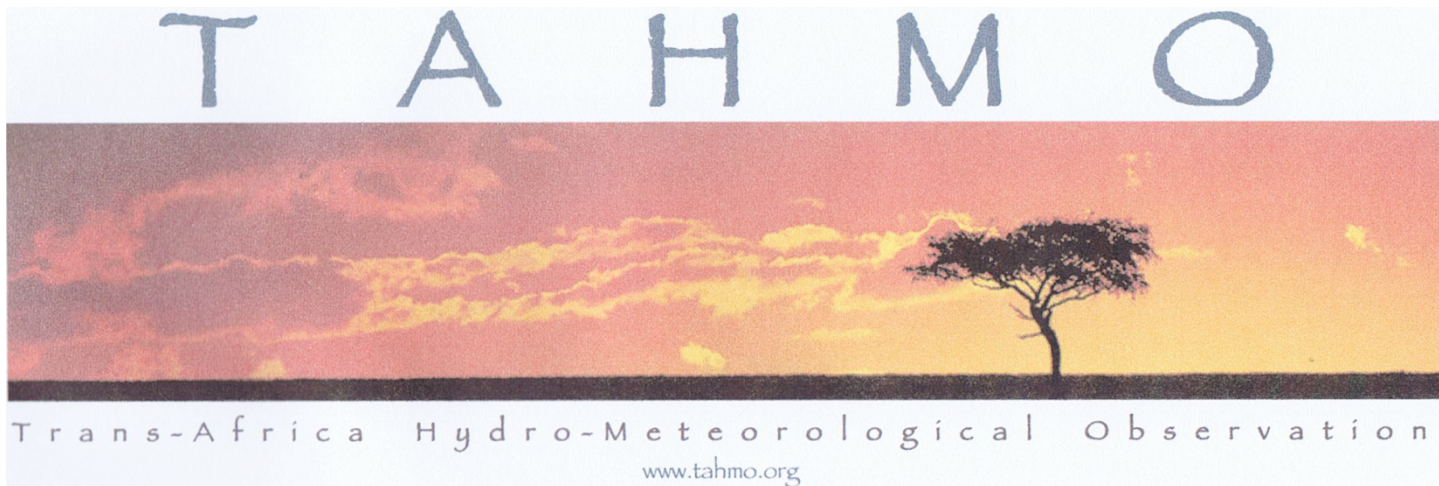


Trans-African Hydro-Meteorological Observatory

Nick van de Giesen
(n.c.vandegiesen@tudelft.nl)



1

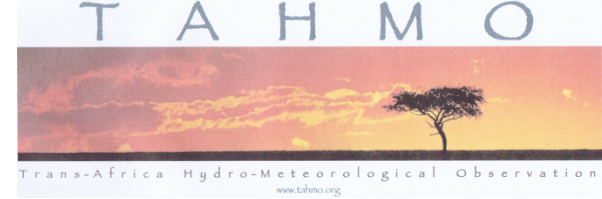


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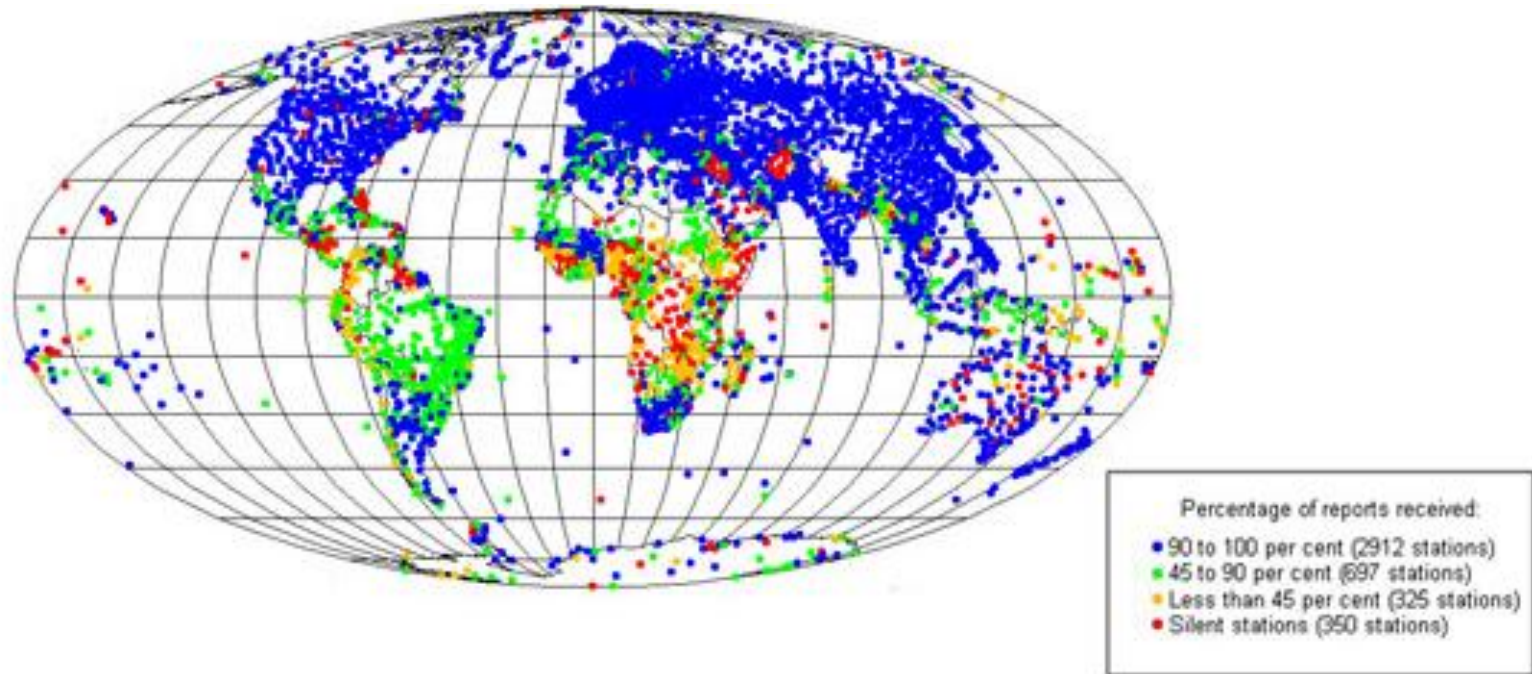
Outline

- **Approach**
- **Design**
- **Operation**
- **Education**



Background

WMO Stations

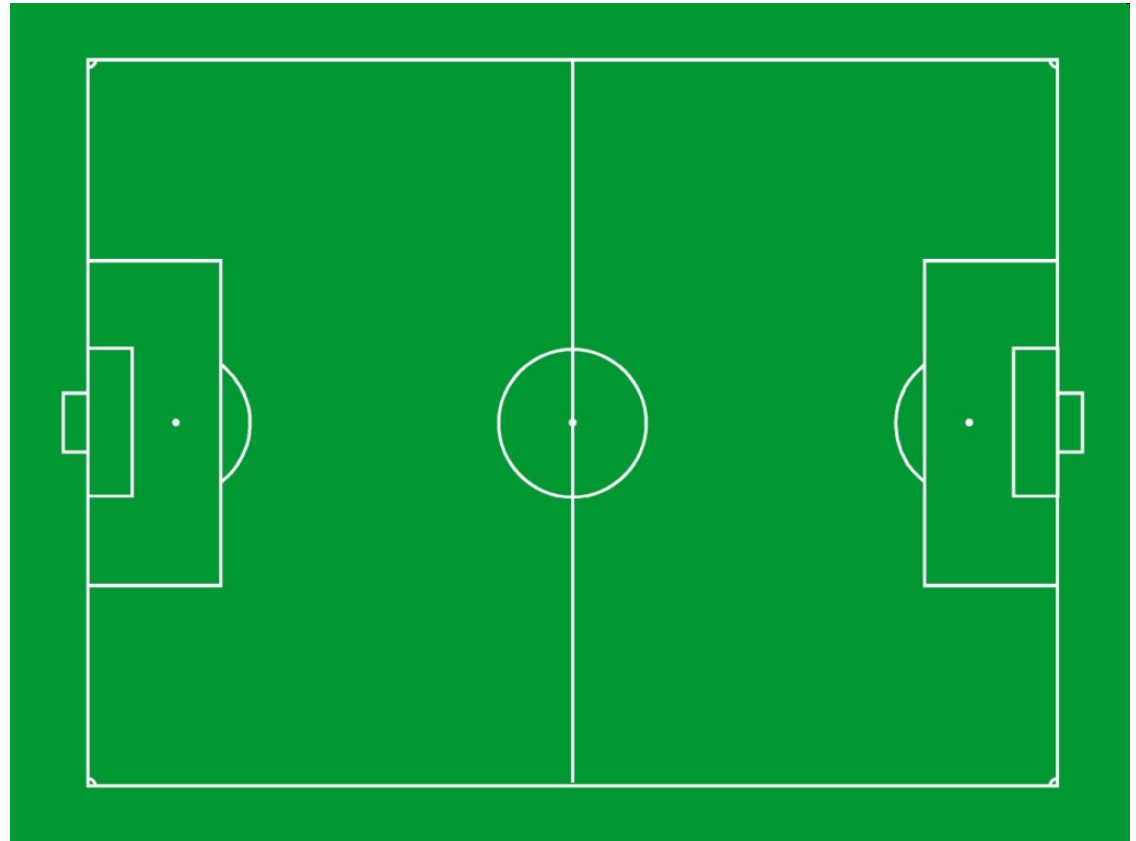


WMO Secretariat

Background

WMO Stations

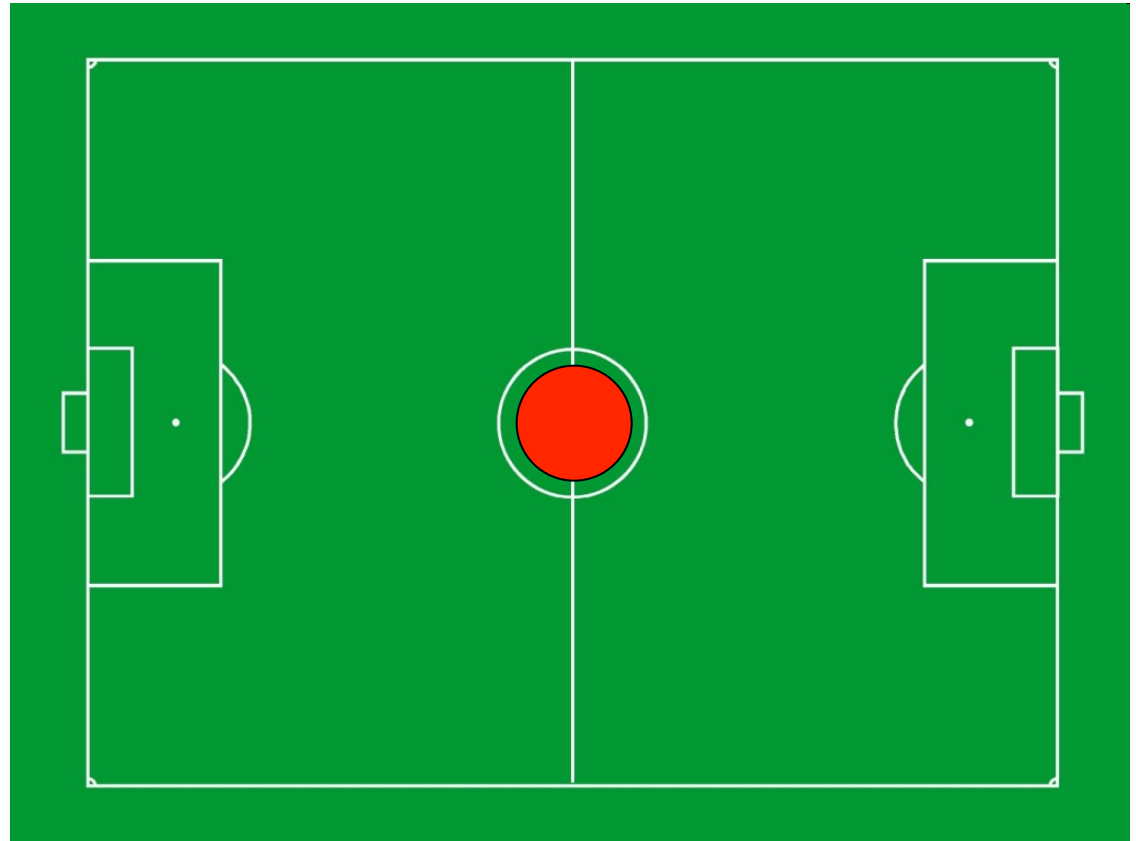
5,000



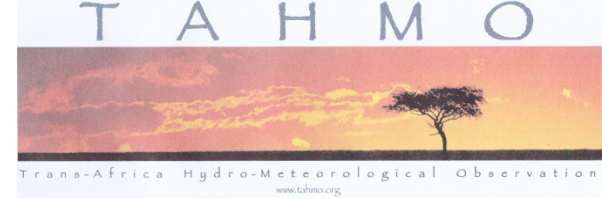
Background

WMO Stations

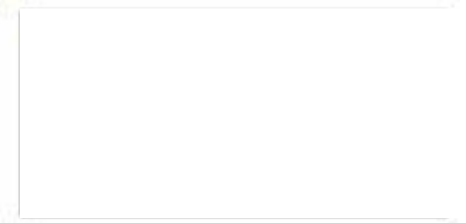
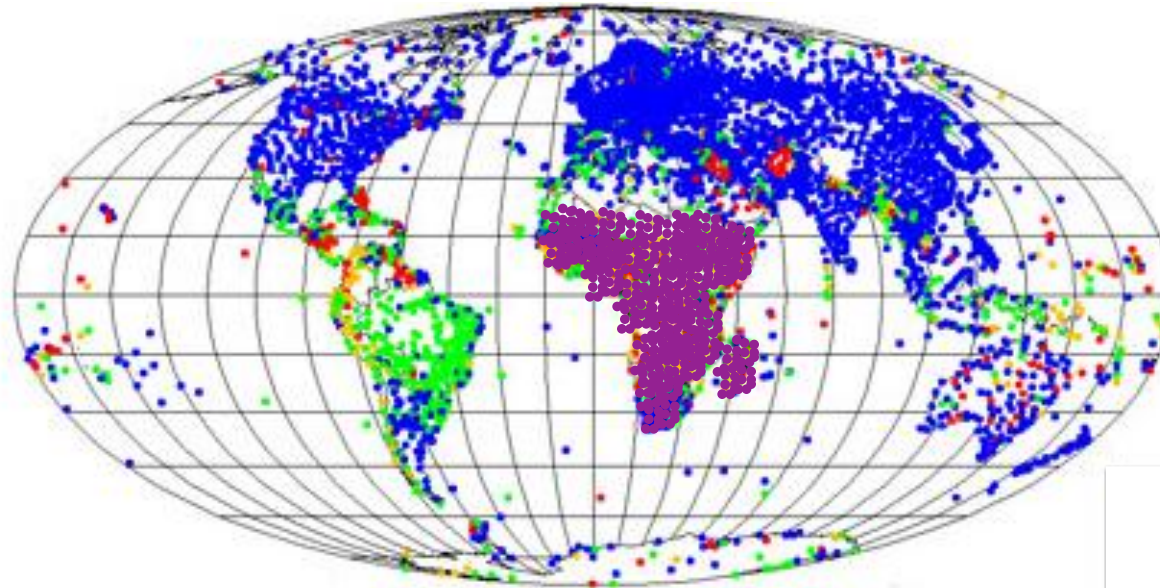
5,000



Background

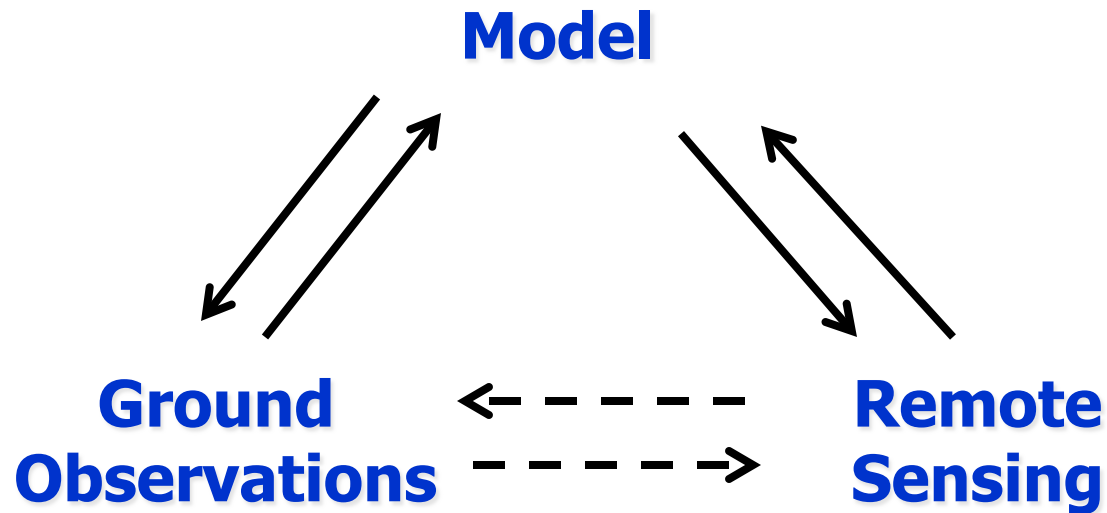


Leapfrog: 20,000 TAHMO Stations!

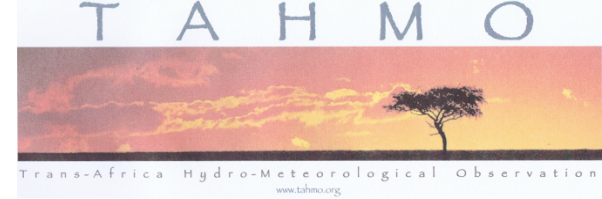


Background

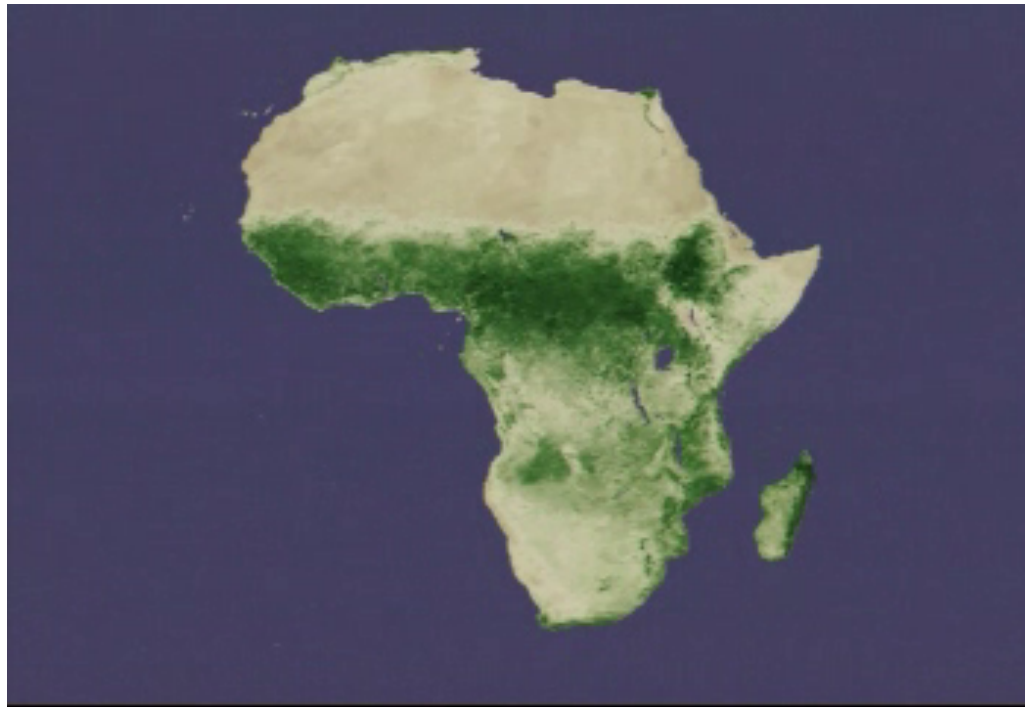
Data assimilation



Background

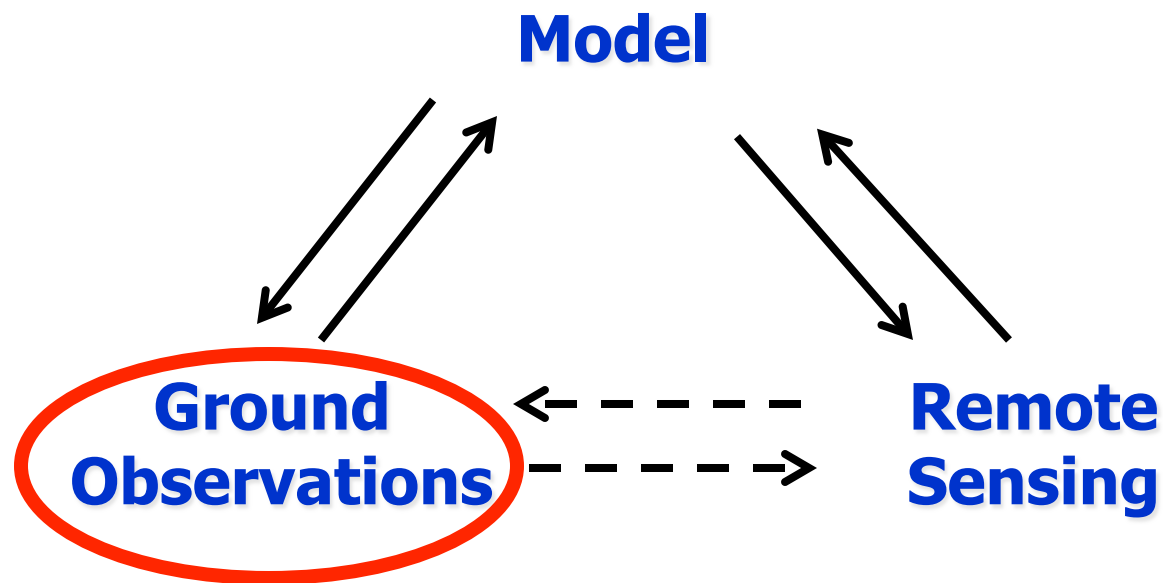


Data assimilation

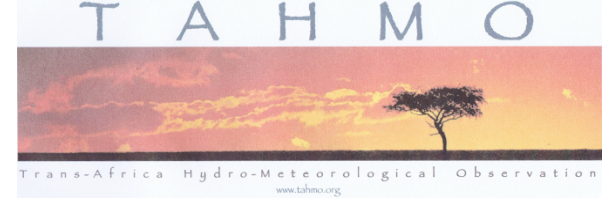


Background

Data assimilation



Approach

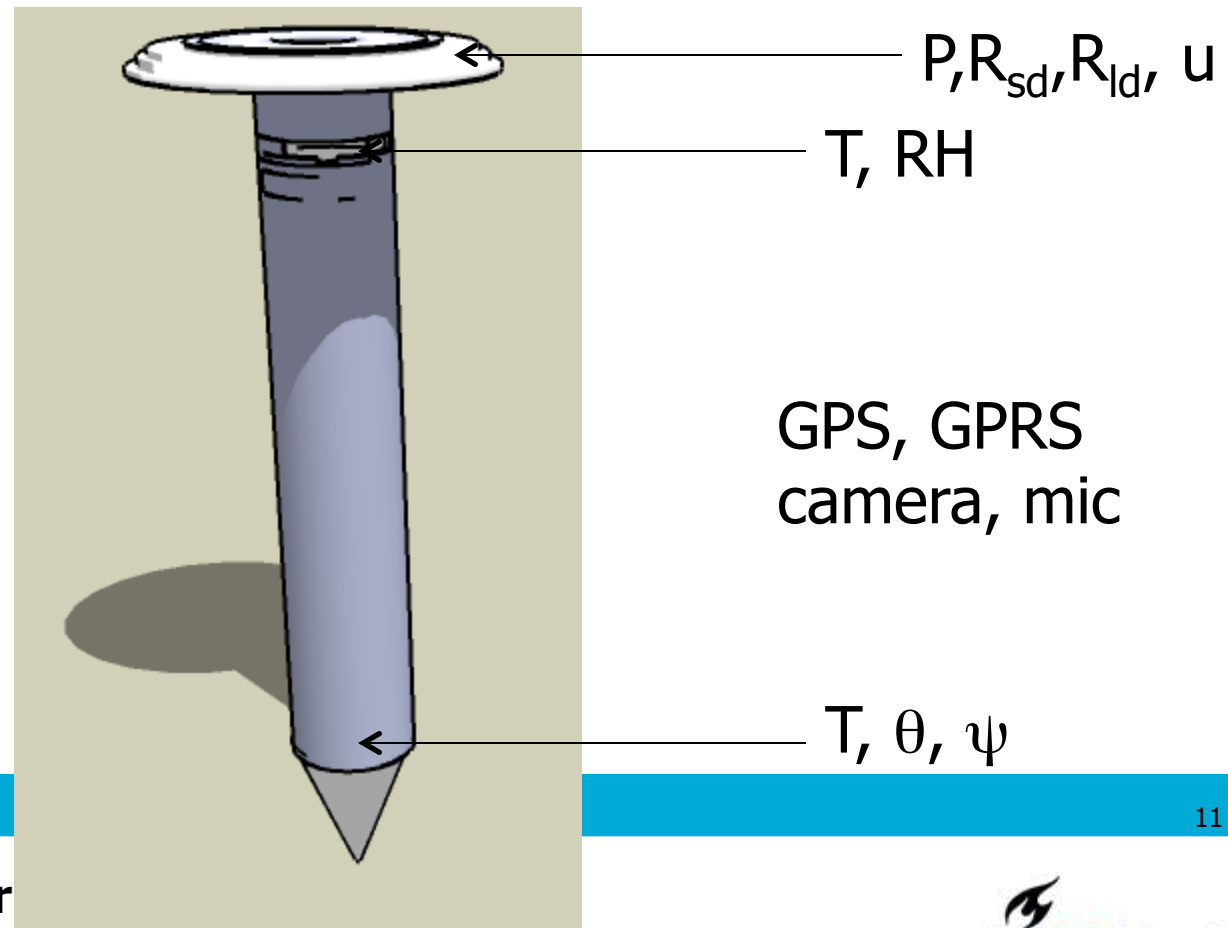


- **Design**
- **Operation**
- **Education**



Approach

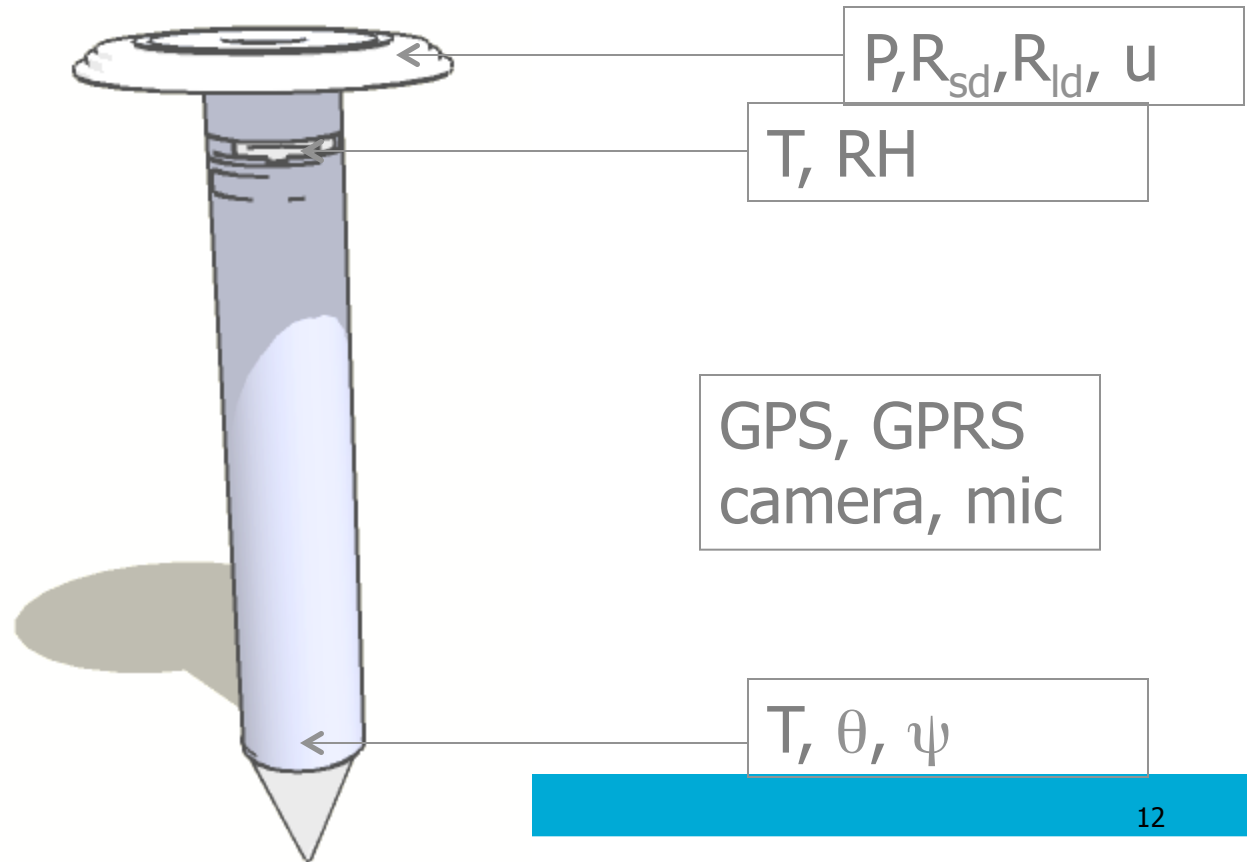
Design



Approach

Design

\$200
20,000
(35 km)



Design

Use existing sensors

- Automotive
- Household

ZyTemp TN9



Design

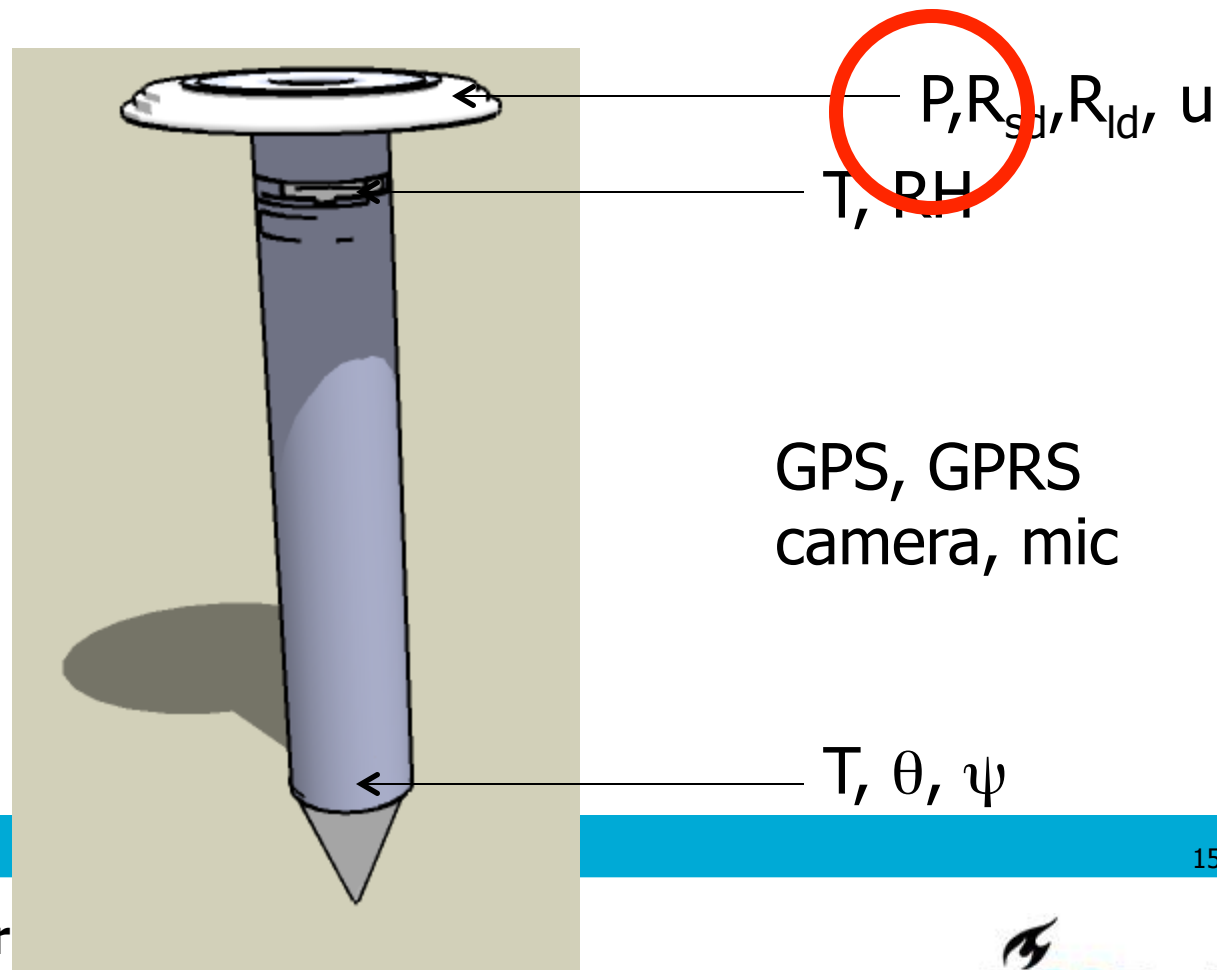
Principles

- **Robust**
- **No moving parts**
- **No cavities**
- **Cheap (<€300)**
- **Self calibrating**
- **Cross calibrating**



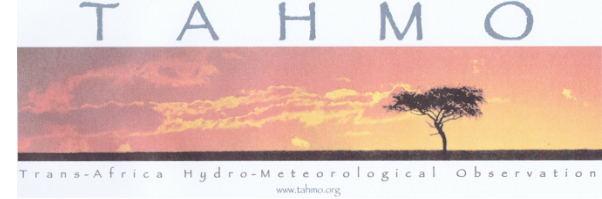
Design

Precipitation



Design

Precipitation



Video disdrometer



Microwave disdrometer



> 10,000 Euros

Laser disdrometer



Joss-Waldvogel
(acoustic)

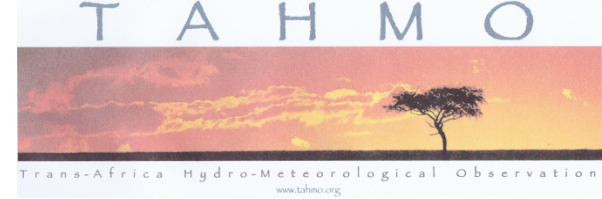


Design

Precipitation

Coen Degen

Piezo ceramic element
(+ other)



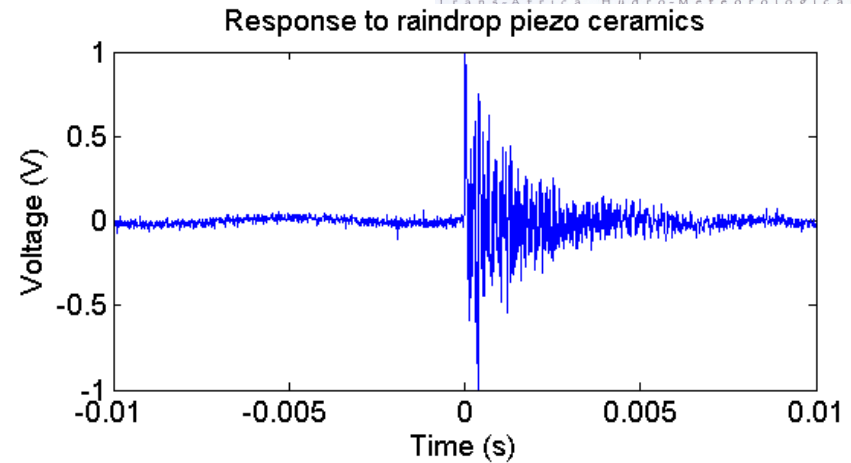


Design

Precipitation

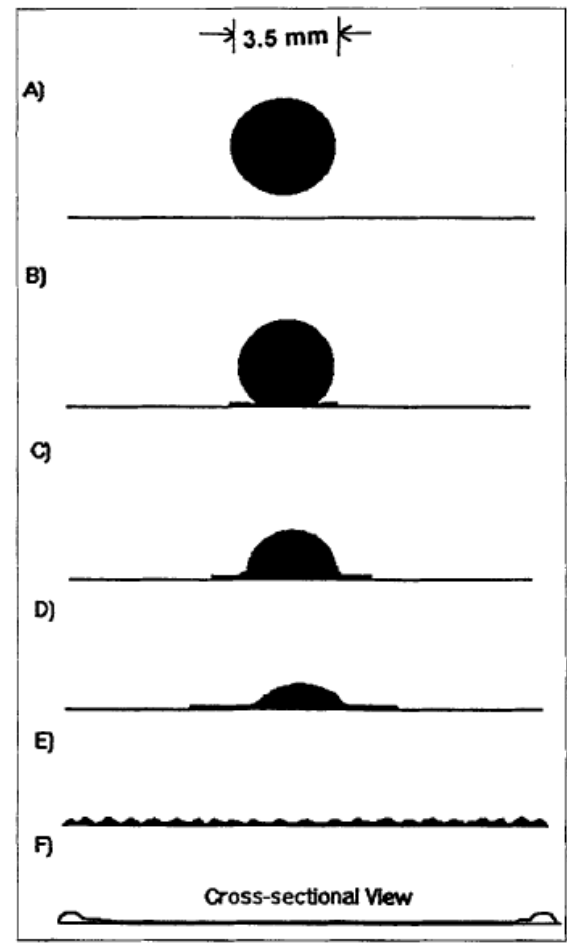
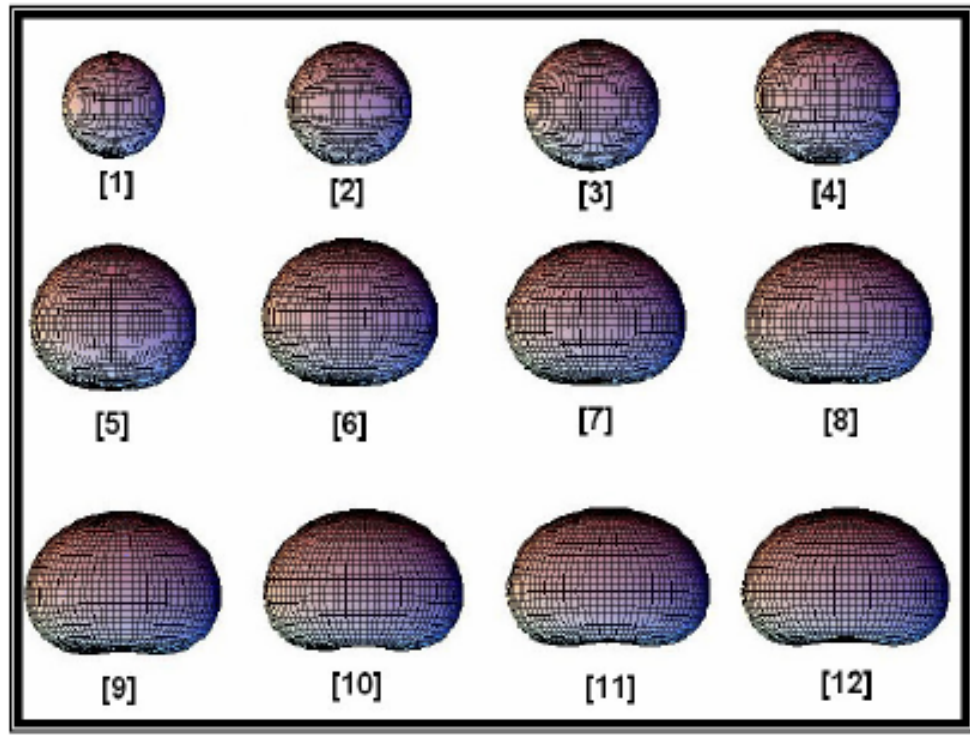
Coen Degen

Piezo ceramic element



Design

Precipitation



Sources: "Tropical raindrop anatomy," S.K. Shariyah *et al.* & "Newtonian drop impact with a solid surface", B.L. Scheller and D.W. Bousfield 19

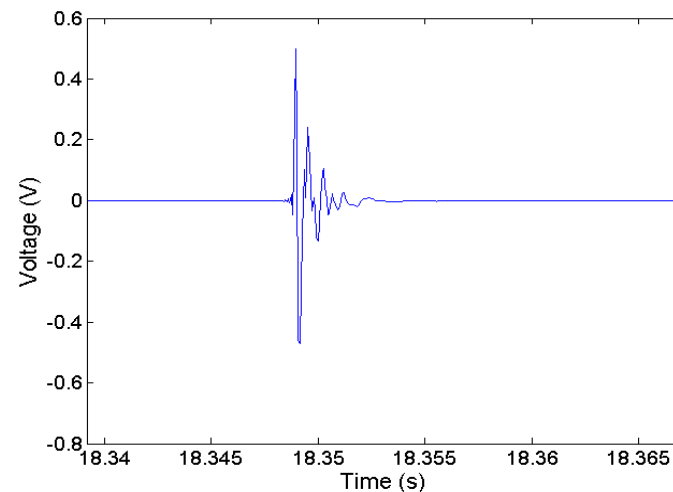
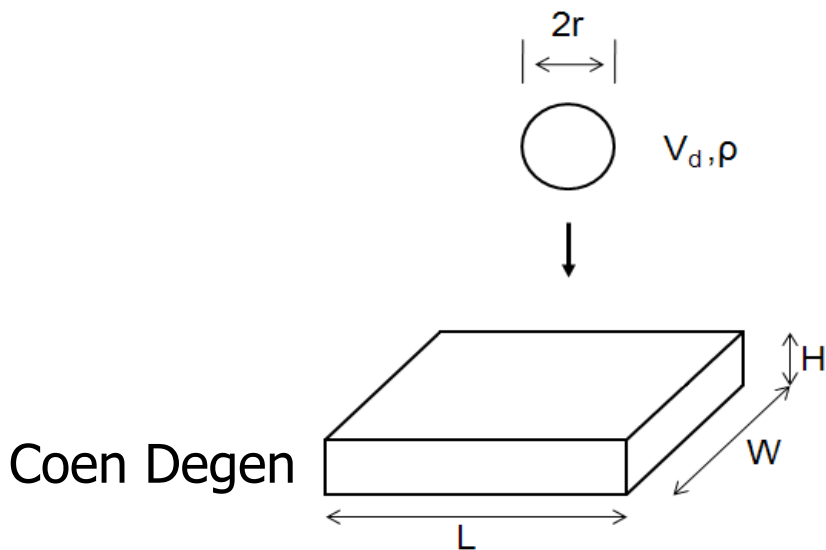


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Design

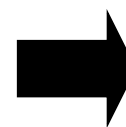
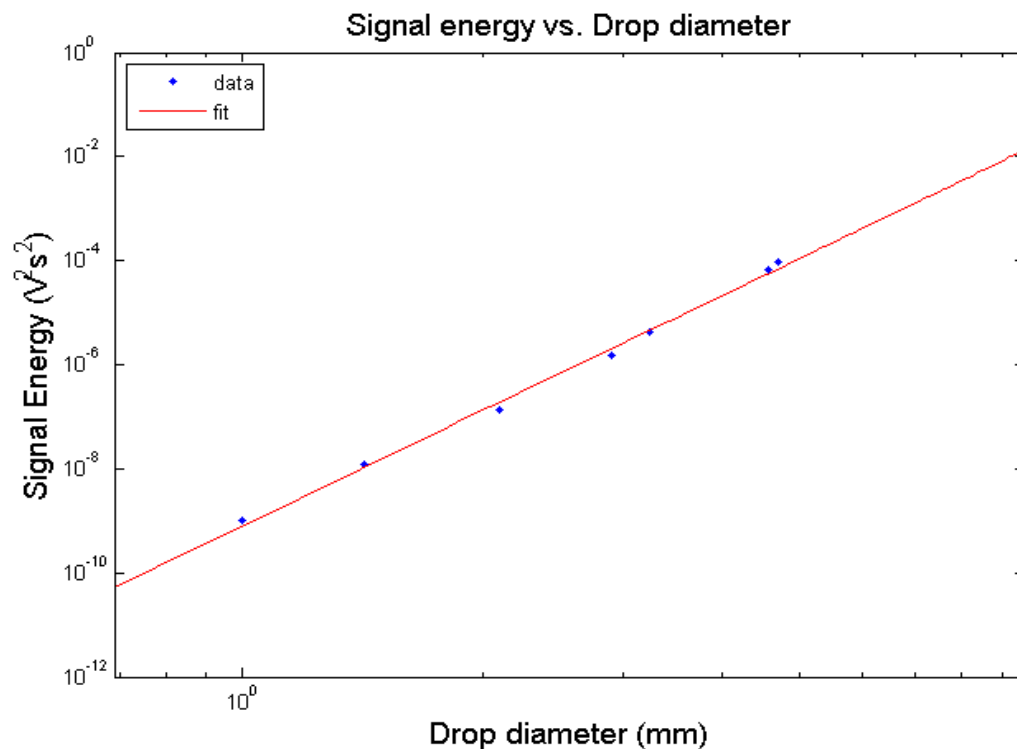
Precipitation



$$E_s = \int |x(t)|^2 dt = f(r, v_d, \rho, H)$$

Design

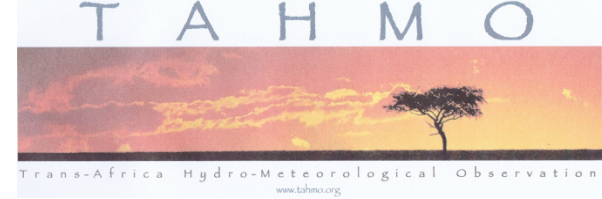
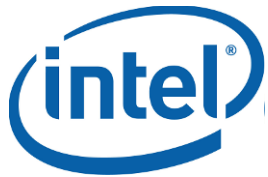
Precipitation



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

Design

One sensor down... n to go!



Business case

Costs (M\$)

• Construction	4
• Design	1
• Educational package	1
• Role out	8
• Computation / RS	4

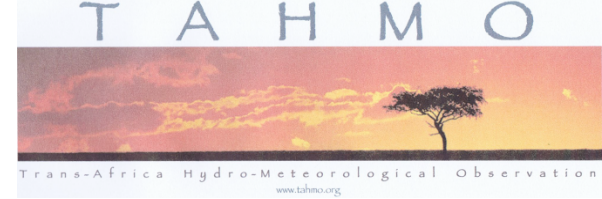
Total 18 M\$

Running costs 2 M\$/yr

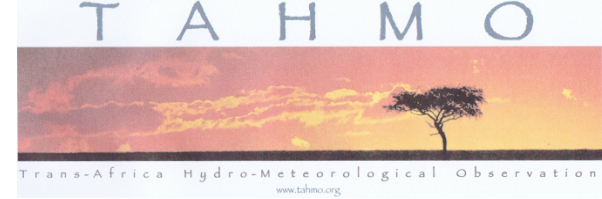
Operation

Business case

Needed: \$ 2M / yr



Operation

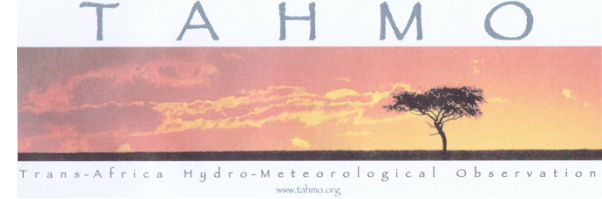


Business case : Where / what?

- Local food aid



Operation



Business case: Where / what?

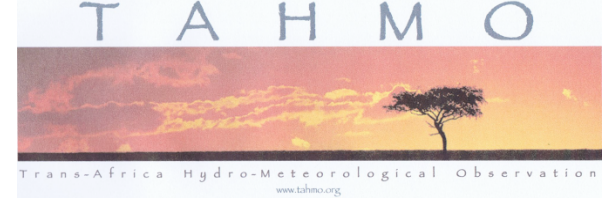
- Local food aid
- Bio fuels



Operation

Business case: Where / what?

- Local food aid
- Bio fuels
- Traditional grains



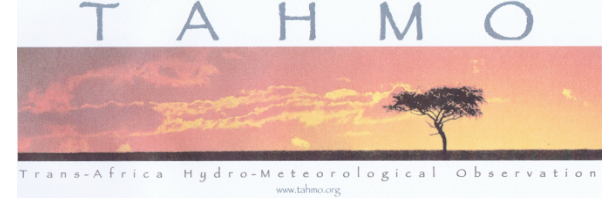
Operation

Business case: Commodity hedging

- Cotton
- Coffee
- Tea
- Cocoa
- ...



Operation



Business case: Insurance

- Droughts
- Floods
- Diseases?

Kilimo Salama Registration Process



1 Purchase
Farmers buy inputs and pay 5% extra to insure the inputs at selected stockists.



2 Registration
Farmers receive a card from the stockist on which they fill their details received by SMS.

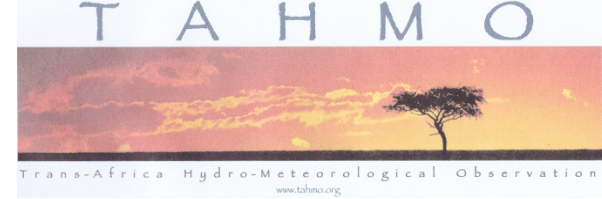


3 Measurement
During the season the weather station measures the rainfall.



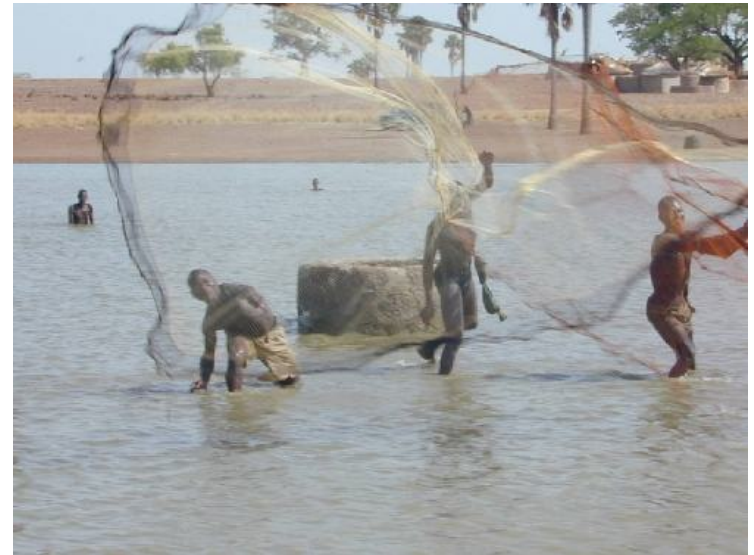
4 Compensation
In case of a payout farmers receive compensation via MPESA.

Operation



Business case: Other

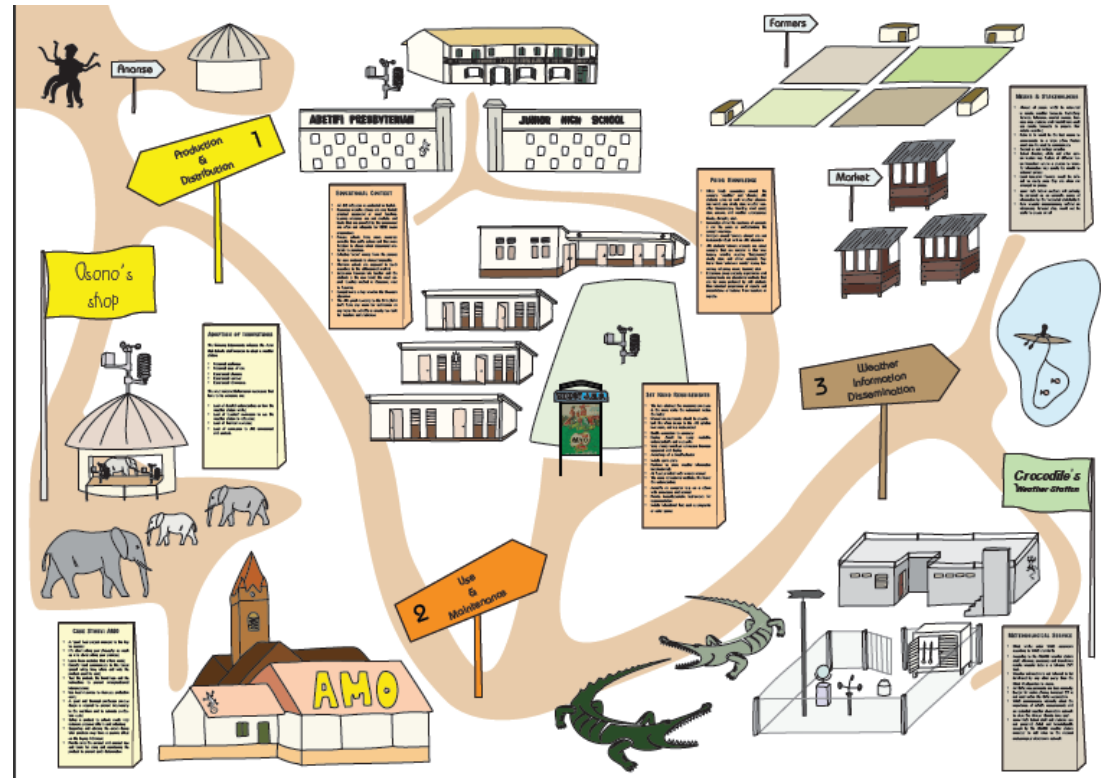
- **Flood Early Warning**
- **Mid-term predictions:**
 - **Hydropower**
 - **Irrigation**
 - **Drinking water**
 - **Ecology / tourism**



Education

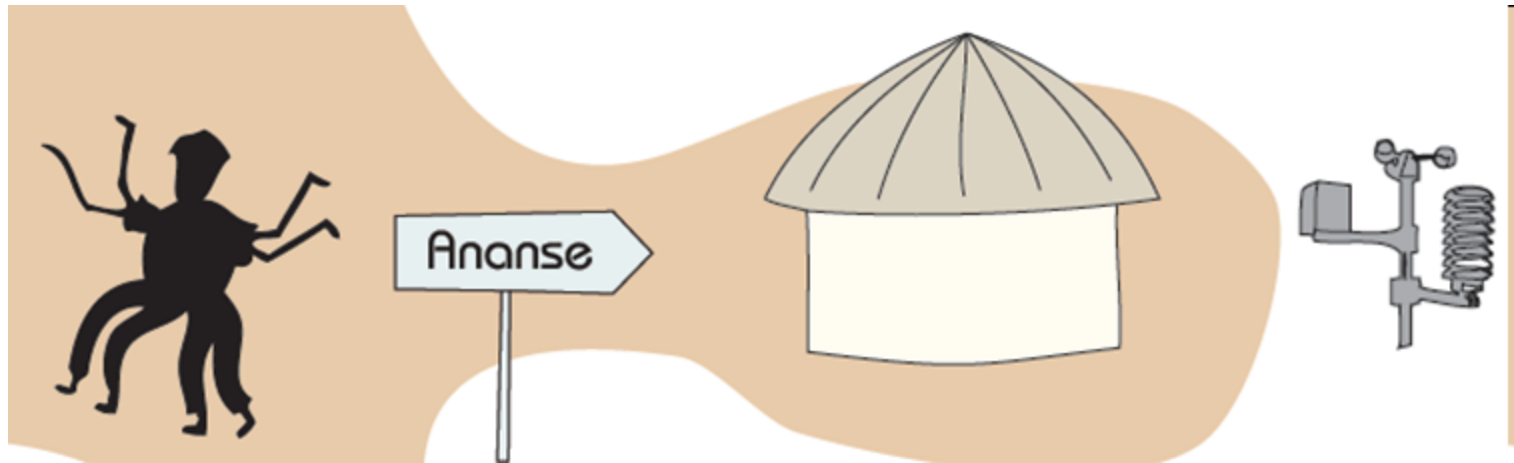
Role out TAHMO

High schools curriculum



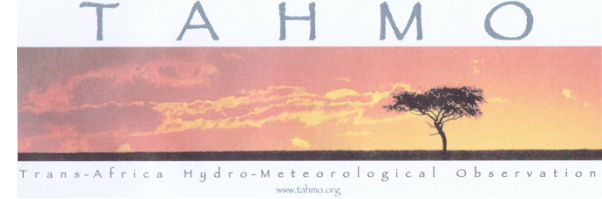
Education

Role out TAHMO



Ghana pilot

Education



Role out TAHMO

XO Computer



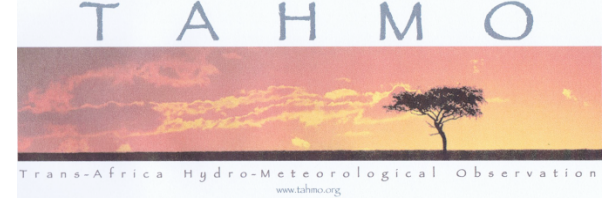
One Laptop per Child

Education

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



Next step



- Crowd sourcing competition (10+ countries)
- Top 5 teams meet in ..., field tests
- Repeat next year

Friday 13:30-17:00 Room SM5

WWW.TAHMO.ORG

nick@citg.tudelft.nl