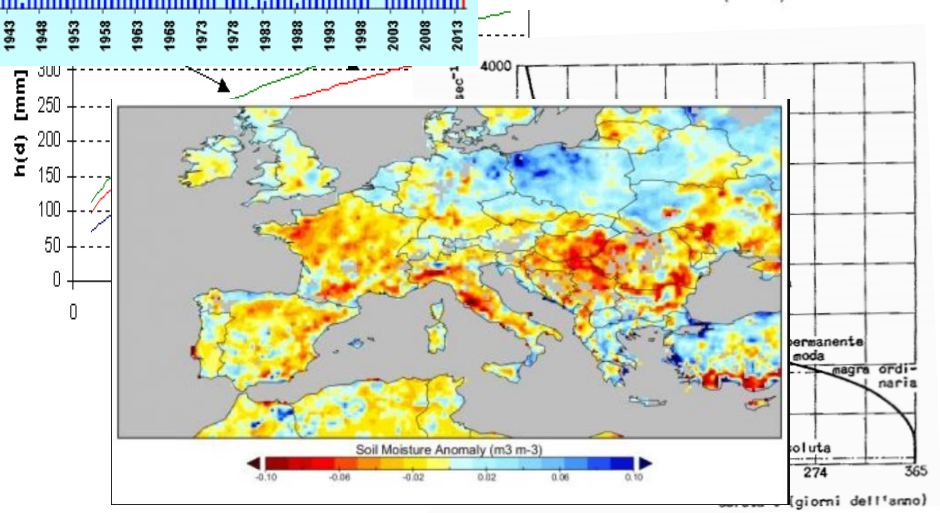
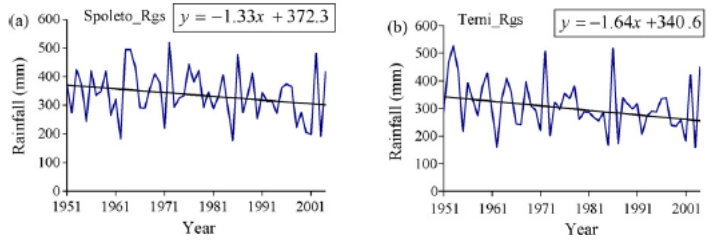






Big data in hazard assessment and its trends

Big Data in trend detection

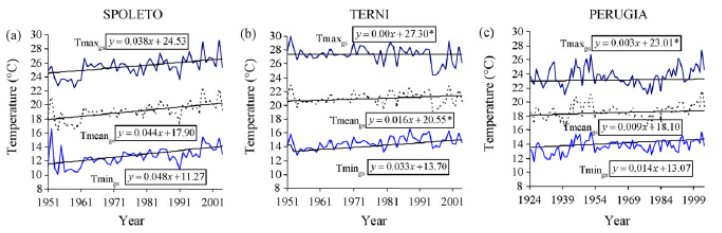


Cumulated rainfall in spring-summer period


Climatic changes in Central Italy and their potential effects on corn water consumption

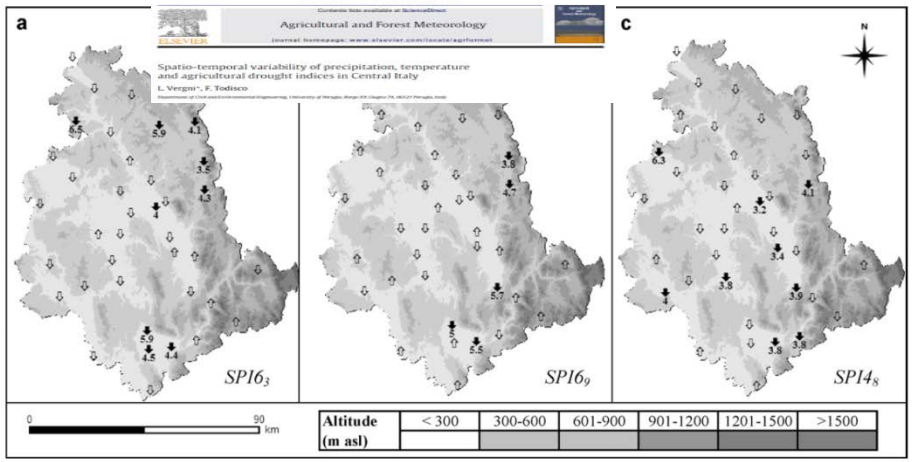
Francesca Todisco *, Lorenzo Vergni

AGRICULTURAL AND FOREST METEOROLOGY 148 (2008) 1–11



minimum/mean/maximum temperature

L. Vergni, F. Todisco / Agricultural and Forest Meteorology 151 (2011) 301–313



ial distribution of trends and tendencies: significant negative (⬇) and positive (⬆) and not significant negative (⇩) and positive (⇧) for the S
ndex: at a 6-month time scale for the months of March, $SPI6_3$, (a) and September, $SPI6_9$, (b); at a 4-month time scale for August $SPI4_8$, (c). Numbers cc
rends show the return period (RT), assumed over a 30-year period, by a drought event having a present RT = 10 years according to the trend slop

Trends of the STANDARD PRECIPITATION INDEX, SPI6, October-March, March-September, March-August

Decreasing water availability

Increasing water requirements

Big data in hazard assessment and its trends

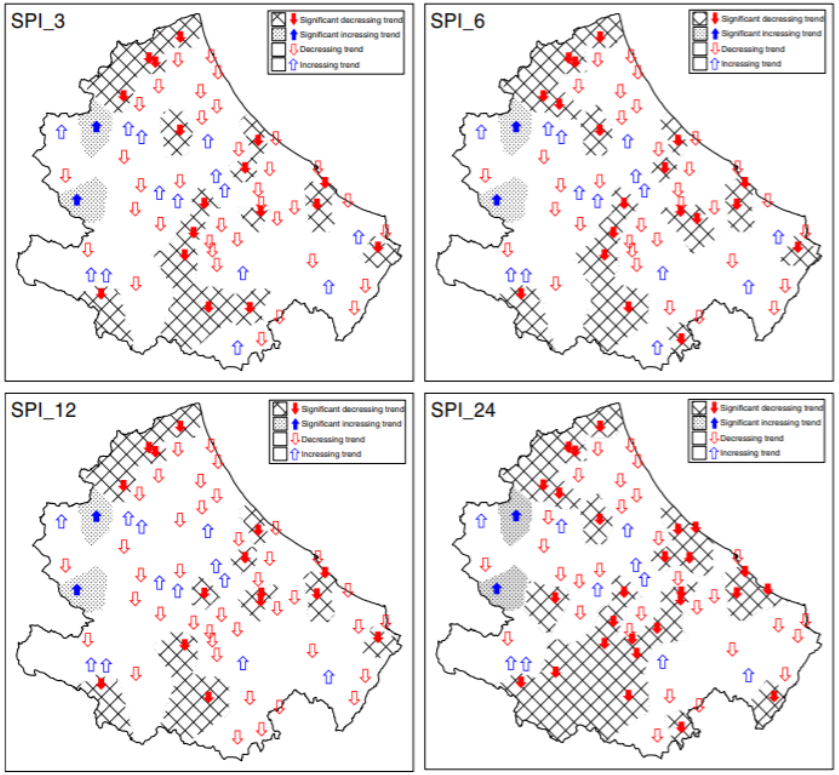
Big Data in trend detection

Theor Appl Climatol (2014) 115:41–52
DOI 10.1007/s00704-013-0876-2

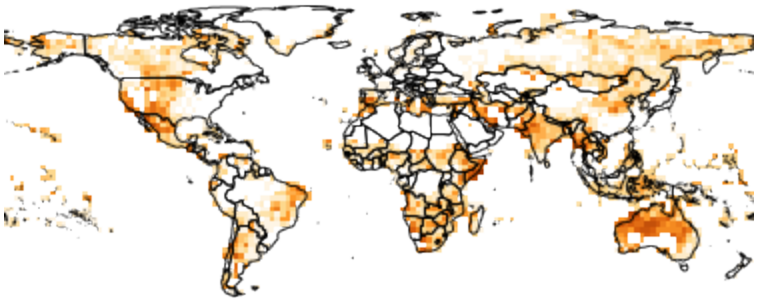
ORIGINAL PAPER

Analysis of drought in the region of Abruzzo (Central Italy) by the Standardized Precipitation Index

B. Di Lena · L. Vergni · F. Antenucci · F. Todisco · F. Mannocchi



Trends of the STANDARD PRECIPITATION INDEX

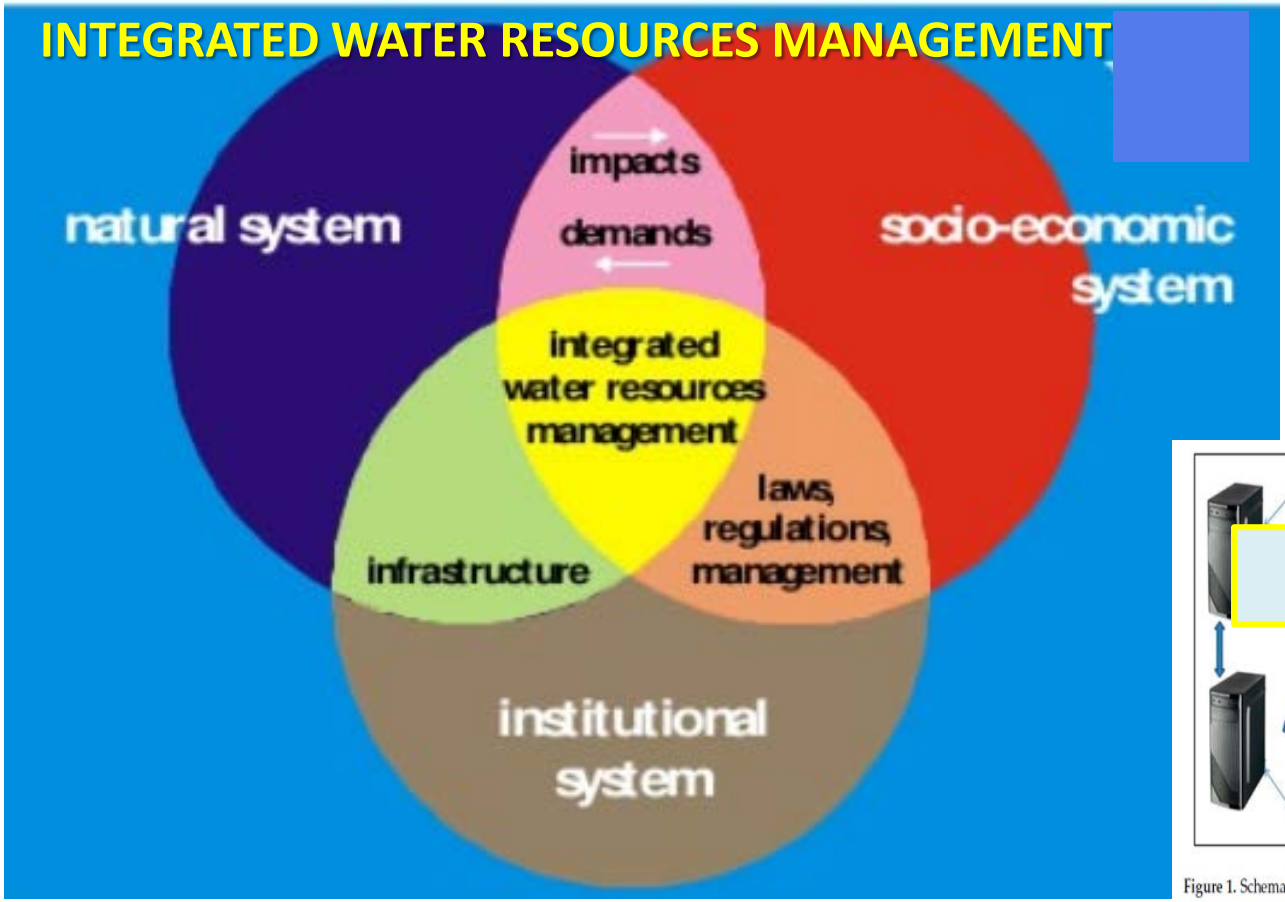


Decreasing water availability

Increasing water requirements

Big data in coping with drought (vulnerability)

Big Data in decision support systems



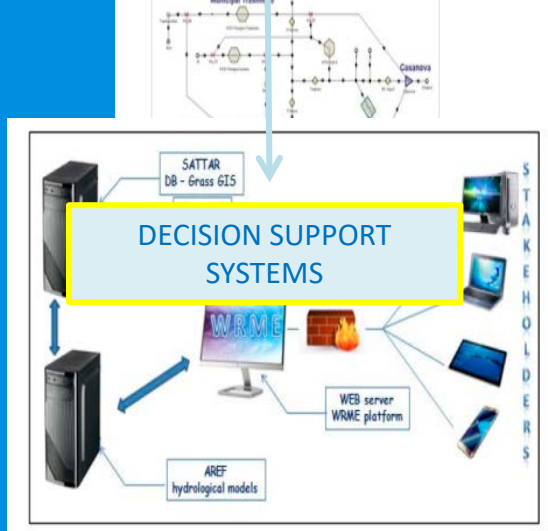


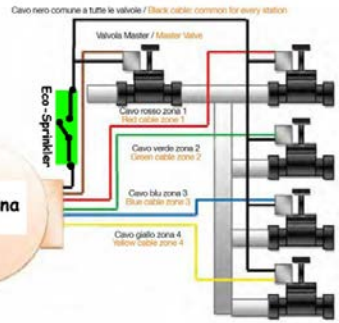
Figure 1. Schematic diagram of the web-based Spatial Decision Support System structure.

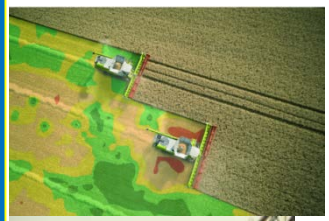
Big data in coping with drought (vulnerability)

Big Data in precision irrigation

Technology to perform variable applications both spatially and temporally
Variable speed technology VRT

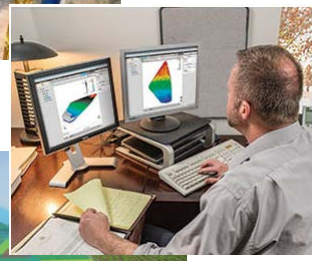
Automation

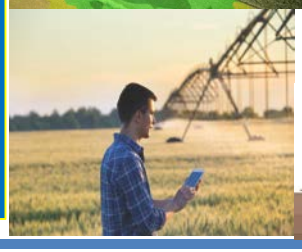


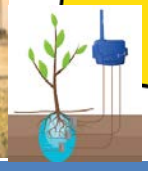


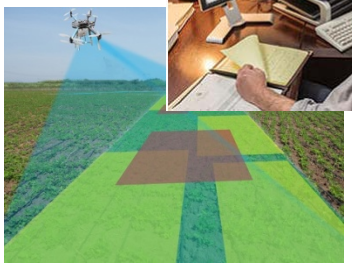
Real time control

Information and communication technology (ICT)





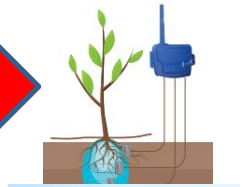


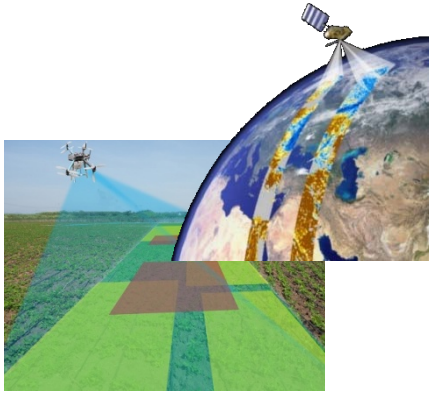


Big data in coping with drought (vulnerability)

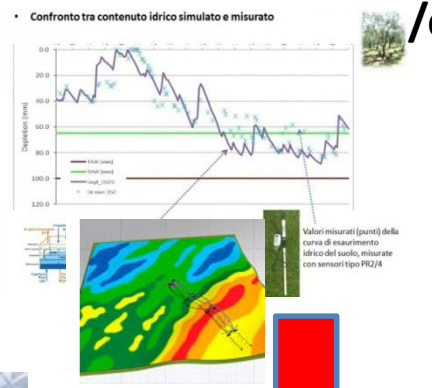
Big Data in precision irrigation

Data acquisition





Interpretation /elaboration



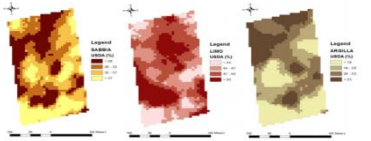
Evaluation

Control

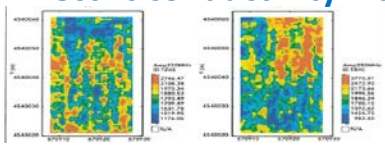
Big data in coping with drought (vulnerability)

Big Data in precision irrigation

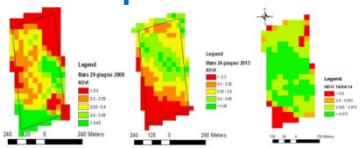
Soil texture maps



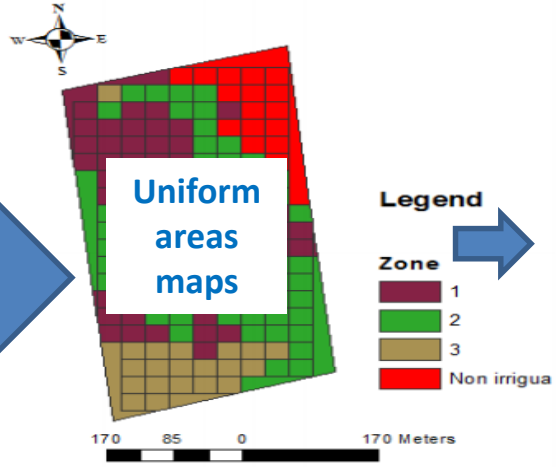
Electric conductivity maps

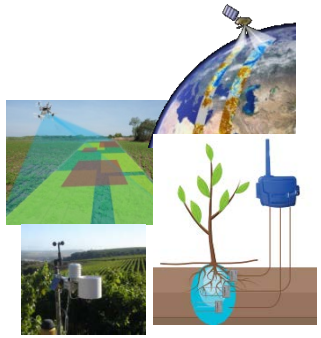


NDVI maps



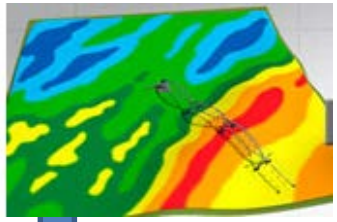
GIS + geostatistic





Irrigation requirements estimation

Irrigation requirements maps



Variable Rate Technology VRT

Conclusions

- Big data and open data are important in Sustainable and Integrated Water Resources Management (SWRM), in assessing hazards and in mitigating vulnerabilities
- In my talk have only given some examples of big data application in SWRM
- Big data and open data are also important in assessing the exposition of an area to a hazard: who and what
- Citizens' science can be a challenge for data collection, but we must pay attention to the quality of the data that derives from it

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