

Microsoft® Research

Faculty Summit 2010

Guarujá, Brasil | May 12 – 14 | In collaboration with FAPESP

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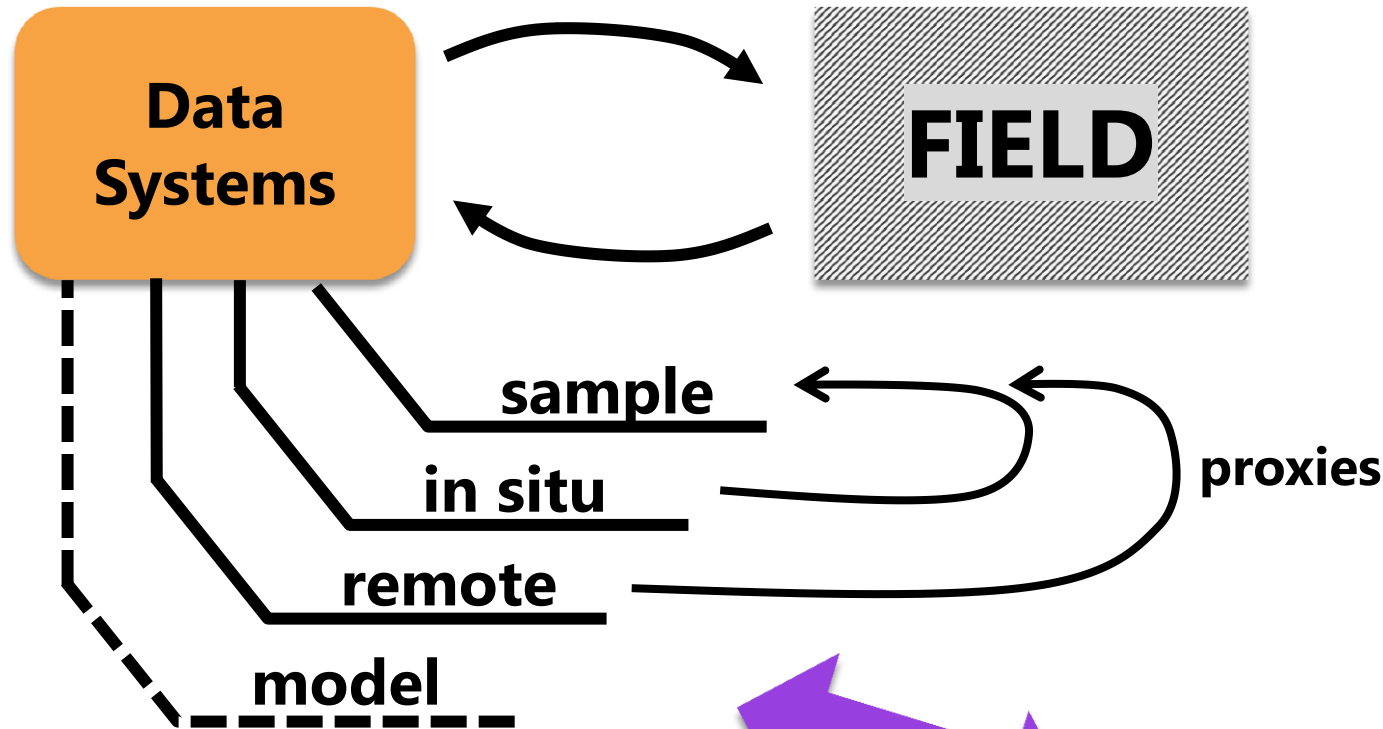
Results from an Atlantic Rainforest Micrometeorology Sensor Network Pilot Study

Humberto da Rocha, Professor Titular, University of São Paulo
Andreas Terzis, Associate Professor, Johns Hopkins University
Rob Fatland, Program Manager, Microsoft Research

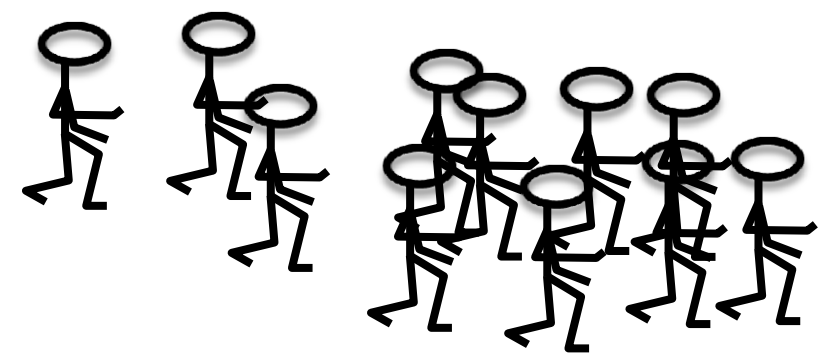
video

Overview: First half of this presentation

- General idea
- Specific case: Mata Atlantica Micrometeorology
- Physical situation
- Sensor net 1 What's the idea?
- Sensor net 2 How does this one work?
- Data and results
- Summary



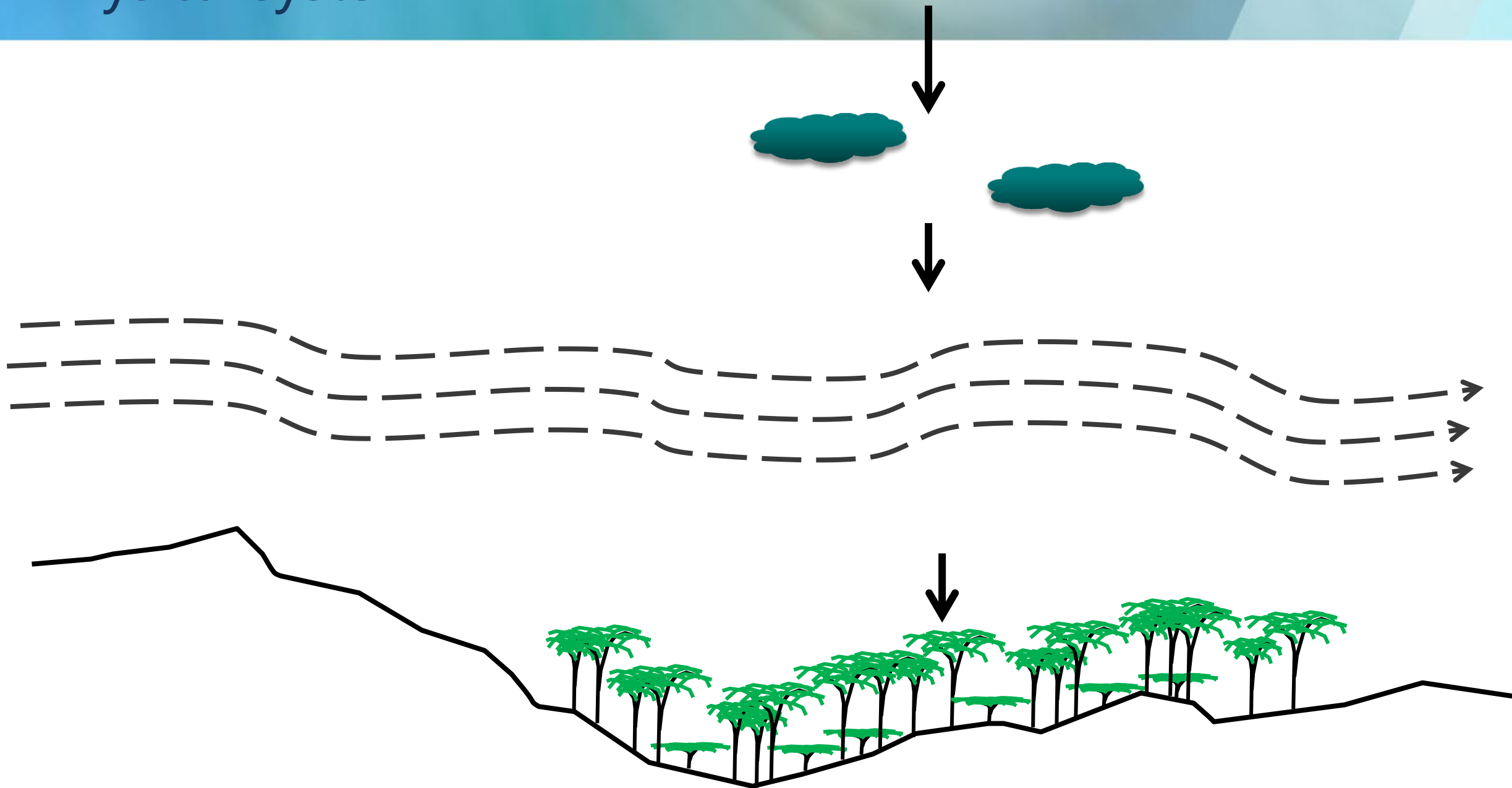
- Replicate methods + solutions ★
- Iterate iterate iterate
- Join the model ecosphere
 - Communicate
 - Educate
 - Citizen science
 - Policy impact



Specifically Mata Atlantica Micrometeorology

- Is the data system robust?
- Is the data scientifically valid?
- Can this experiment be adopted or replicated elsewhere?

Physical system



Sensor networks 1: The idea

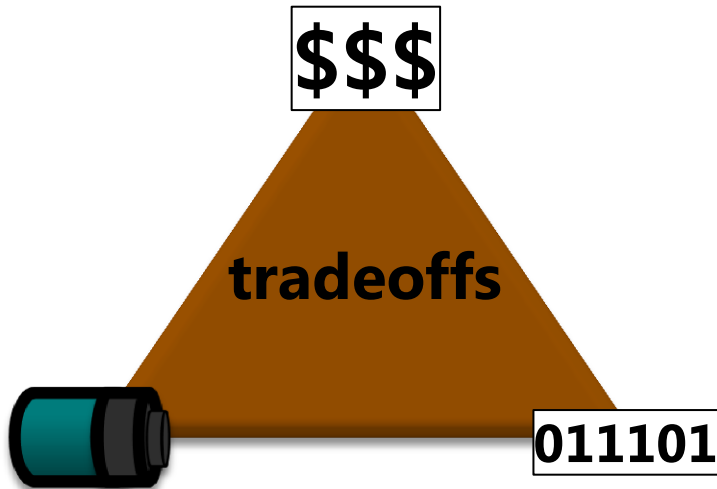
Sensor networks 2: In practice



- ~~Computers are reliable and foolproof~~
- ~~Networks are reliable and foolproof~~
- ~~Therefore use powerful network nodes~~

Alternative idea

- Simple is good
- Simple uses little power
- But still have to figure out where to put the smarts

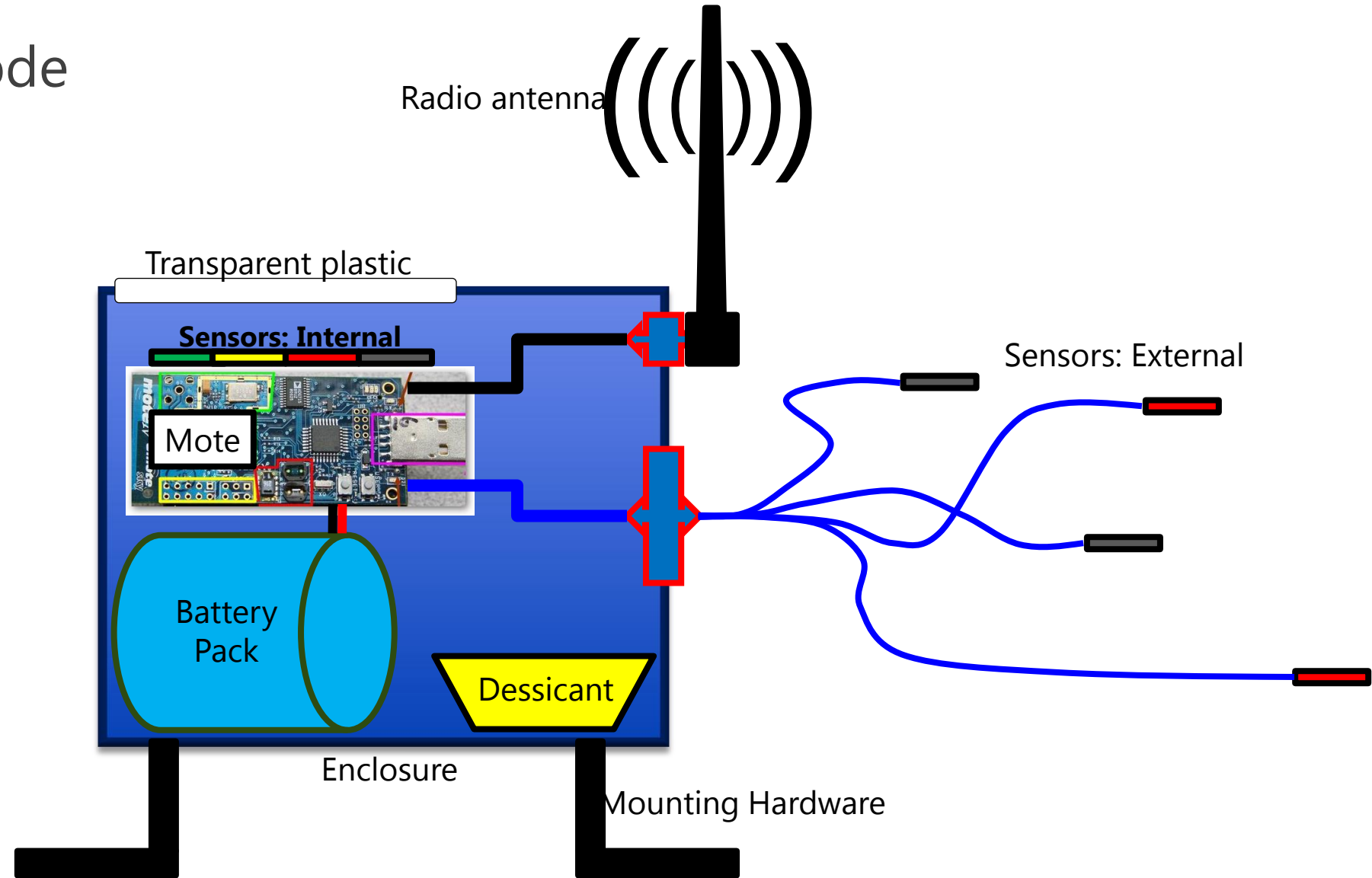


Johns Hopkins:
Life Under Your Feet:

Koala

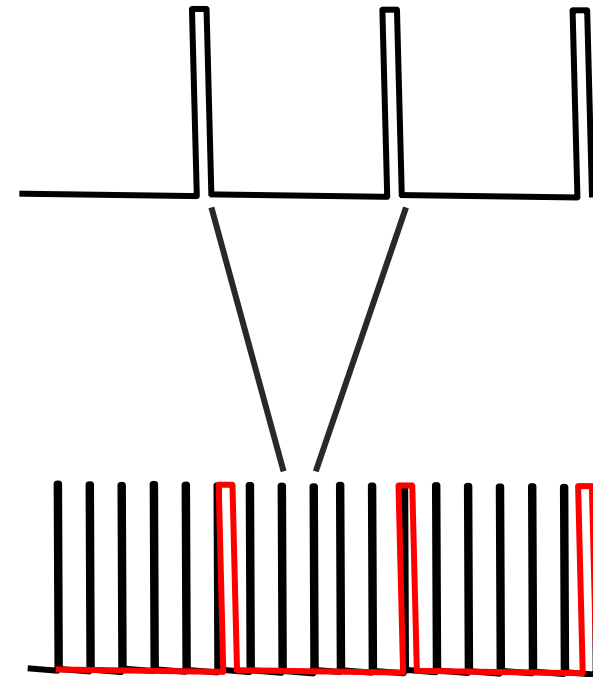
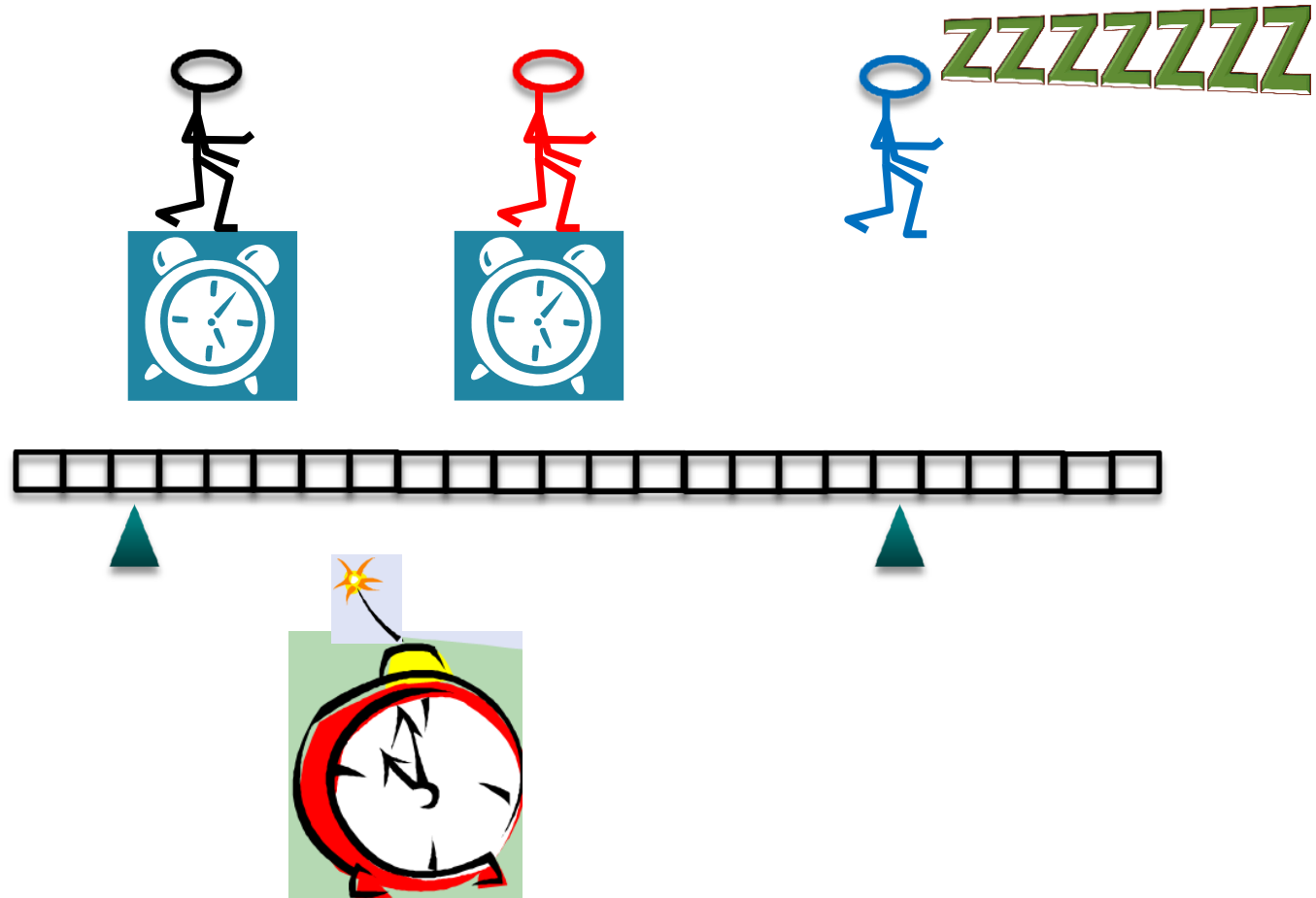
Sensor networks 2: In practice

- The network node



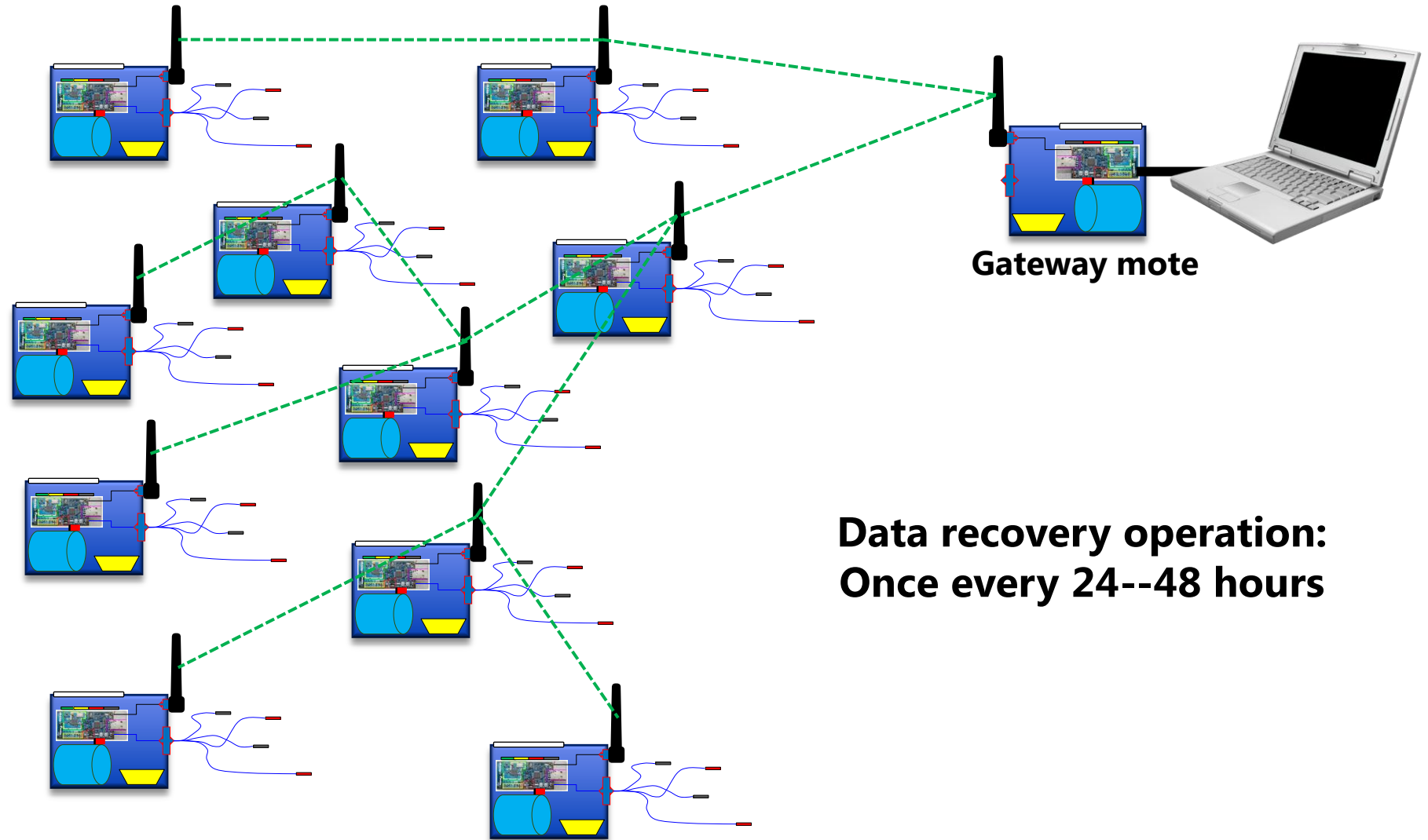
Sensor networks 2: In practice

The network node



Sensor networks 2: Koala in practice

The network



Data manipulation using .NET

Simple Brazil Dataset Cleaner

Messages
19008: 2.35322 - 24.9 - 61.8
19009: 2.35356 - 25.0 - 61.0
at plotSourceX loop endRefTimeAsIndex is 14400
0 (6): Intrap 14398, 2Prior 0, PriOnly 1, PostOnly 1, NO 0, nLines 26632

Main controls
Halt
Clear All
Set All
Go notes

iButton + met
Go iBtn 1
Go iBtn 2
Go Met 1
Go Met 2

note subset config
Ref-0 2009 - 11 - 17 0 : 0 : 00.0
Year Month Day Hour Min Sec
Duration 5 52
decimal days max notes
Source Folder 2009 Data/datadrop 2010 04 20/
Data File Extension _External_4_19_2010.csv

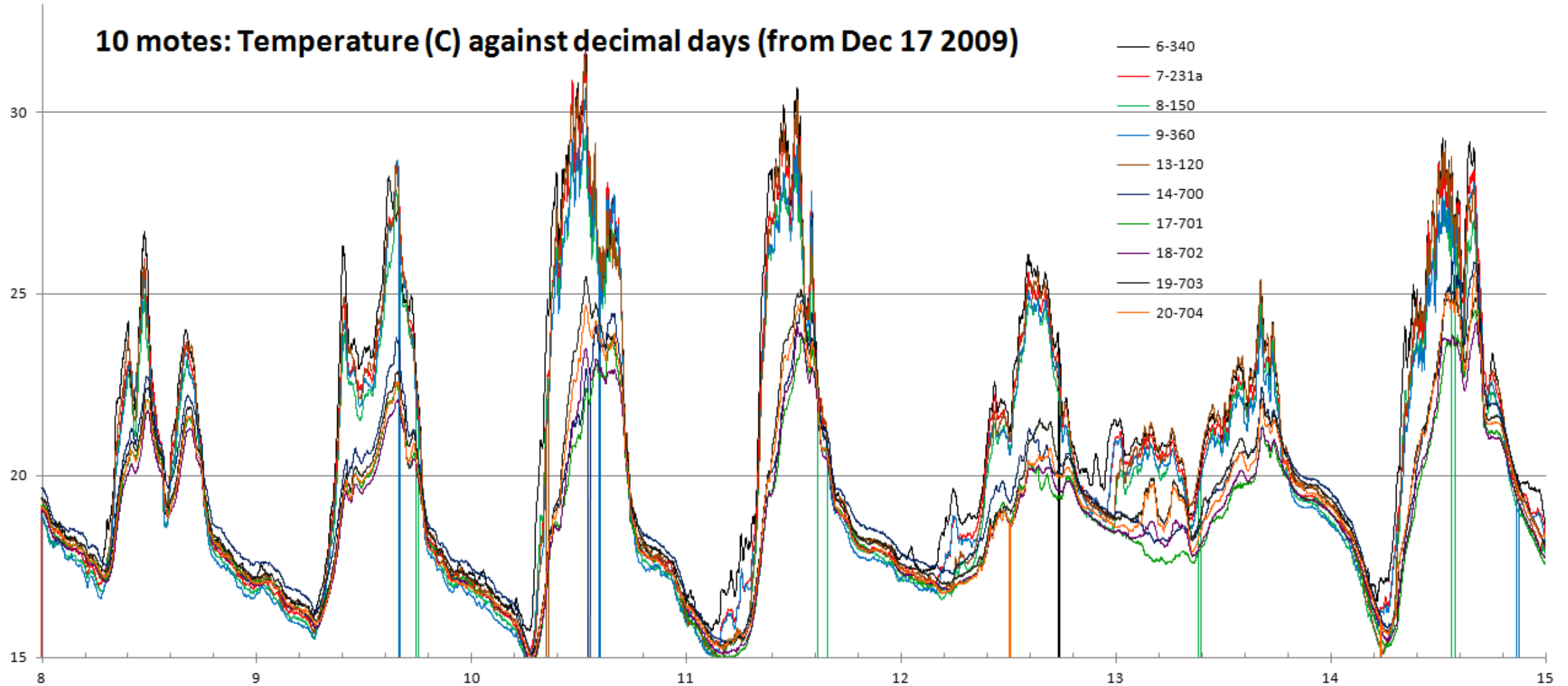
Met stations + ancillary notes
Met 1 = (1 min) Air { T, RH, V, Dir }
Met 2 = (10 min avg) { Precip, Solar, Barom }
55 = Base (TB)
70 = GPS 1
71 = GPS 2
12 spare 11 @ Vexcel
53 spare 15 @ Vexcel
69 spare (was 10) 16 @ Vexcel
NaN @ Vexcel (was 67) 23 @ Vexcel
54 @ Vexcel

iButton filename config
sub-folder 2009 Data/iButton pilot set 1 Nov 18 2009/
sources i sitenum/ i sitenum_idx_t (h)

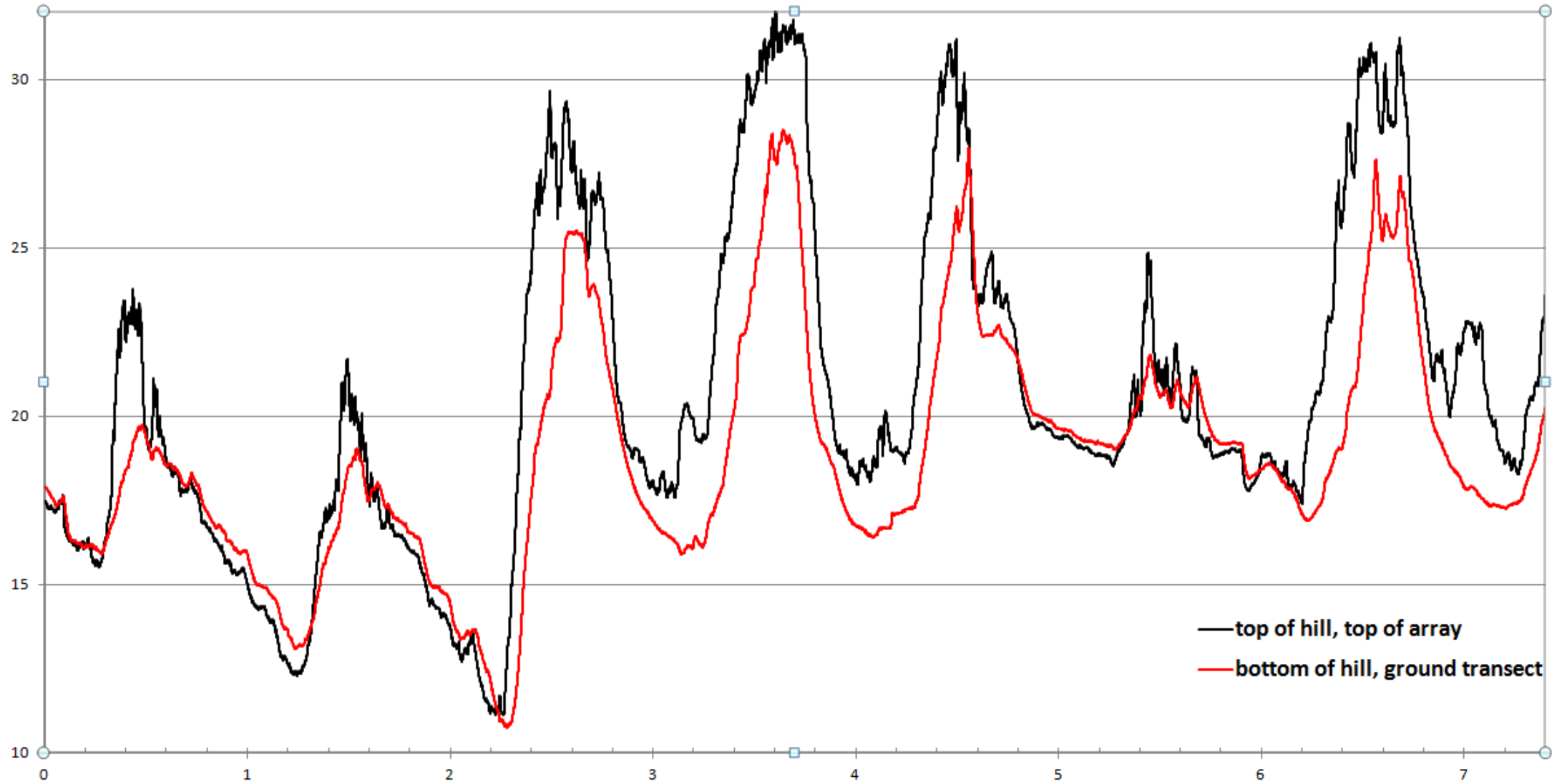
Sensor Network Schematic

Some Data; red is source, blue is regular-ized

Data and Results

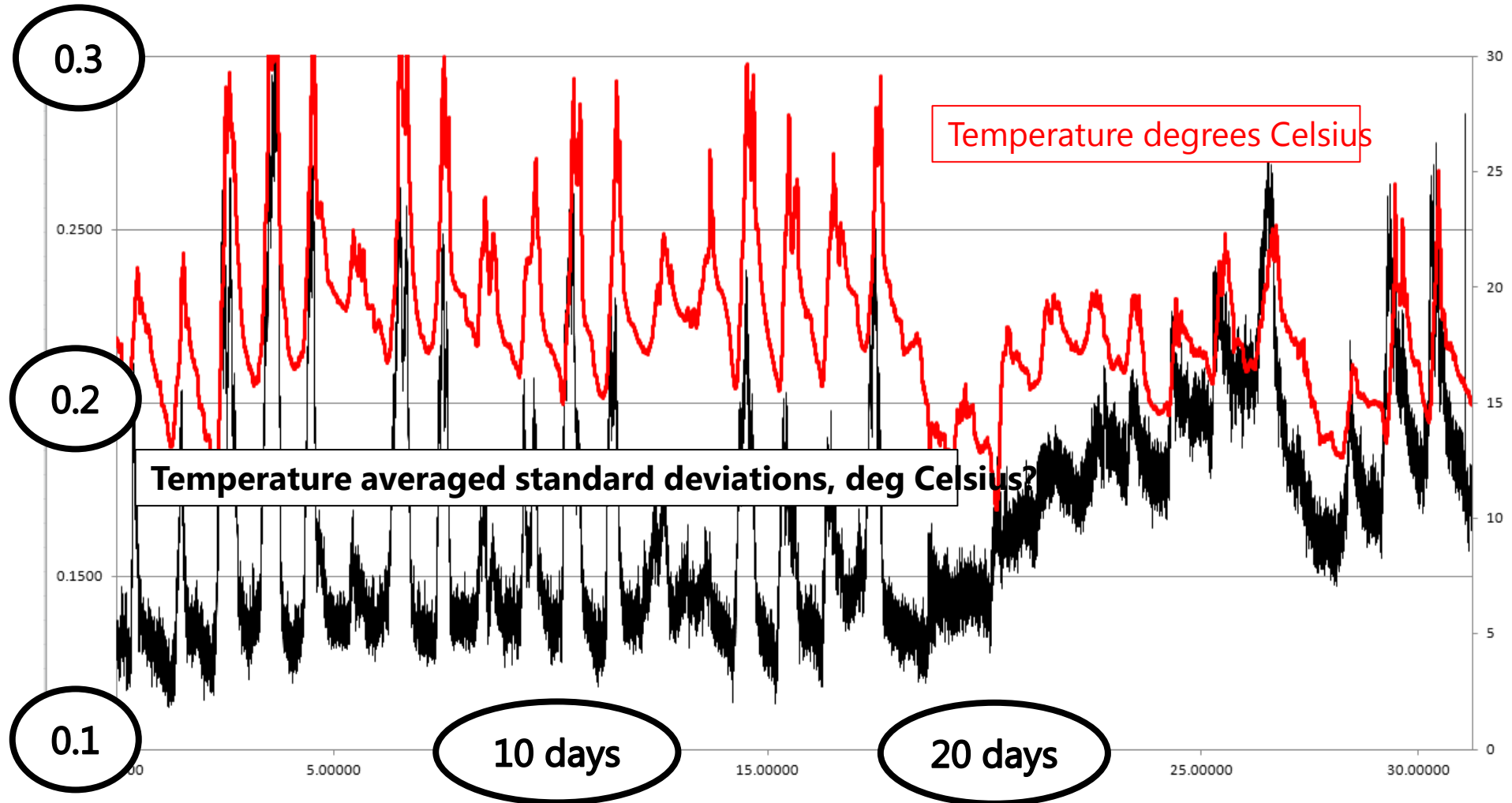


Data and Results



Black: Over 32 days how do 3 adjacent sensor vary compared to 0.1 deg Celsius?

Red (right vertical axis): What is the temperature in the canopy?



Summary

- 20 million data values: One small step
- Data appears to be scientifically valid
- 100% mote survival rate
- Study site ready for further studies
- Scalability an open question



GeoSynth if possible