

Satellite Rainfall Estimates and Land Cover mapping: how are they related?

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Introduction

- Biologist, Earth Observation.
- Today's messages:
 1. Field work can't be entirely replaced by satellite data;
 2. Educators, students, and citizen scientists can play A big role in science.
 3. Watersheds are the functional units of landscape.



Flooding and Drought

- Uninterrupted, accurate and timely rainfall estimates are necessary



Rainfall gauges are insufficient



Tropical Rainfall
Measuring Mission
(TRMM)



Global Precipitation
Measurement
(GPM)



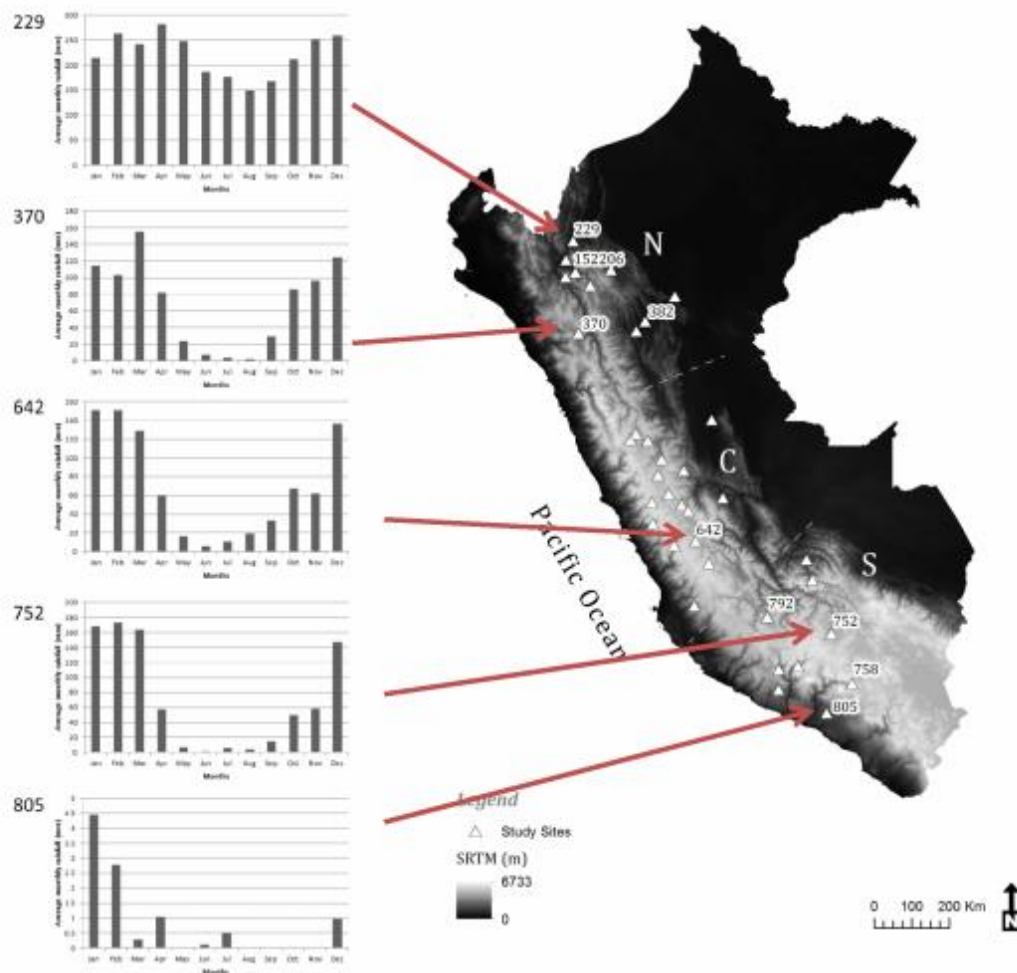
Satellite Rainfall Estimates

- Satellite Rainfall Estimates are used in a broad range of applications with significant **societal benefits**;
- Applications include hydrological modeling, global change studies or ecosystem research;
- These applications require the data to be available at **adequate** spatial and temporal **resolution**.

Satellite Rainfall Estimates

- To be used operationally, rainfall products must be **calibrated and validated**;
- **Calibration**: the process of identifying robust relations between the satellite data and the variable of interest (e.g. rainfall);
- **Validation**: the process of comparing the values returned by the product and those measured in reality (evaluates the performance).

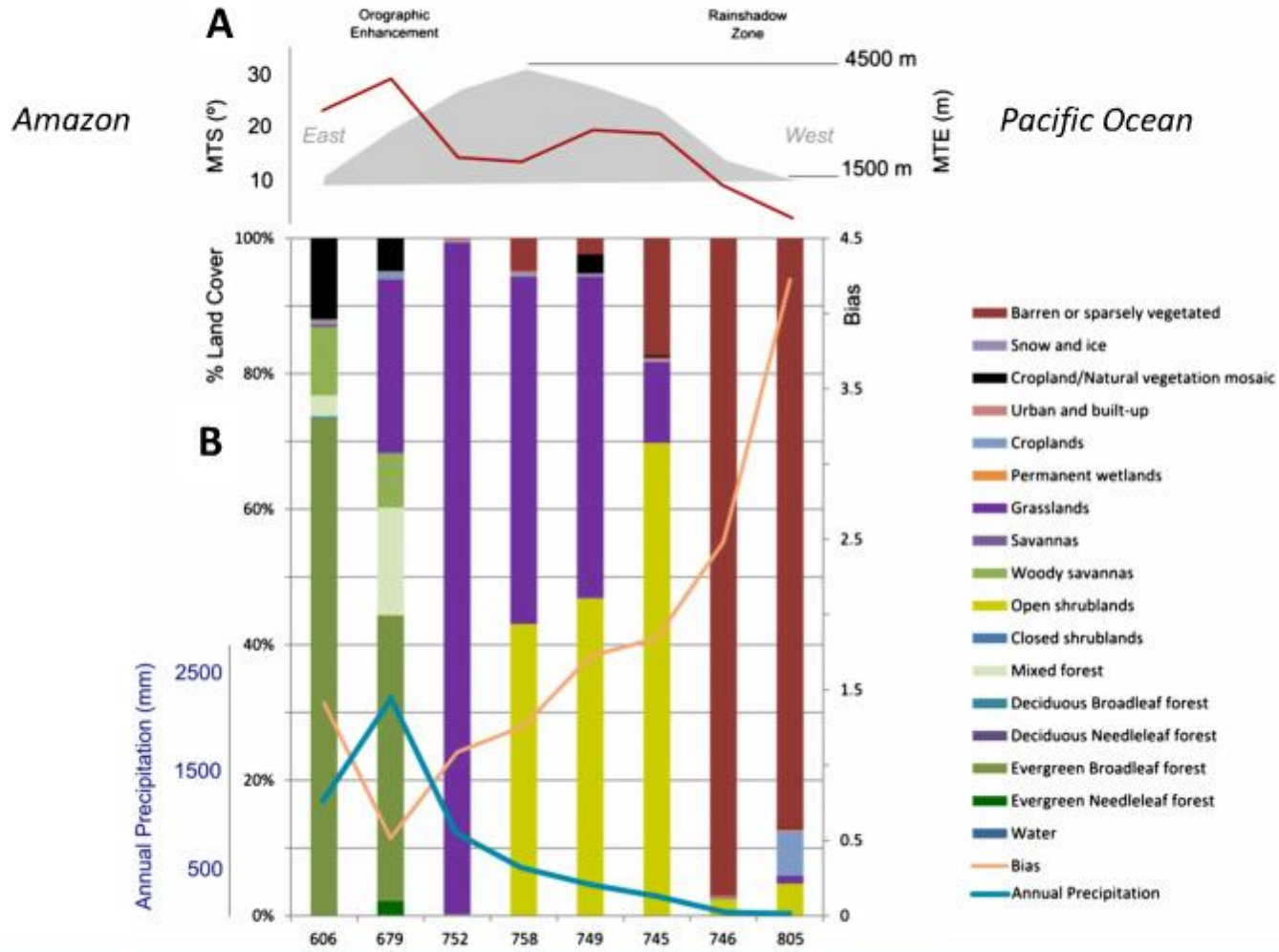
Validating Rainfall Estimates



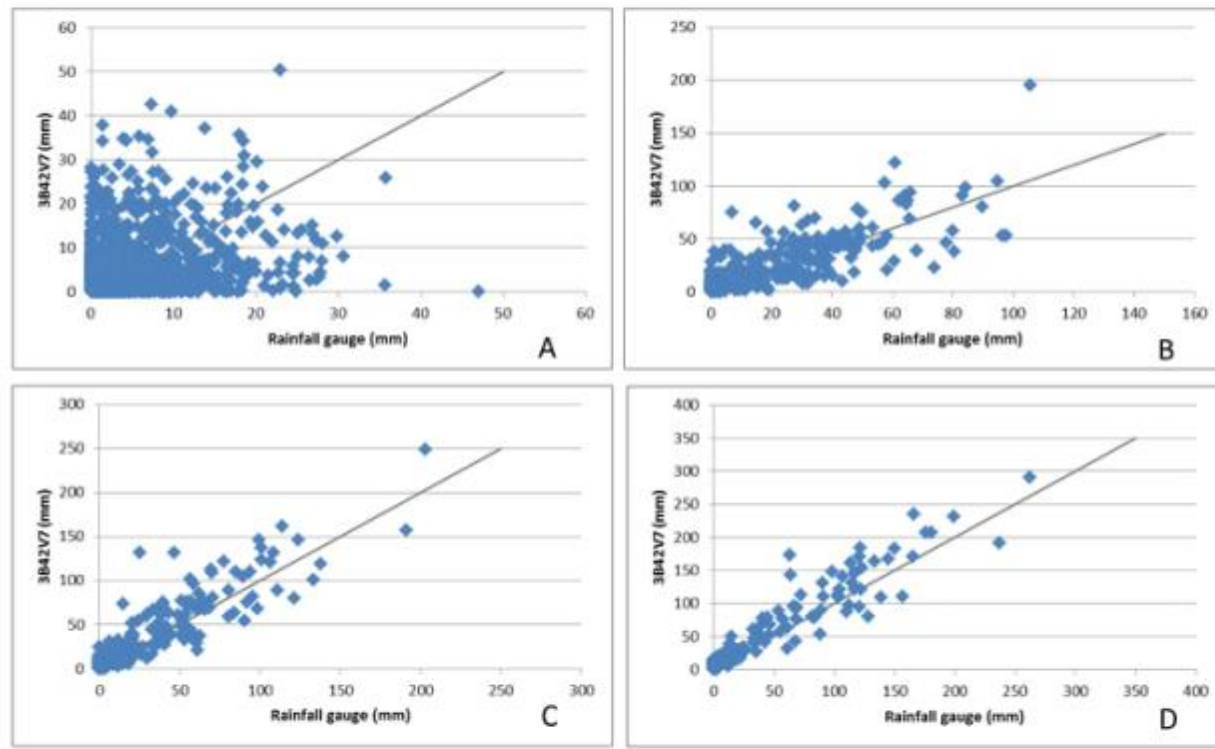
Case study 1: Peru



Rainfall and Land Cover



Validating Rainfall Estimates



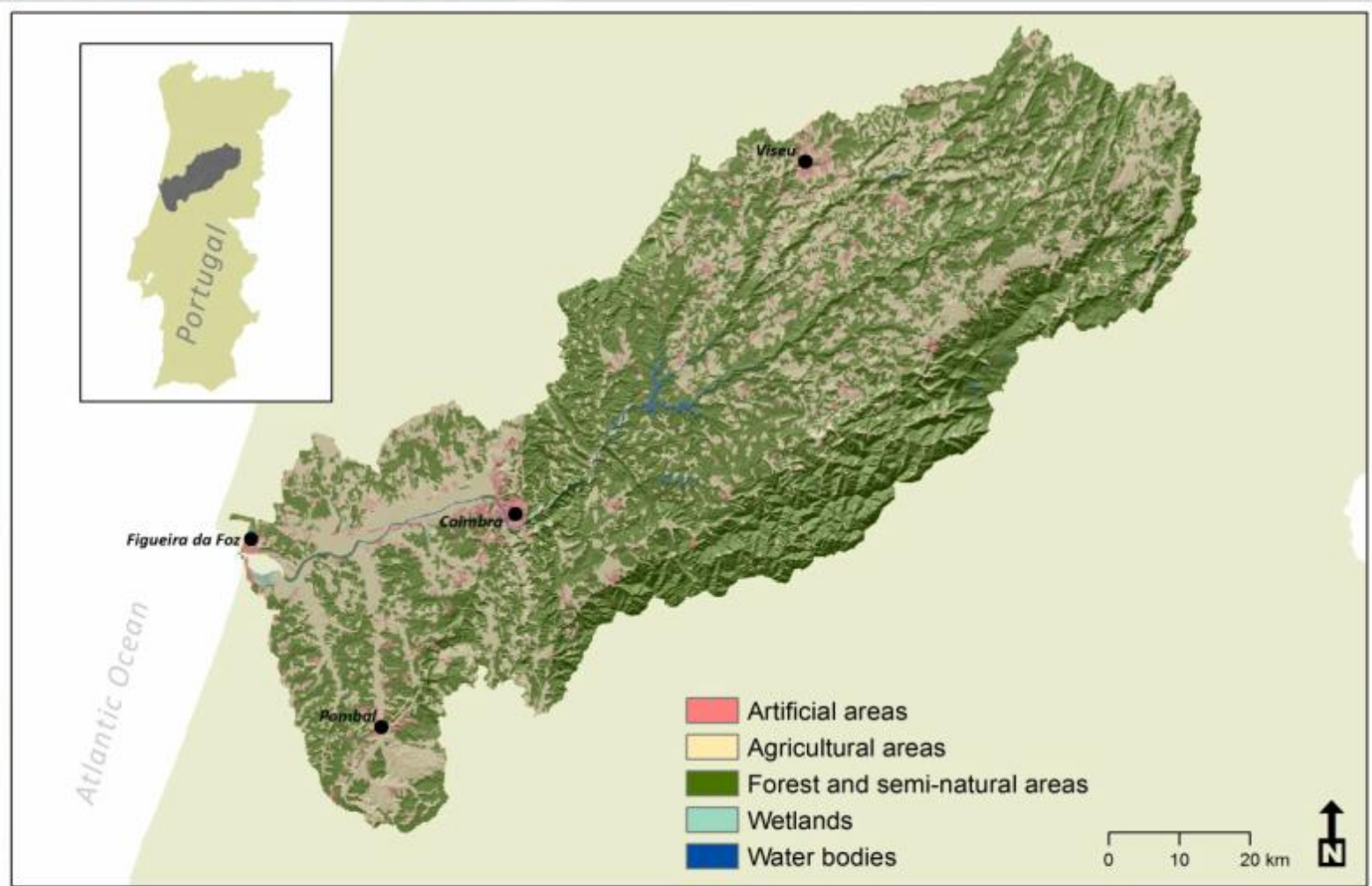
Correlation of Satellite Rainfall Estimates and gauge measurements

A: Daily
B: 8-Day
C: 16-days
D: Monthly

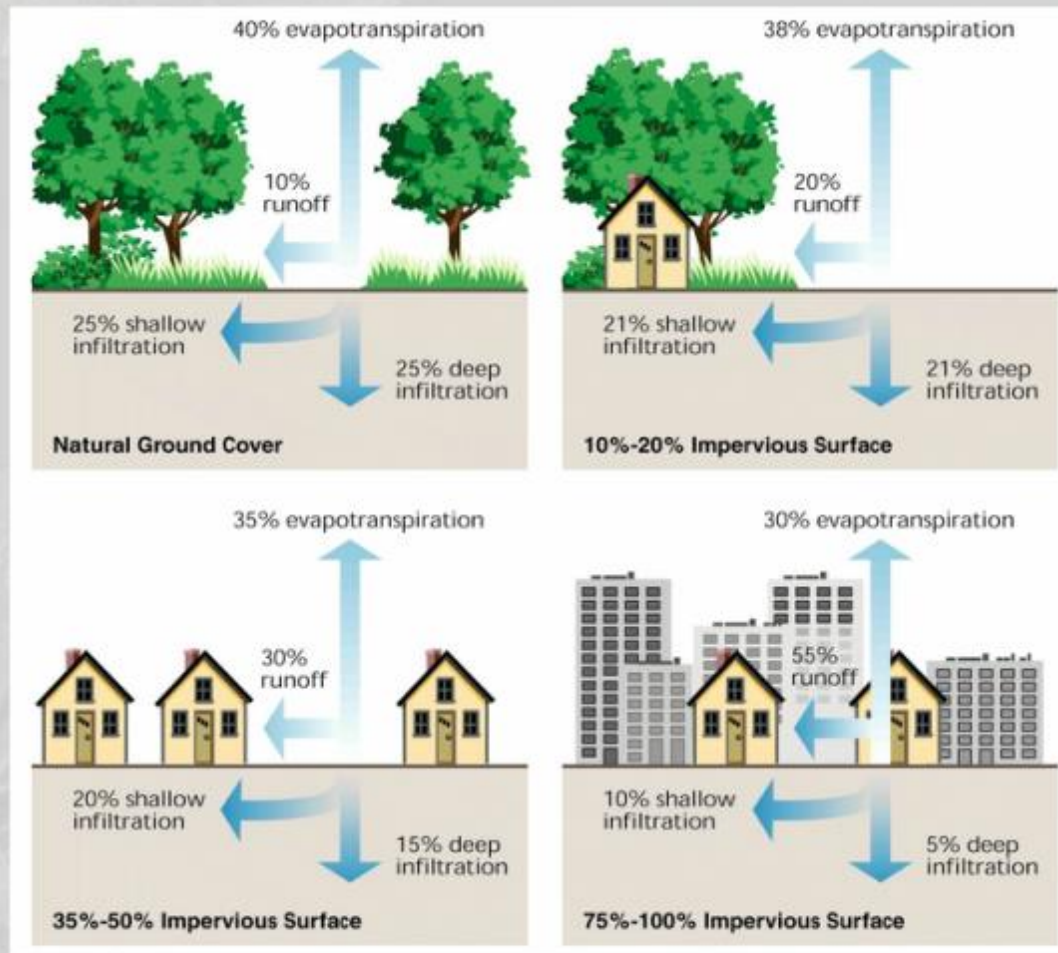
Land Cover

- Rainfall affects land cover (e.g. vegetation types and phenology);
- Land cover variables are often used in models that also integrate rainfall estimates (e.g. hydrological modelling);
- Mapping urbanized areas relevant to forecast the impact of flooding events in **watersheds**.

Case Study 2: Urbanized areas in a watershed

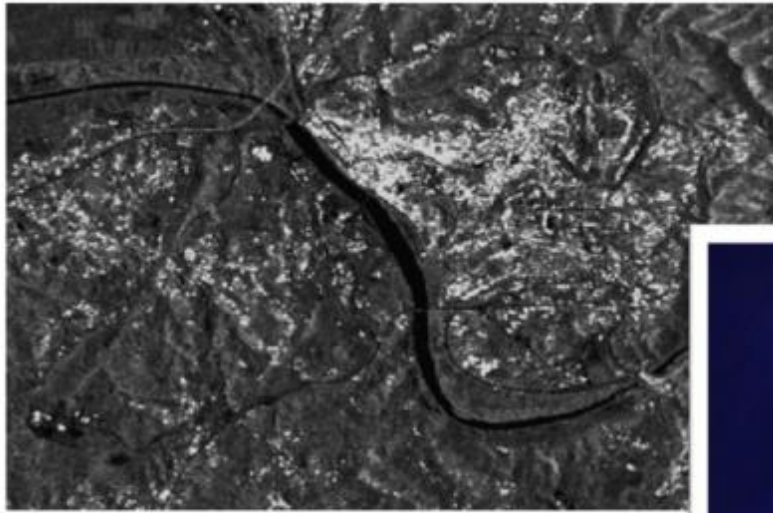


Case Study 2: Urbanized areas in a watershed



Source:
www.fairfaxcounty.gov

Data sources



Landsat-8

RADAR: Sentinel-1A (ESA)

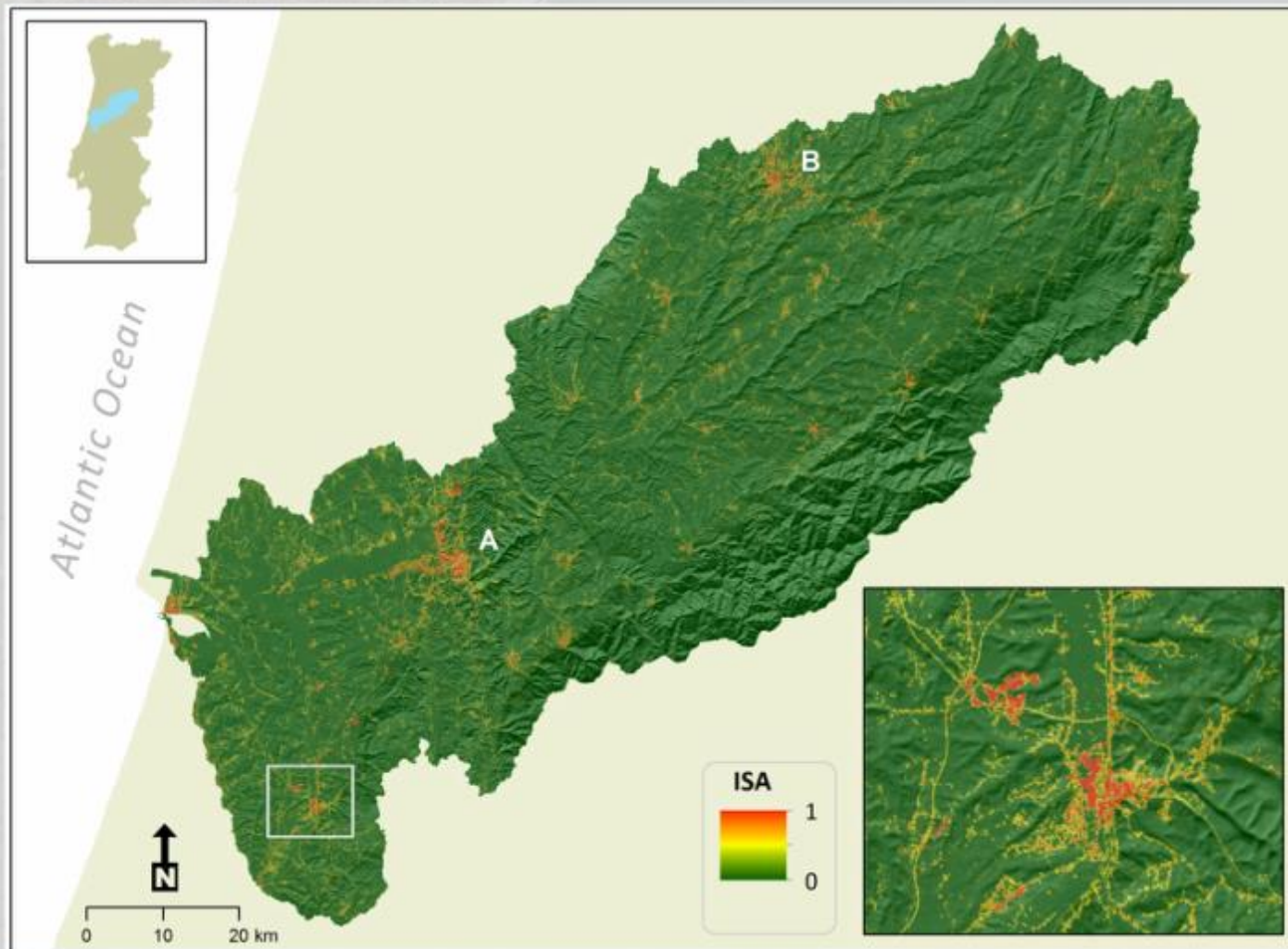


Land Cover mapping

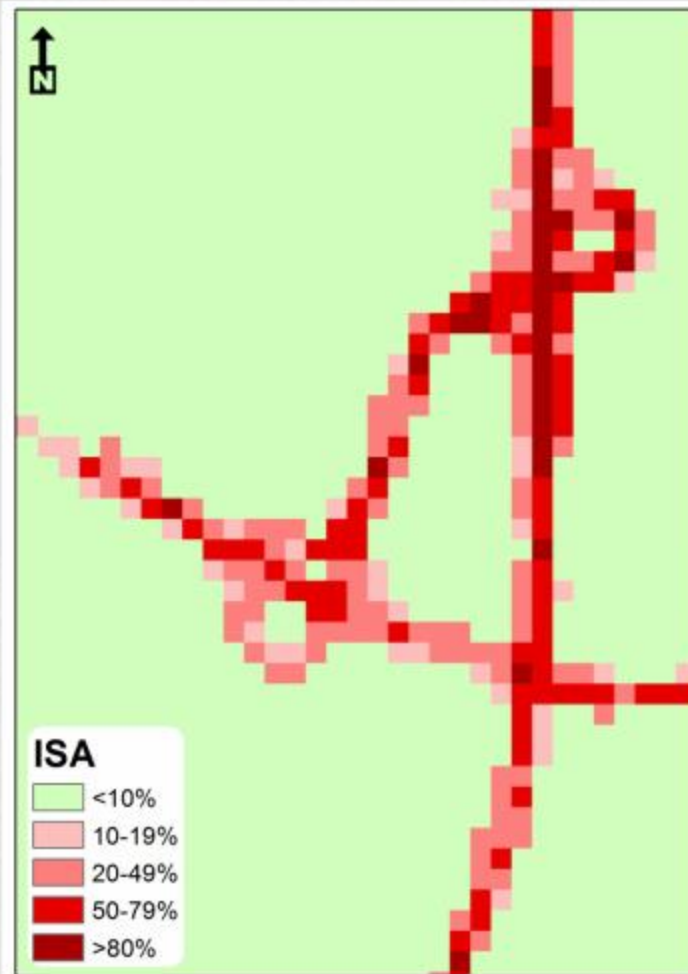
Ground Truth, how much is enough?

- Aerial and High Resolution Satellite data as well as ground truth campaigns;
- Pervious and impervious surfaces are manually or automatically identified;
- 133 km² of samples;
- Additional independent validation set.

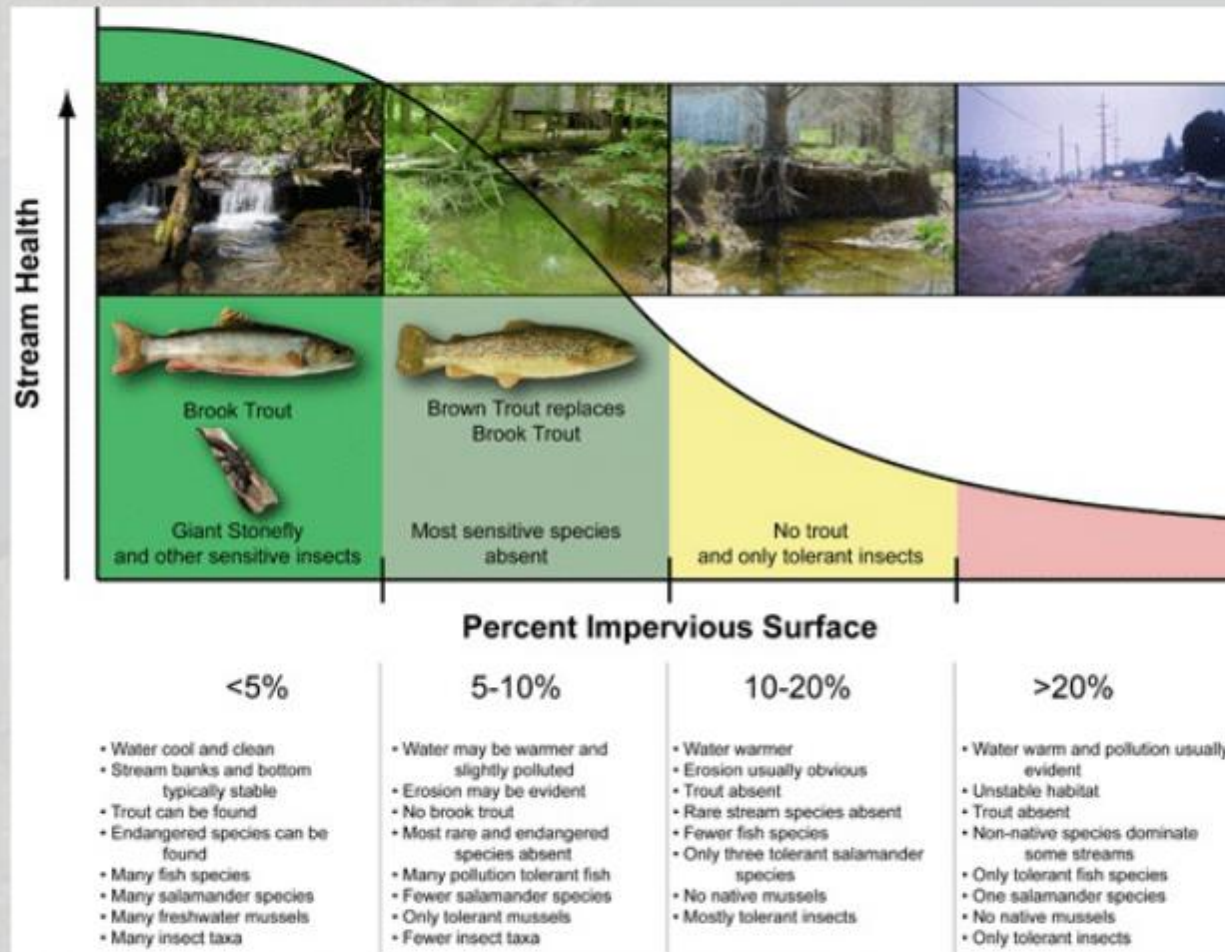
Land Cover mapping



Land Cover mapping



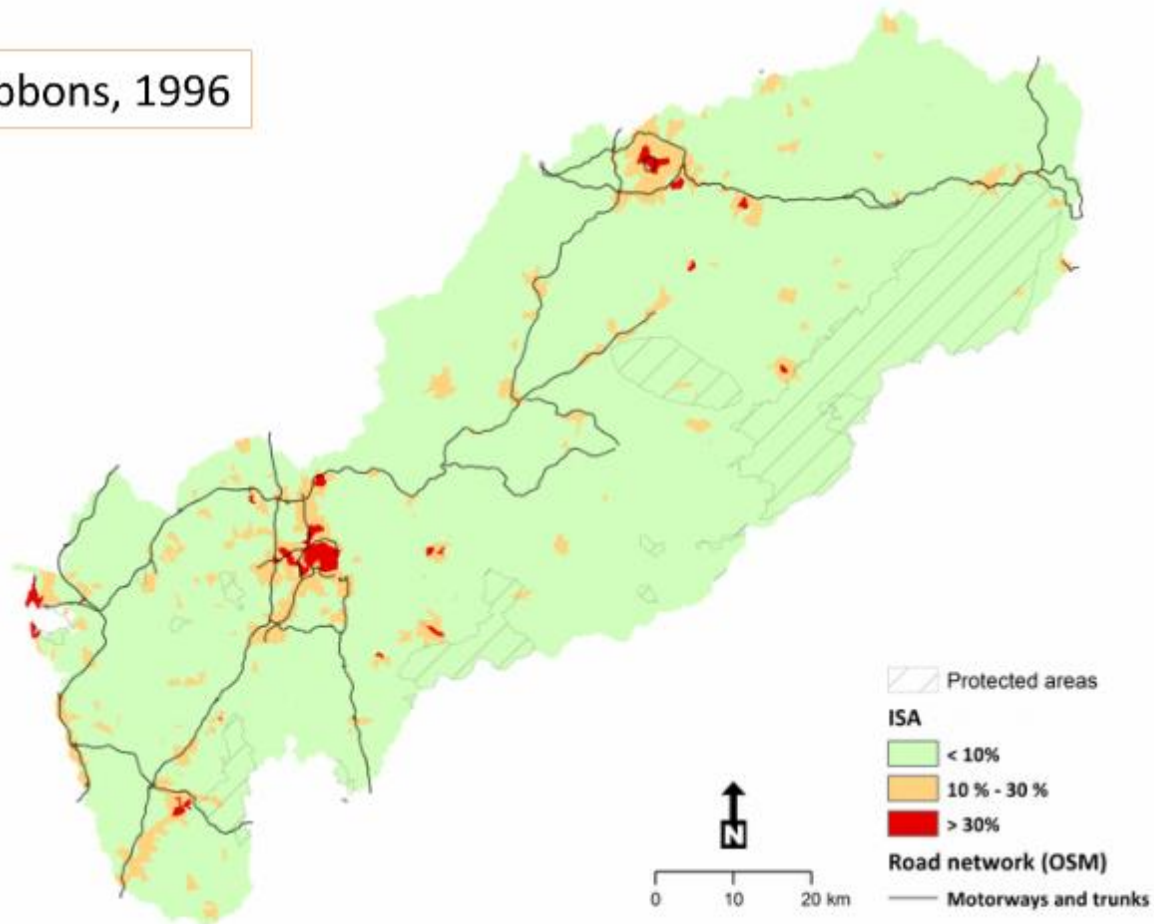
Land Cover mapping



Source:
www.maryland.gov

Land Cover mapping

Cf. Arnold and Gibbons, 1996



Data distribution

- Final step: **data distribution**;
- Traditional data portals (web);
- Emerging platforms:

smartphones/tablets
the cloud



Local experience matters

- **Local experience** is relevant because satellite products often address societal challenges and needs;
- **Listening to communities** is the first step towards defining development priorities;
- The **Story Maps** initiative of the El Niño Campaign asks communities worldwide to share El Niño-related experiences.



Local experience matters

www.smartbasins.com/storymaps

El Niño Stories

Learn
Niño is
commu
learnin
unders

El Niño beginn rescue Californ from its drough

Dramatic images sh
to rescue California

As you may know, t
has been facine drow

An El Niño Connection, U.S. to Peru and Back

What do students in Lima Peru and Ida Michigan have in common? The answer is quite simple, the dramatic effects of this year's El Niño. Thanks in part to The GLOBE Program's worldwide reach in connecting schools with one another, mentorship from Dr. Kevin Czajkowski from the University of Toledo and the inquisitive nature of students from Ida



Conclusion

- Earth Observation (EO) products are relevant to a wide range of applications and can replace/supplement *in situ* data sources;
- EO products particularly important to monitor dynamic phenomena, such as El Niño;
- Calibration and Validation activities are important and can include the efforts of citizen scientists;



Thank you!

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Projects supported by:

