

Trans-African Hydro-Meteorological Observatory

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John Selker (OSU)



Outline

- Background
- Design
- Operation
- Education
- Technology

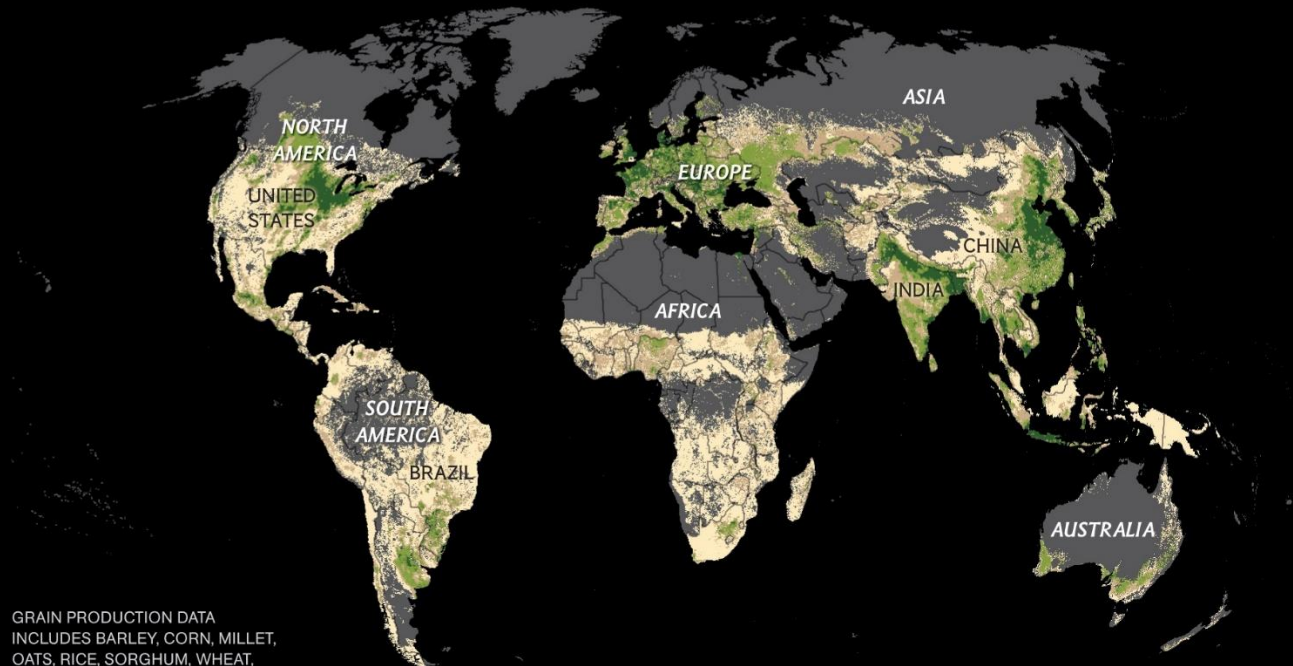


Background

GRAIN PRODUCTION is high in only a handful of countries. Regions that cannot grow enough to meet their demand must depend on imports.

METRIC TONS OF GRAIN
PRODUCED PER HECTARE, 2000

1	0.3	.05	NEGLECTIBLE OR ZERO
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GRAIN PRODUCTION DATA
INCLUDES BARLEY, CORN, MILLET,
OATS, RICE, SORGHUM, WHEAT,
RYE, AND MINOR GRAINS.

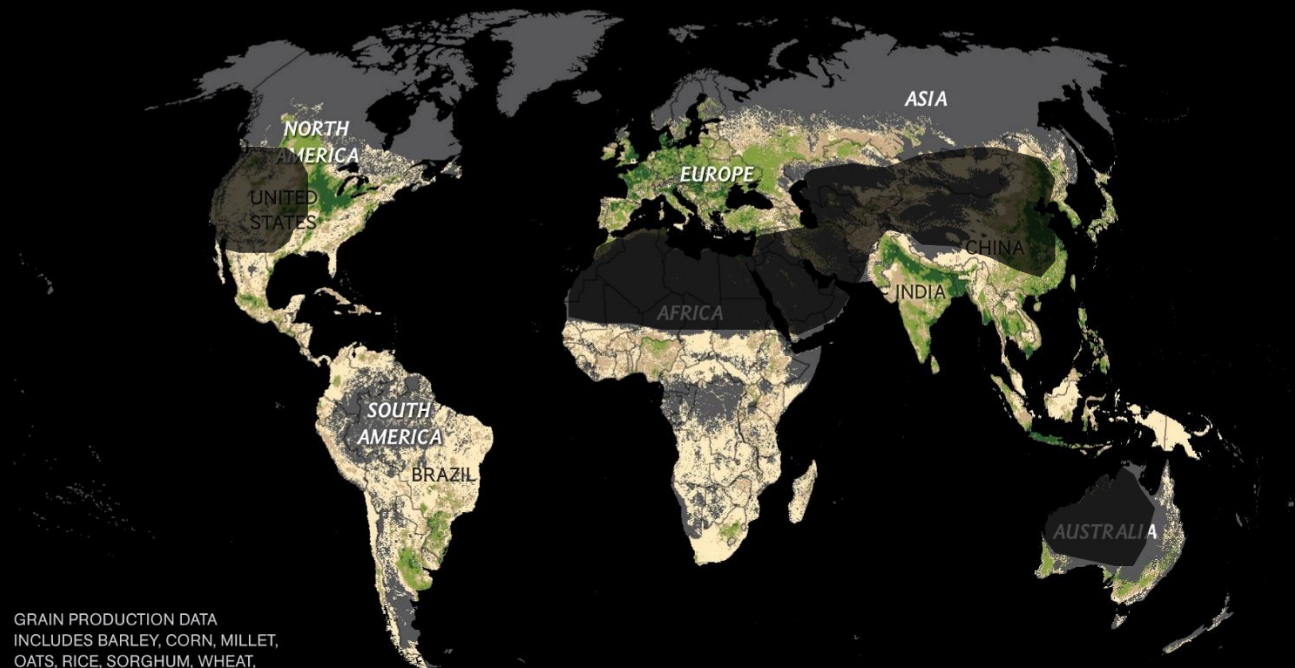
MAPS: VIRGINIA W. MASON, NG STAFF. SOURCES: PROGRAM ON FOOD SECURITY AND THE ENVIRONMENT, STANFORD UNIVERSITY;
UN FOOD AND AGRICULTURE ORGANIZATION (FAO); CONSORTIUM FOR SCIENCE, POLICY & OUTCOMES, ARIZONA STATE UNIVERSITY;
DEPARTMENT OF GEOGRAPHY, MCGILL UNIVERSITY; INSTITUTE ON THE ENVIRONMENT, UNIVERSITY OF MINNESOTA
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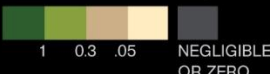
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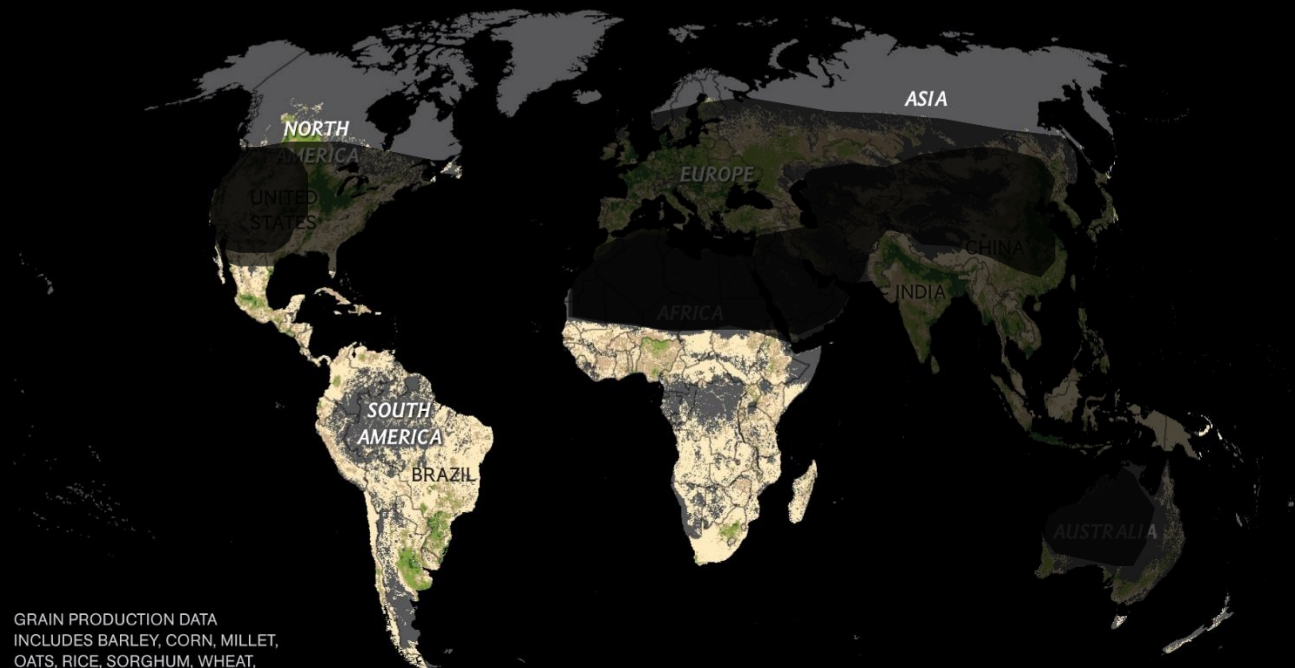
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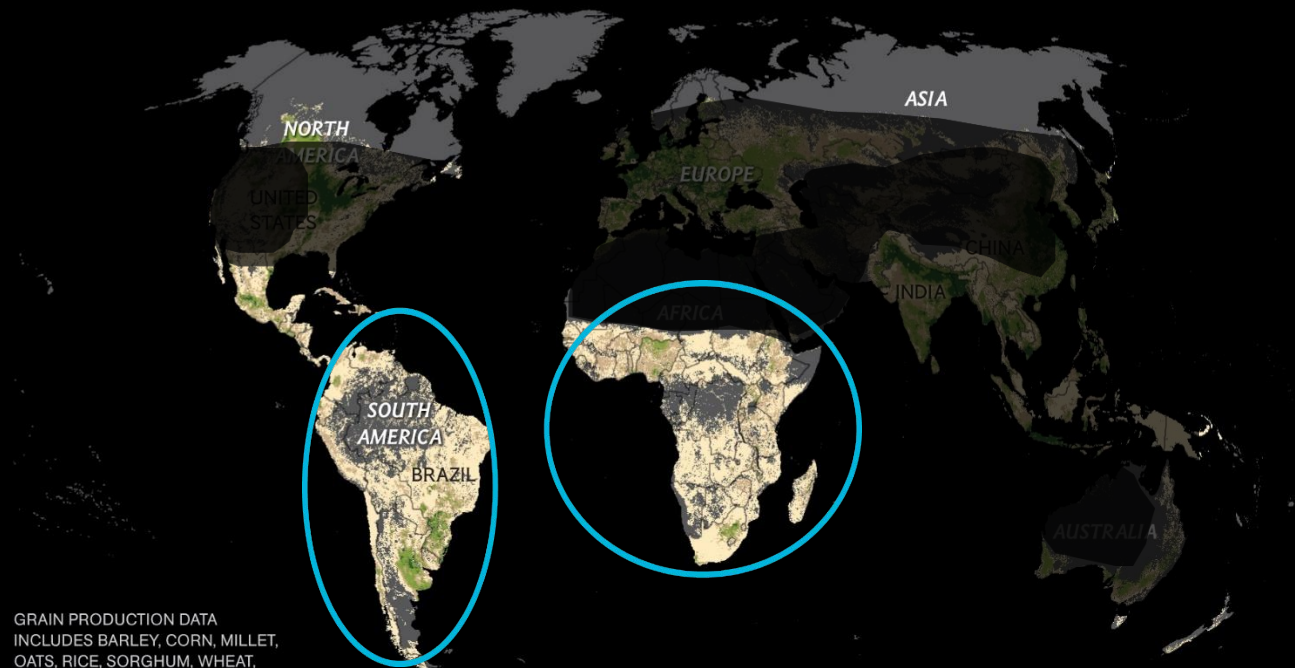
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METRIC TONS OF GRAIN
PRODUCED PER HECTARE, 2000

Color	Value
Dark Green	1
Light Green	0.3
Yellow	0.05
Grey	NEGLIGIBLE OR ZERO



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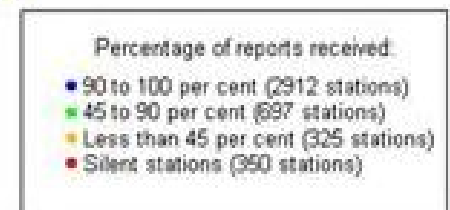
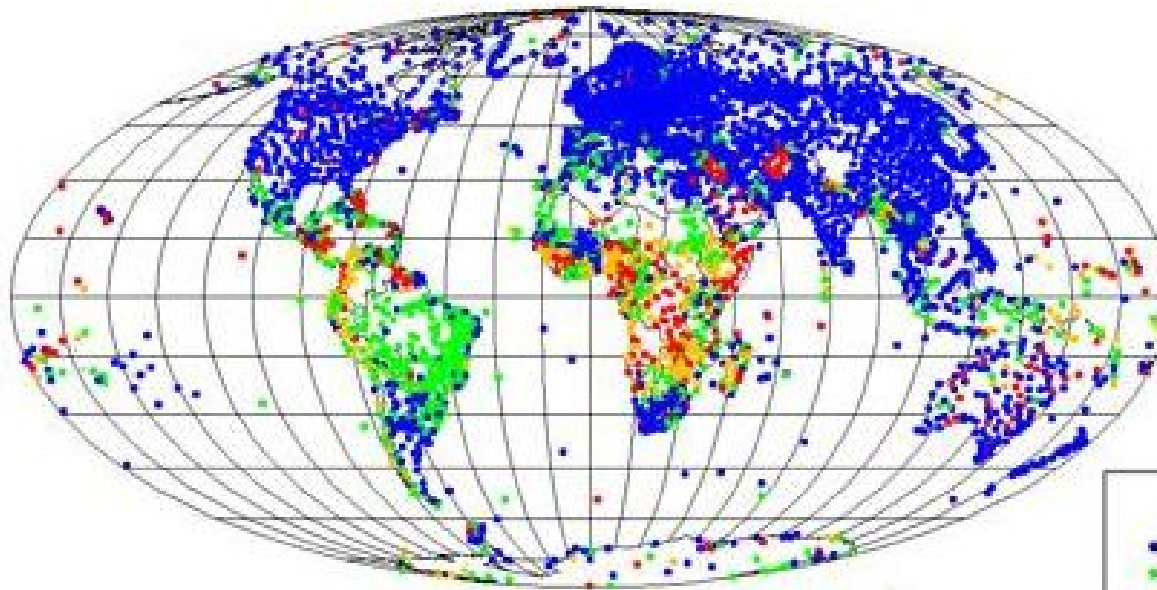
Background



**60%
world's
uncultivated
arable
land!**

Background

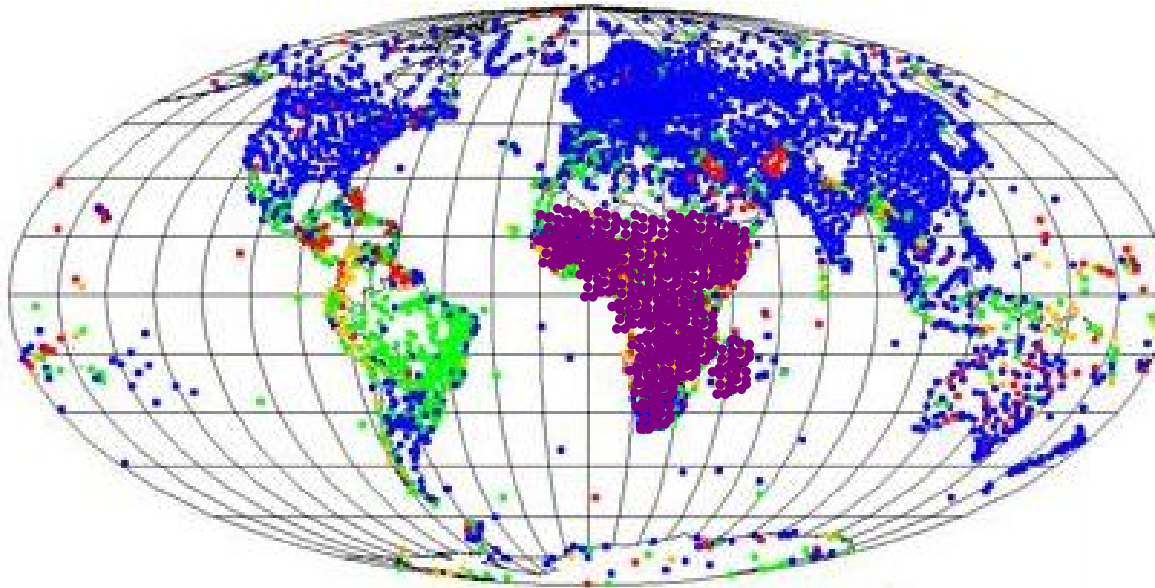
WMO Stations



WMO Secretariat

Background

Leapfrog: 20,000 TAHMO Stations!

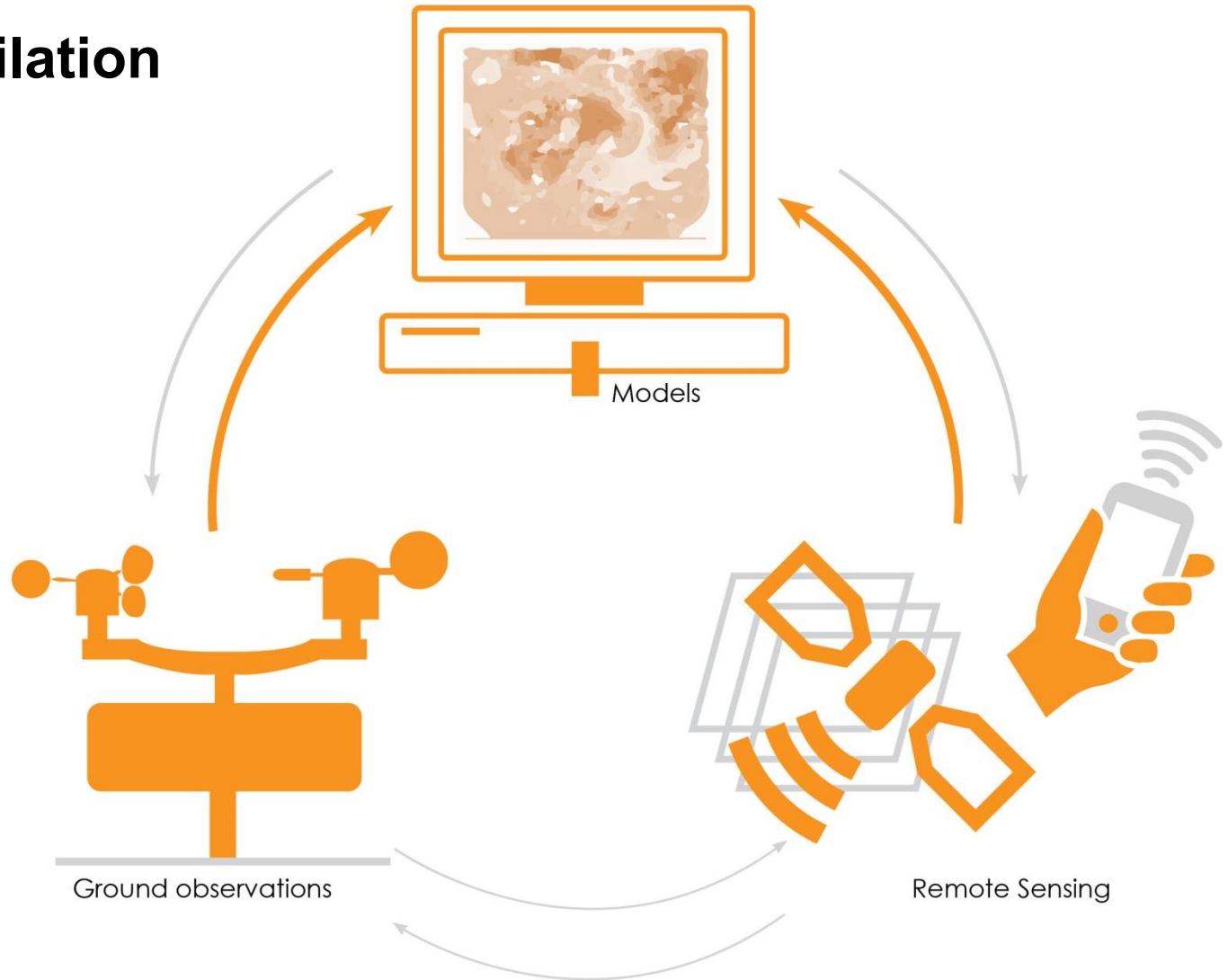


Source: Leapfrog, 2014. TAHMO Stations, 2014. TAHMO Stations, 2014.

Background



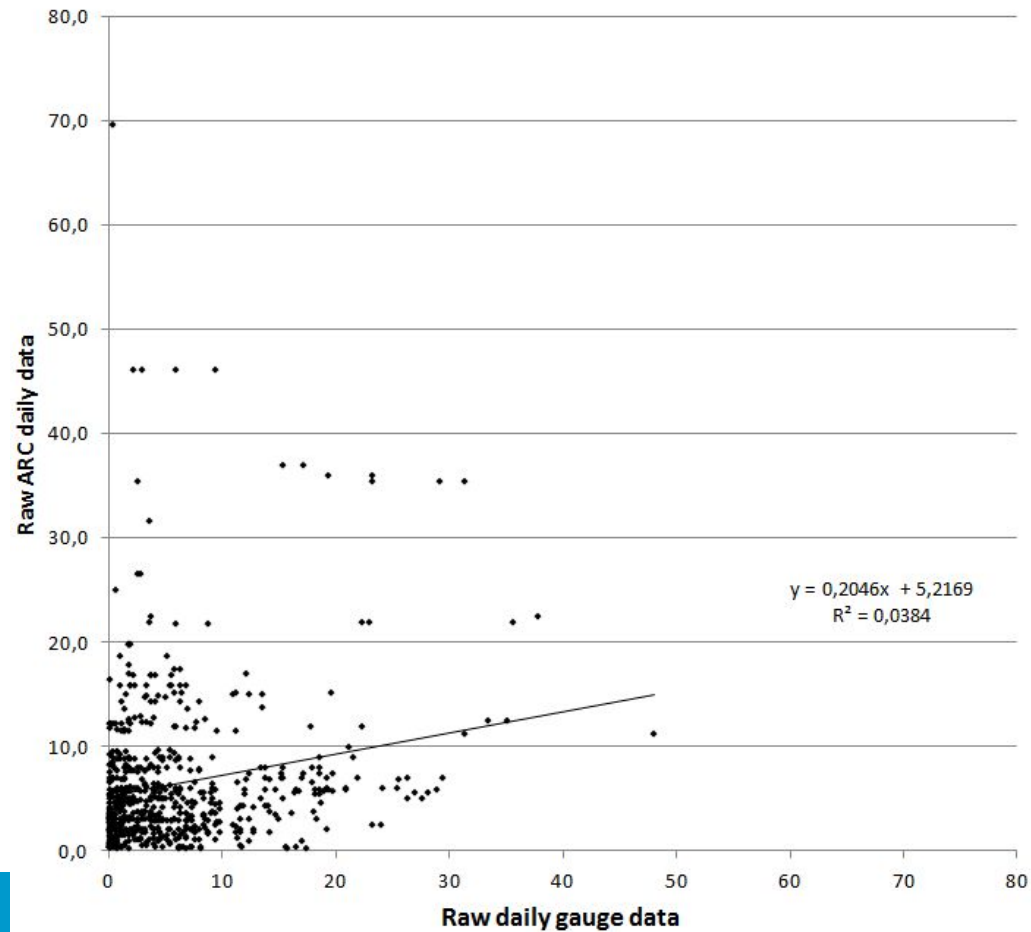
Data assimilation



Background

Busogo study Rwanda

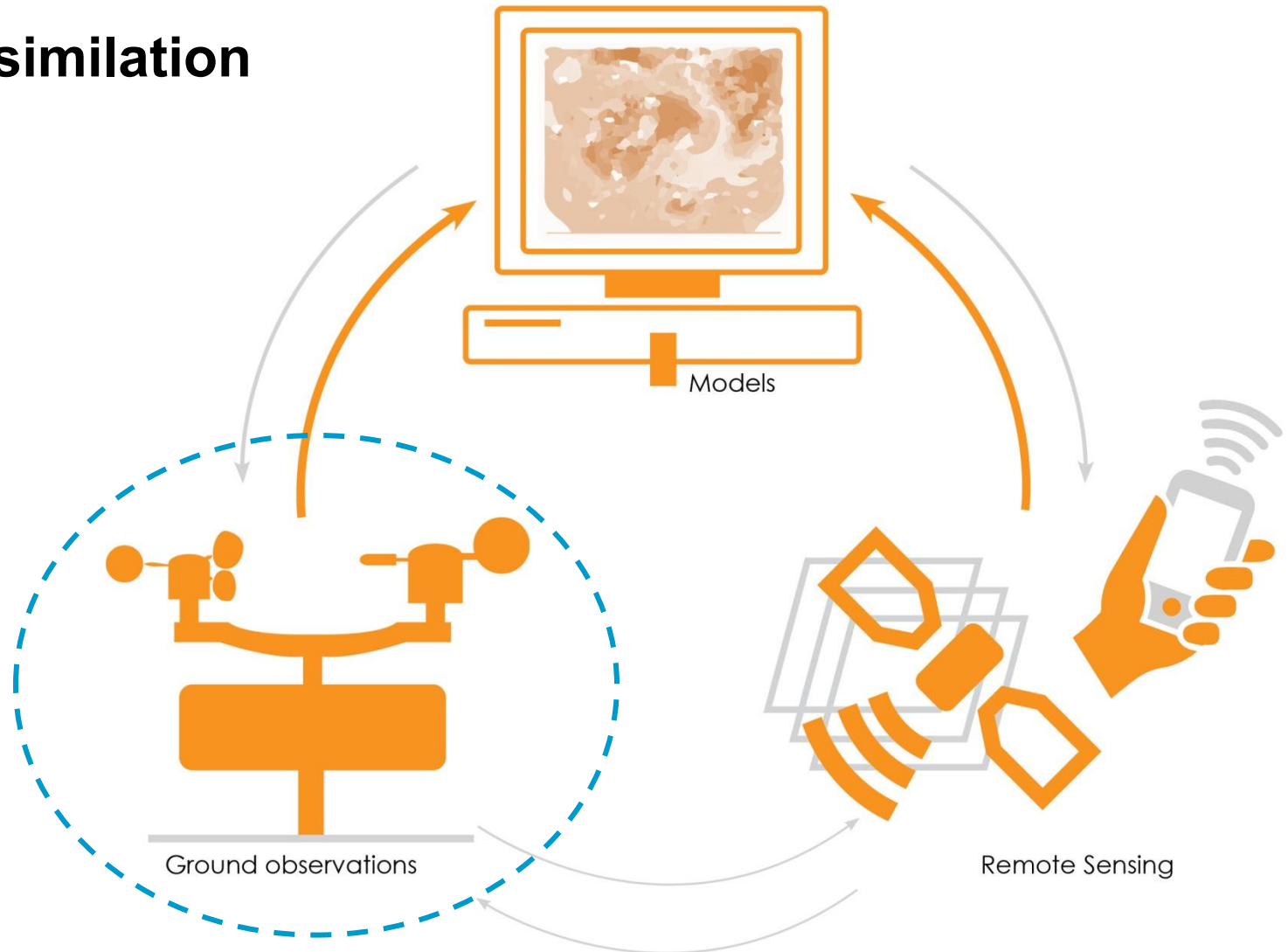
Basic regression between ARC pixel and daily gauge rainfall



Background



Data assimilation



Background



- Design
- Operation
- Education
- Technologies



Design

Principles

- Robust
- No moving parts
- No cavities
- Cheap (<\$500)
- Self calibrating
- Cross calibrating



Design

Principles

- Robust
- No moving parts
- No cavities
- Cheap (<\$500)
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Design

Present model



P, R_{sd}, u

T, RH

barometer

lightning

GPS, GPRS

compass,

accelerometer



Operation

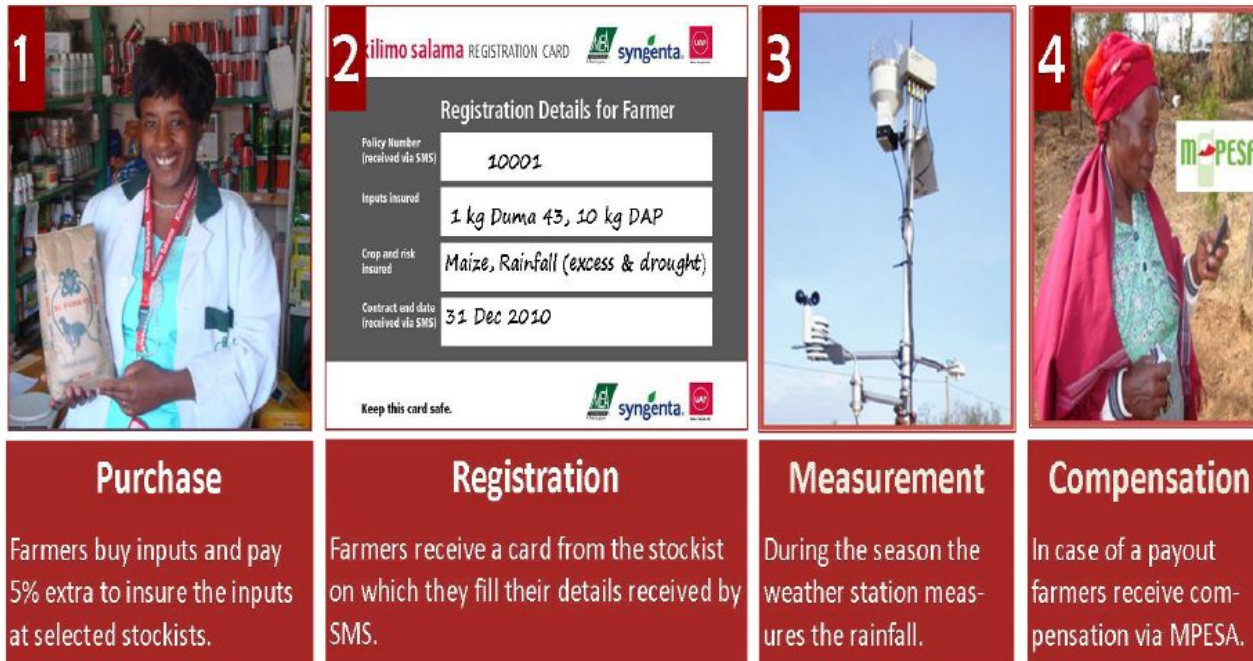
Costs (M\$)

• Construction	32
• Educational package	2
• Role out	32
• Computation / RS	4

Investment	70 M\$
Running costs	5 M\$/yr
All in	2M\$ / month

Business case: Insurance

Kilimo Salama Registration Process

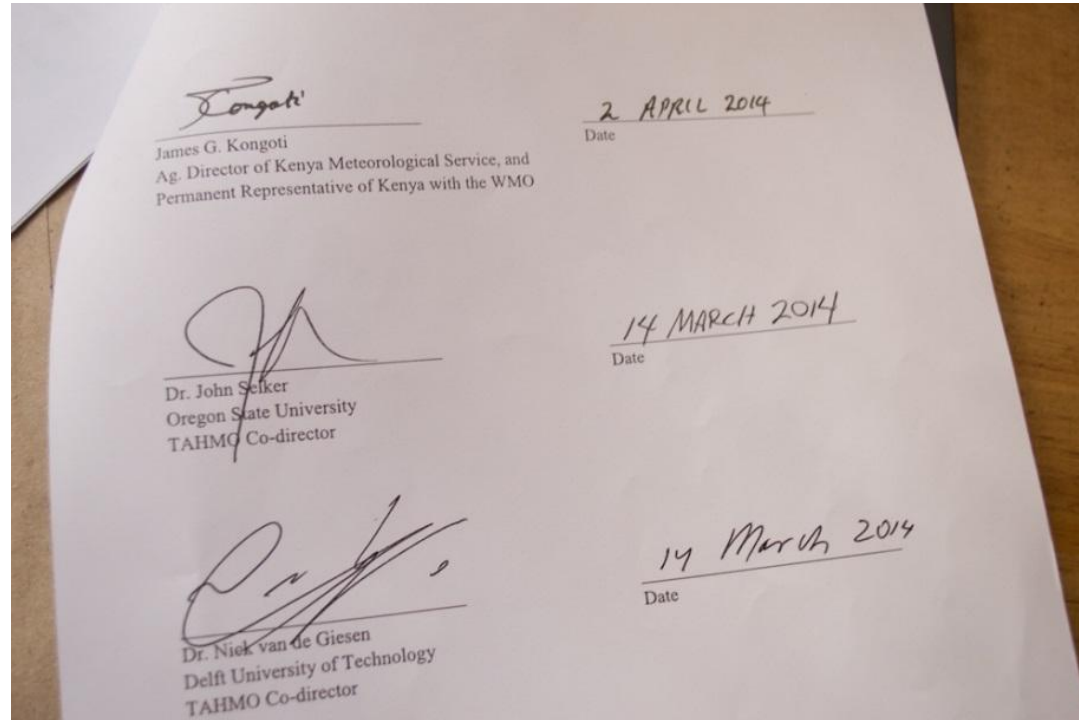


Operation

MoU

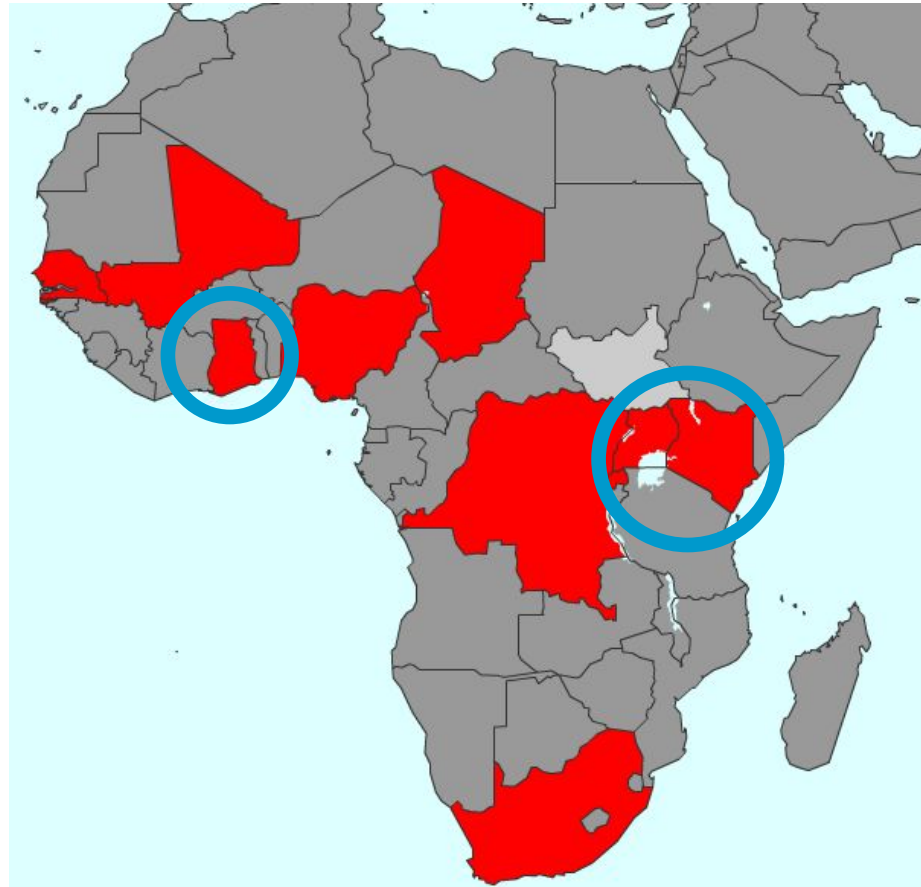
Kenya
Ghana
Malawi
Benin

Nigeria
Uganda
Zambia



Pilots

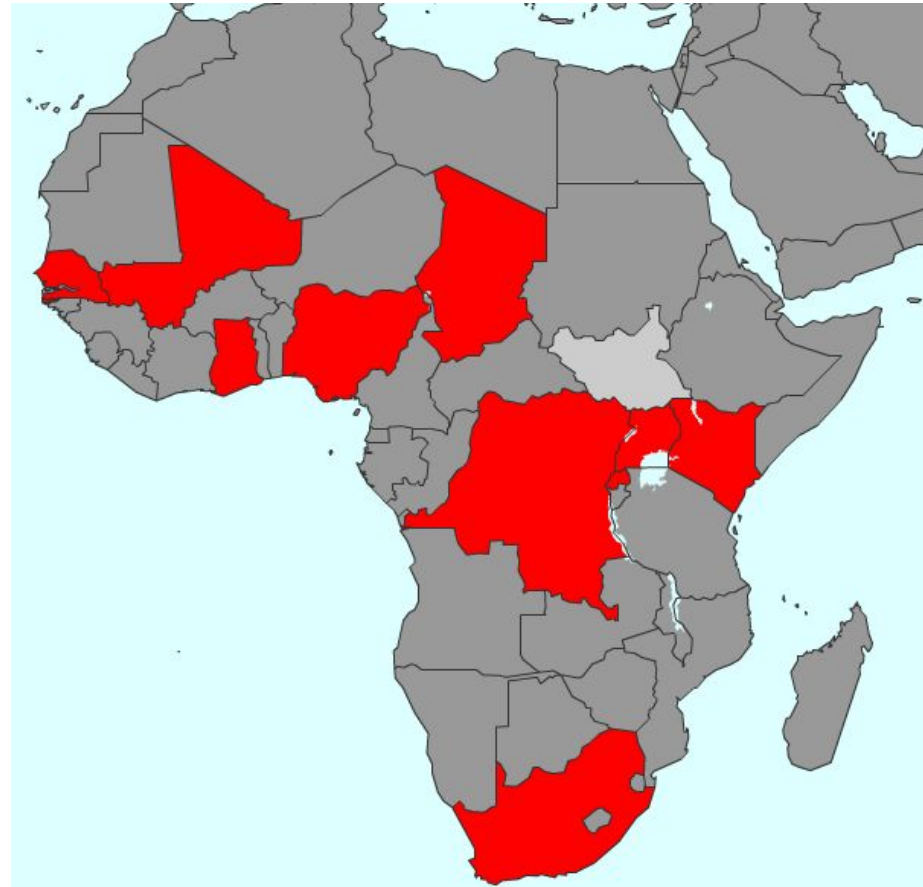
- Ghana
- Kenya
- Uganda
- Zambia



Operation



Pilots



Operation

Communication



Education

- Associate with schools
- Develop environmental education package
- Teach children about their environment
- Teach children about their environmental connectedness



Education

School2School program

- Sister school
- Costs sharing
- Involvement
- Sharing ideas



Education



Universities

- Nairobi
- Akure



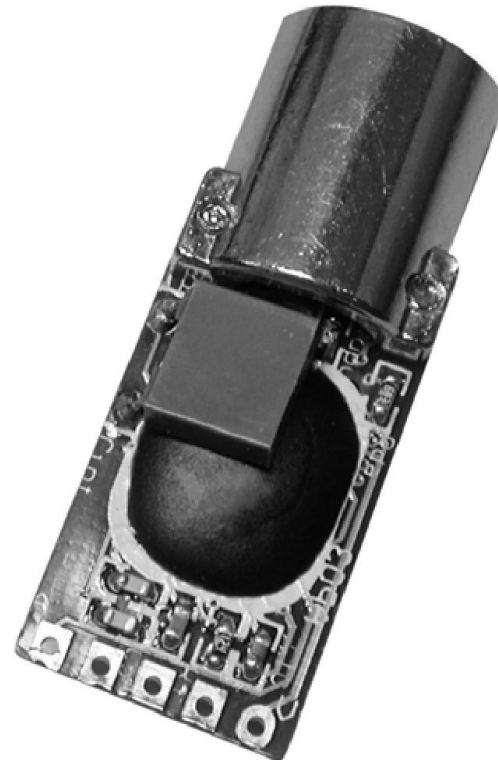
Sensor Design Competition

Technologies

Use existing sensors

- Automotive
- Household

ZyTemp TN9



Technologies

Precipitation

Video
disdrometer



Microwave disdrometer



>10,000 Euros

Laser
disdrometer



Joss-Waldvogel (acoustic)

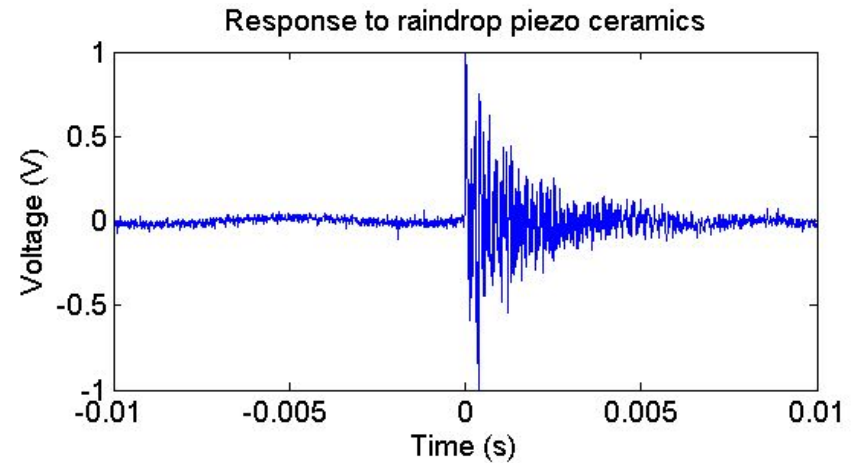


Technologies

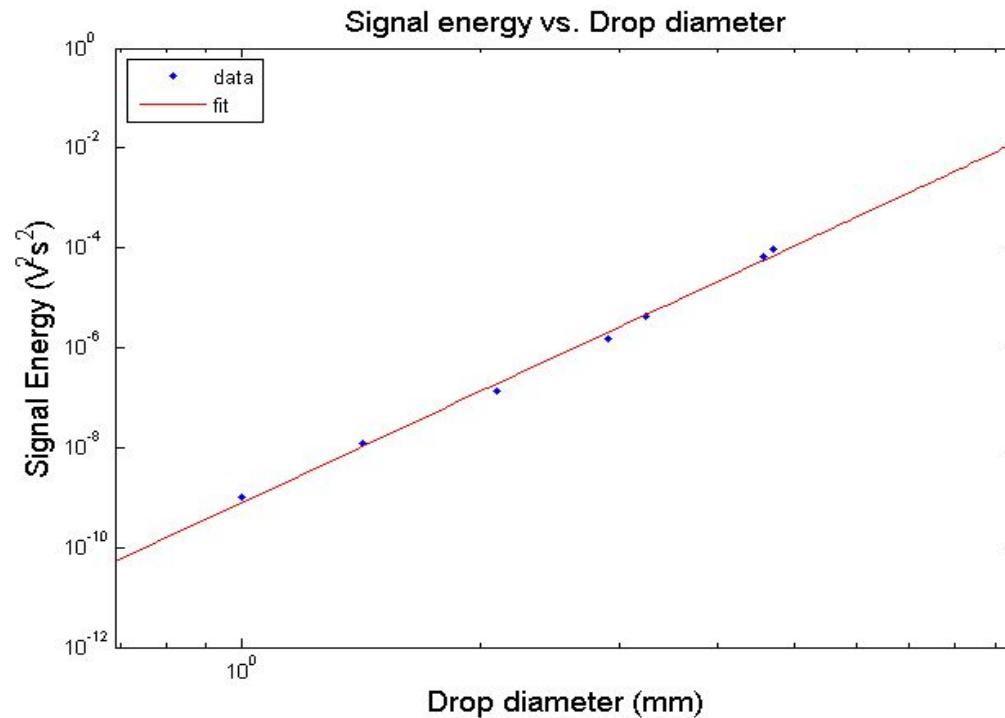
Precipitation

Coen Degen

Piezo ceramic element



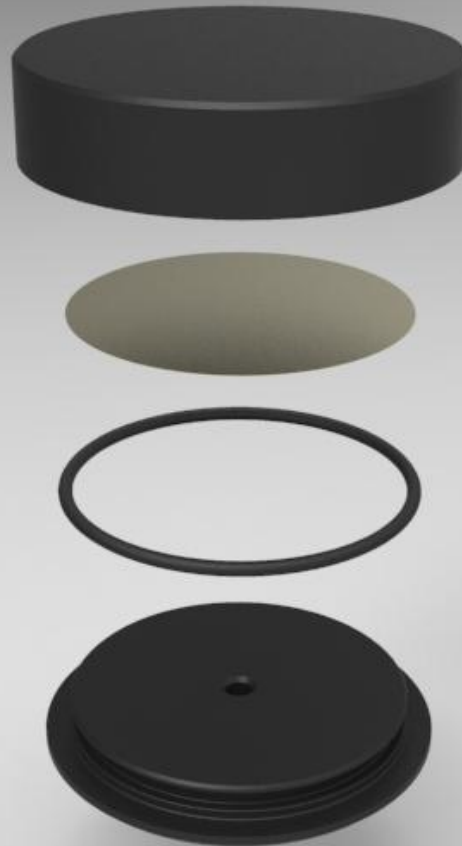
Precipitation



$$E_s = 8 \cdot 10^{-10} \cdot D^{7,34}$$

Technologies

1. Housing top
2. Piezoelectric sensor
3. O-ring
4. Housing bottom



Disdro 

Technologies

Lightning

- Automotive
- Household

Gilbert Mwangi



Design of a Low-Cost Microcontroller-Based Lightning Monitoring Device

Kamau M. Gilbert^{1*} Kang'ethe M. Samuel¹, Kamau I. Stanley¹, Giesen Nick²

¹Faculty of Engineering, Department of Electrical & Electronic Engineering Department, JKUAT, P.O Box 62000-00200, Nairobi-Kenya

²Faculty of Civil Engineering and Geosciences, Water Management Department, Delft University of Technology, Postbus 5 2600 AA Delft, The Netherlands.

Technologies



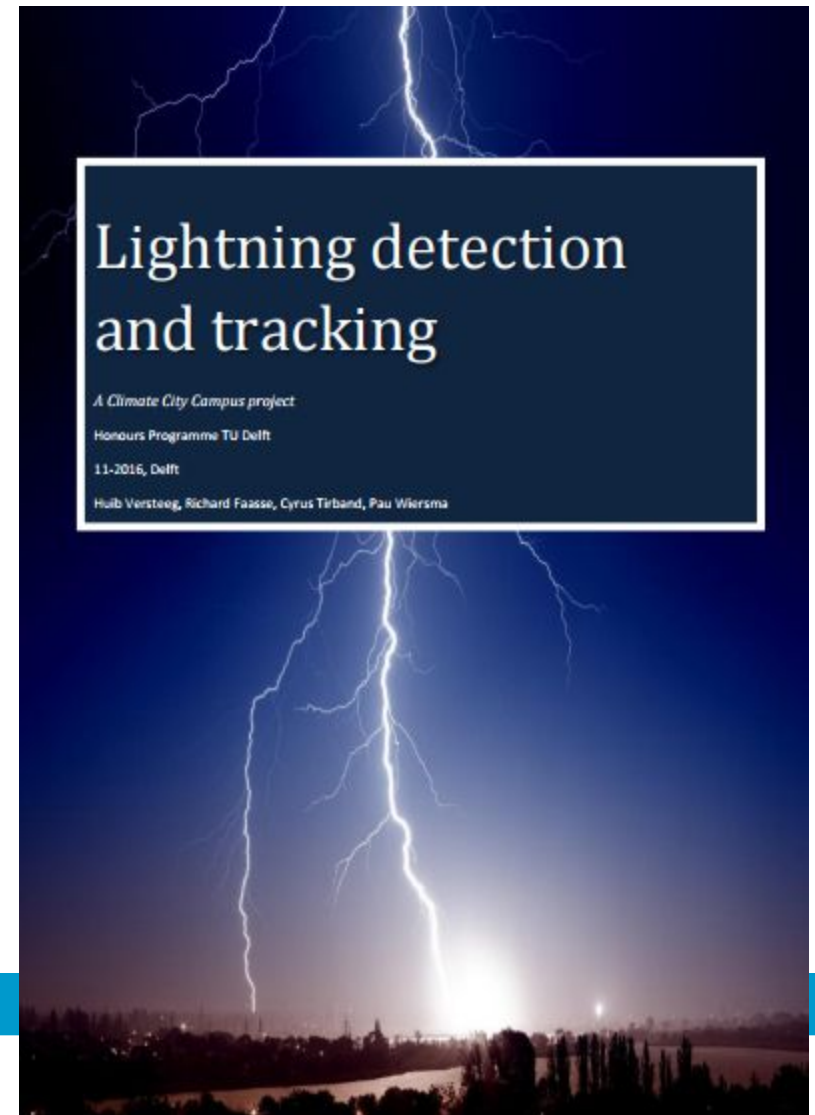
Lightning

Huib Versteeg

Richard Faasse

Cyrus Tirband

Pau Wiersma



Technologies

Precipitable Water Vapor



EUROPEAN
SATELLITE NAVIGATION
COMPETITION 2015

Eugenio Realini / GReD

Technologies

Precipitable Water Vapor

Eva Stierman

Mariska Koning





Join!

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