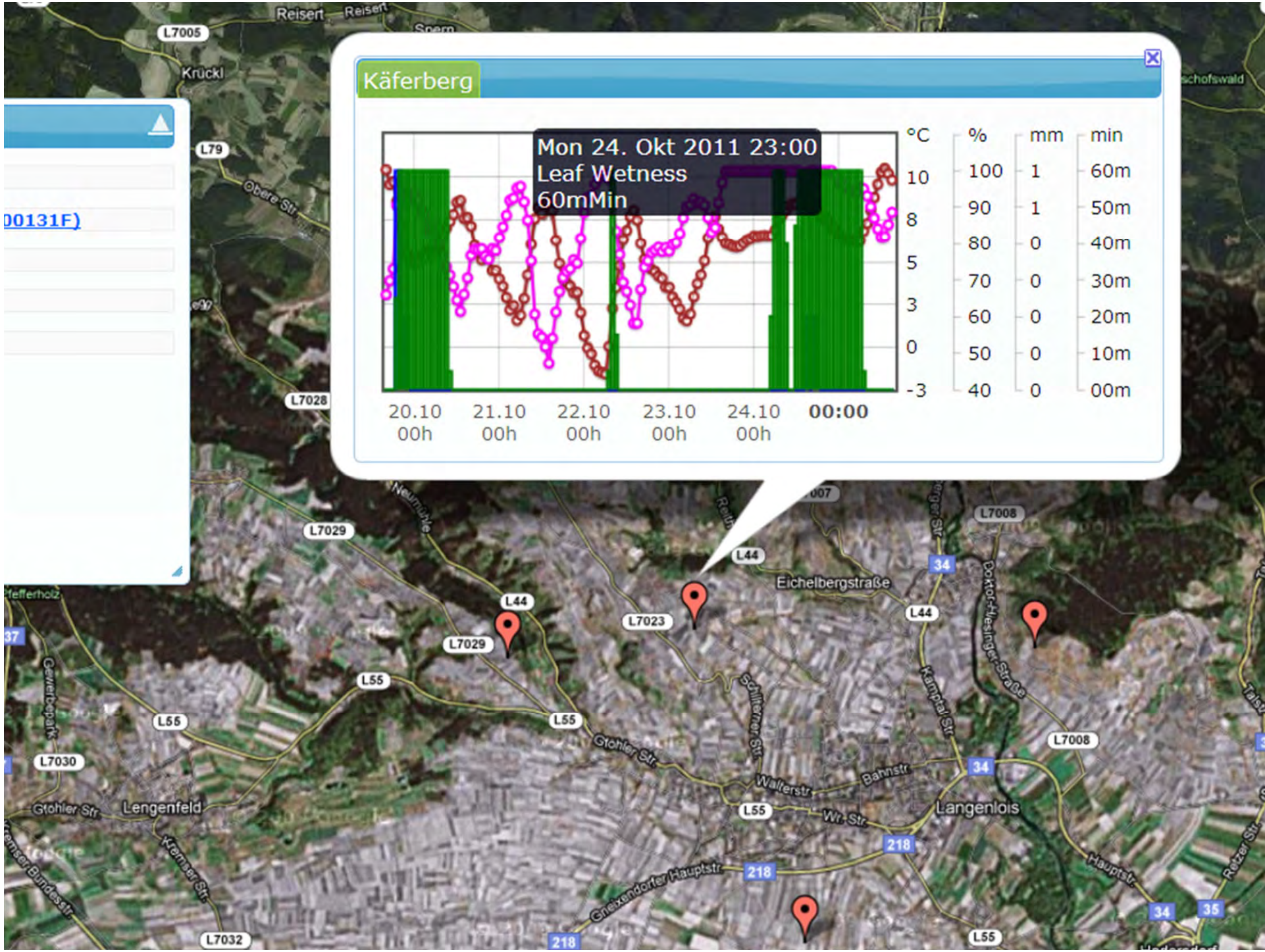


Establishing Information systems
for crops to enable better pest
and disease management.

Heiner Denzer
Pessl Instruments GmbH
Weiz Austria

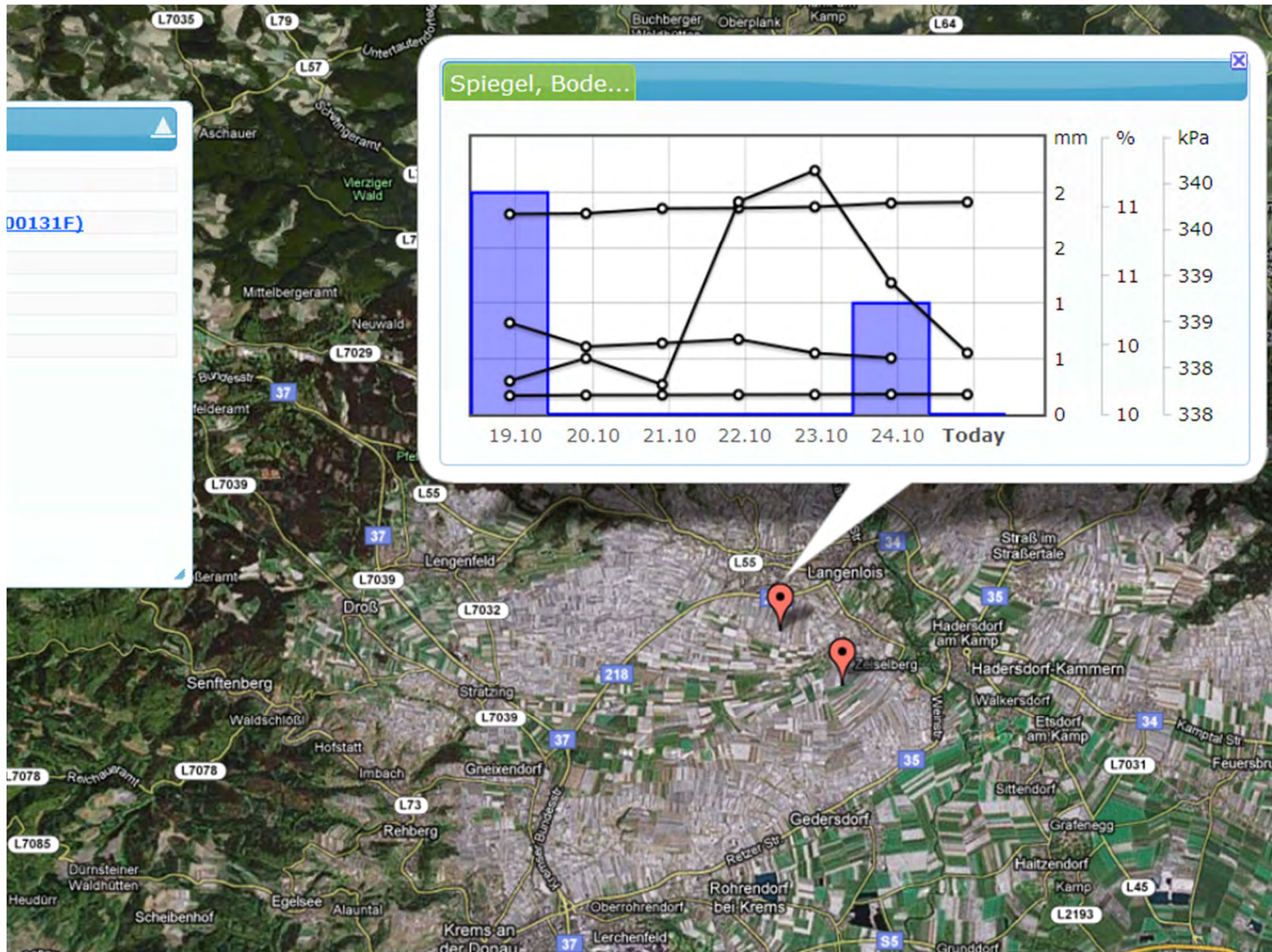


Käferberg

Mon 24. Okt 2011 23:00
Leaf Wetness
60mMin

°C % mm min
10 100 1 60m
8 90 1 50m
5 80 0 40m
3 70 0 30m
0 60 0 20m
-3 50 0 10m
40 0 00m

20.10 00h 21.10 00h 22.10 00h 23.10 00h 24.10 00h 00:00



Short Introduction of Pessl Instruments and iMETOS

Heiner Denzer or Gottfried Pessl, Pessl Instruments GmbH, Weiz, Austria



What are we working for?

- Climate Information for Farming decisions
 - How favorable is the weather for a specific crop, variety ...
 - Talking about the weather
- Disease progress or disease pressure information as an output of plant disease models
 - May there be disease problems, high pressure, unusual diseases..
 - What are the important treatments
 - Does my product fit to the disease situation..
- Train farmers for better understanding of diseases
- Give Evapotranspiration data to farmers for better irrigation
- Use soil moisture measurement in irrigation trials for better understanding in soil water behavior
- Making Irrigation designs simpler
- Making Irrigation Control more comfortable to use

Pessl Instruments - Fieldclimate - Mozilla Firefox

http://www.fieldclimate.com/pikernel/index_new.php

Meistbesuchte Seiten | Pessl Instruments - Fi... | Pessl Instruments - Fi... | Pessl Instruments - Fi... | http://www.fldchip.c... | Pessl Instruments - Fi... | taz.de | Neues - Fieldclimate | Estacion iMetos Online...

Pessl Instruments - Fieldclimate - Admin... | Gazakrieg: Israel empört über UN-Beric... | Laden...

Pessl Instruments

Welcome, 1 1 | Add new station | User settings | Log out | Go to old Fieldclimate

All sensors(Pessl Instruments Company Weather, Sernum. 00000146) | Apps | Stations | Favorites

Expand | Collapse

- Pessl Instruments Company Weather (Sernum.
 - Climate Monitoring
 - All sensors
 - Disease Climate
 - Growing Climate
 - Frost and temperature monitoring
 - Soil and precipitation monitoring
 - Forecast
 - Station Health
 - Station info
 - Names
 - Settings
 - SMS service
 - Tools
 - Delete Weather Data
 - Disease models

Date from 2009-05-09 11:00:00 | Show: 48 | Hour(s) | Show Data

Group by:

- Hour
- Day
- Month
- None

Soil temperature Air temperature Dew Point Solar radiation Dgt Wind speed Battery voltage

Precipitation Leaf Wetness HC Relative humidity

Date	Soil tempe [°C]			Solar radi [W/m ²]		Air temper [°C]			Precipitat [mm]	Wind speed [m/sec]	Batte volt [mV]	Leaf Wetne [min]	HC Air te [°C]			HC Relativ [%]	Dew Point [°C]		
	aver	mini	maxi	aver	maxi	aver	mini	maxi	sum	aver	maxi	last	aver	mini	maxi	aver	mini	maxi	
2009-05-09-11:00:00	18.00	13.20	18.60	592	592	15.7	21.7	22.00	0.0	0.70	1.60	6004	0.22	0.42	1.42	22.50	14.6	0.50	8.70

2008 Pessl Instruments GmbH

Warten auf www.fieldclimate.com...

Data presentation in FieldClimate.Com



iMETOS

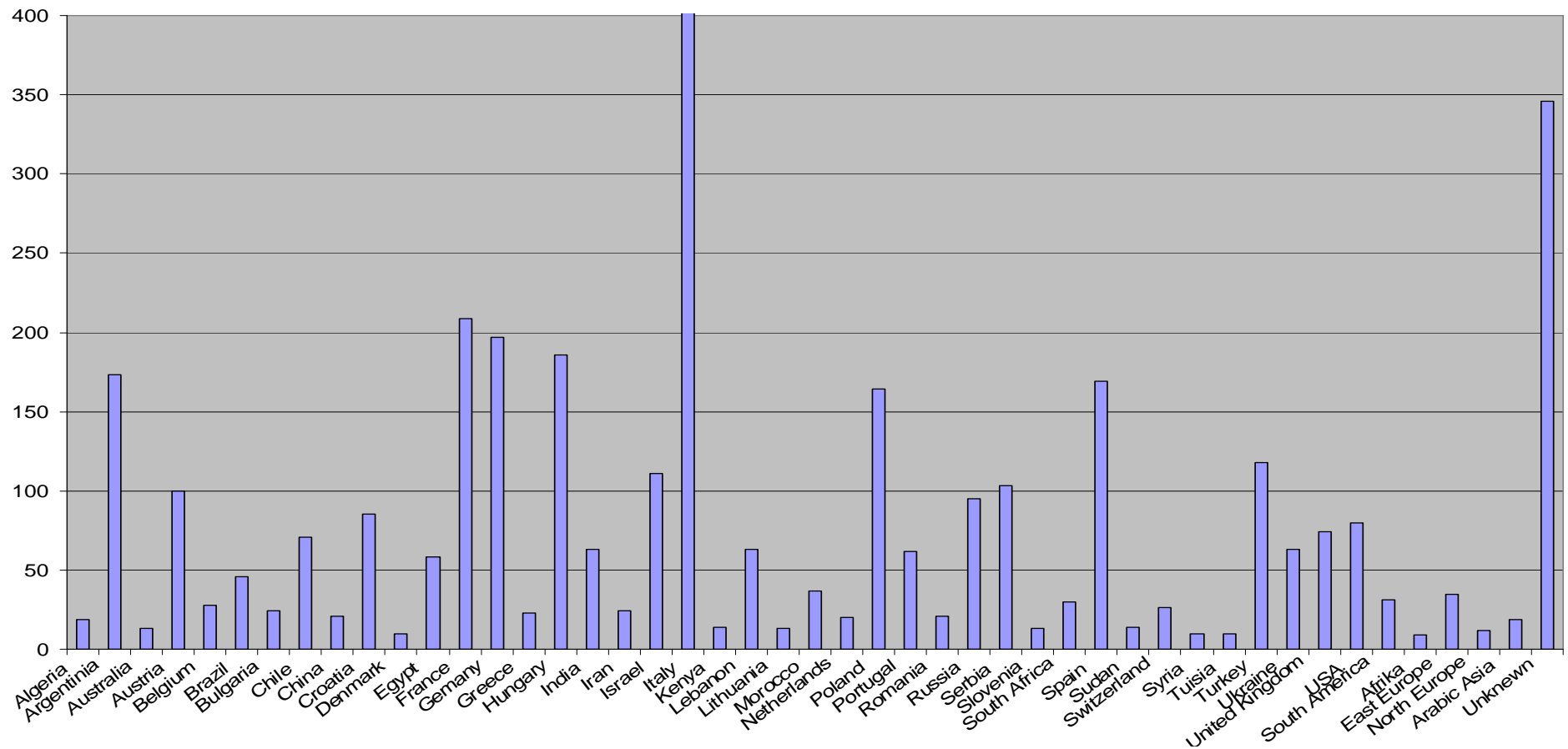
- GPRS or CSD-Dial in based internet connection
- SMS alert messages for
 - Frost
 - Soil Moisture
 -
- Climate sensors for
 - Disease models
 - Evapotranspiration
 - ...
- Soil moisture sensors
 - Watermak
 - Tensiometer
 - Ech₂o Probes
 - Sentek Enviroscan
 - Sentek easy ag
 - Sentek TriScan
- Temperature Monitoring in
 - Silos
 - Plastic Tunnels
 -



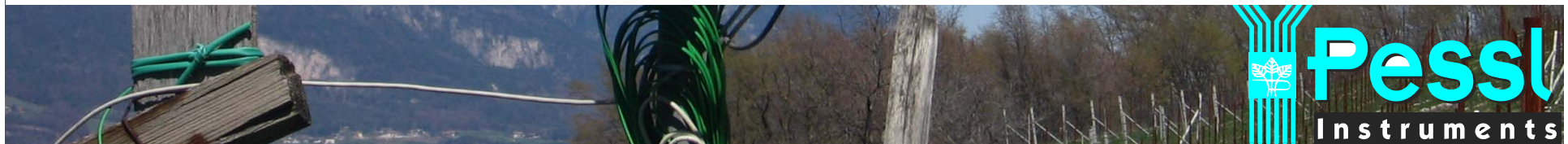
Pessl International in the world



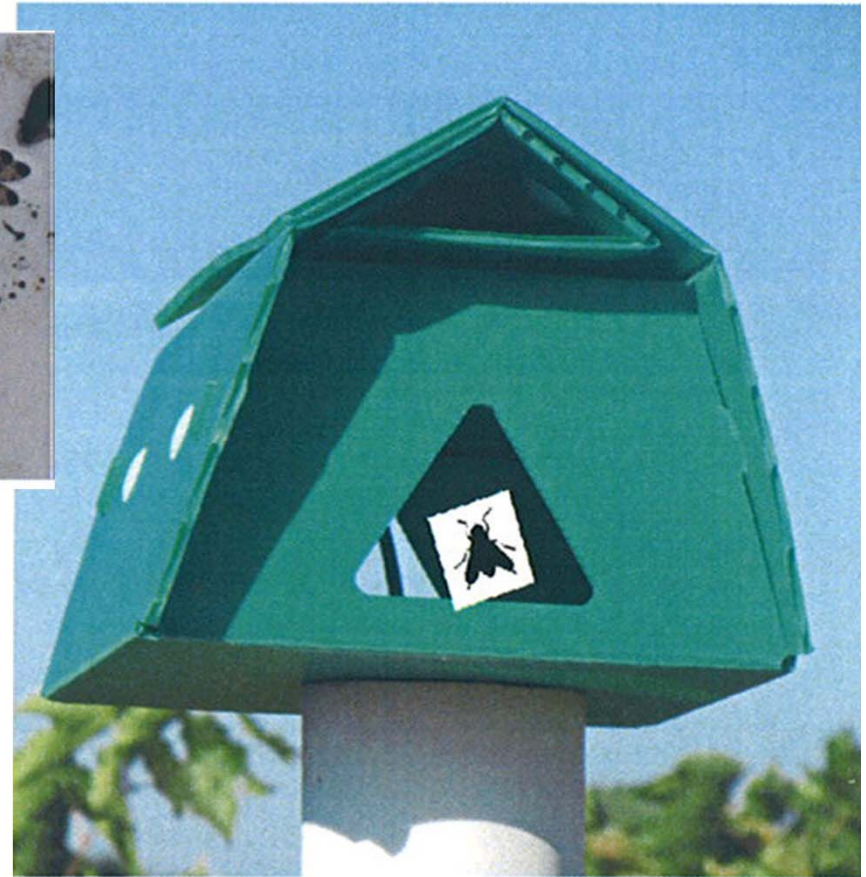
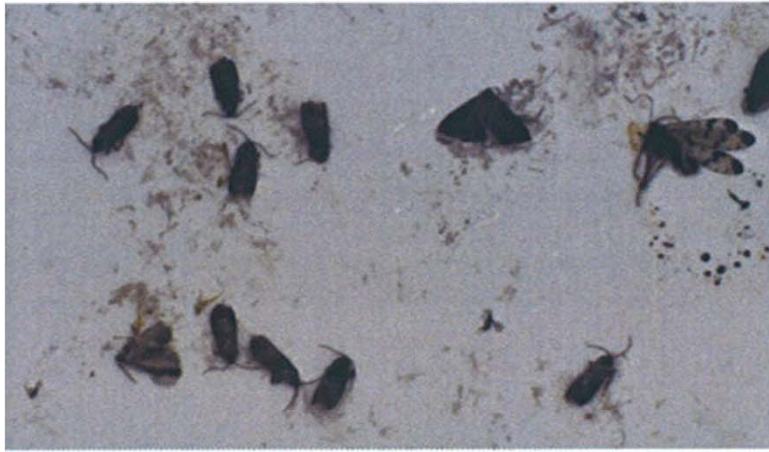
5100 iMETOS Climate or Soil Moisture Stations in Field



Auf 1892 iMETOS Wetter Stationen werden die Weinbaumodelle berechnet.



iMETOS trap: Sending daily pictures of trapped insects onto FieldClimate.Com



- Making use of cost effective cameras
- Using overall availability of GPRS
- Giving easy and from everywhere available access on the insect flight monitoring done by pheromone traps

iMeteo – Precision Weather forecast



meteoblue
weather close to you

Stations



Quelle: MeteoSwitzerland

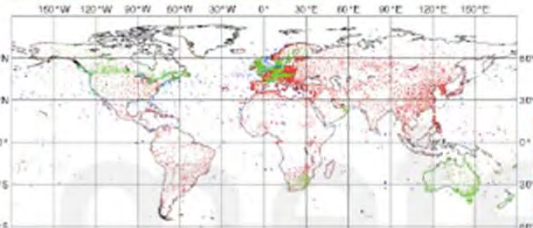
Data sources for weather modelling

get what you can, but... make sure it is correct...

www.meteoblue.com

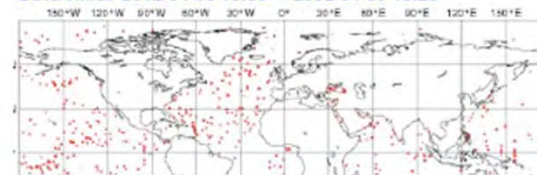
Observation Coverage - ORACLE

Synoptic land stations and ships
Manual (red), automatic (green) land and manual (blue), automatic (cyan) ship
Date/Time: 2002-04-09 11:00 - 2002-04-09 13:00



Drifting buoys

Date/Time: 2002-04-09 10:30 - 2002-04-09 13:29



Buoys

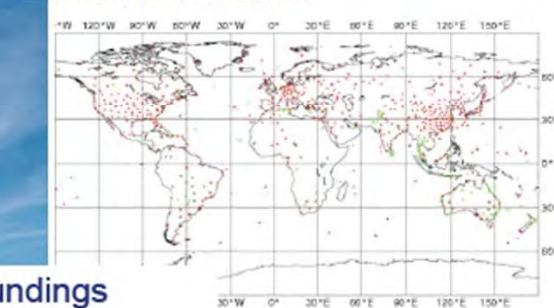


Big challenges:

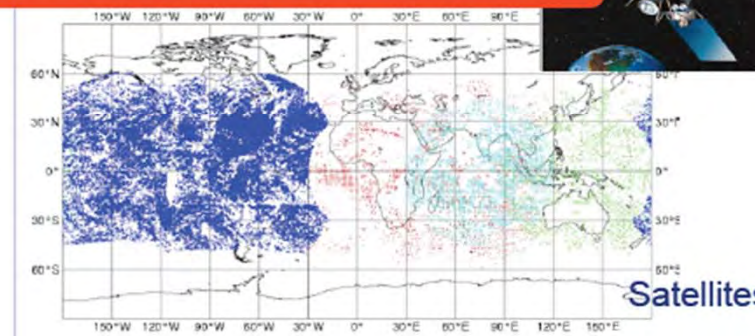
- data available for less than 1% of „cells“
- separate garbage from „reality“
- multiple timezones and reporting schemes
- must be done within 2 hours...worldwide

Observation Coverage - ORACLE

Land and ship radiosondes
Land Temp (red), Land Pilot (green), ship Temp (cyan), ship Pilot (blue)
Date/Time: 2002-04-09 11:00 - 2002-04-09 13:00



Radio Soundings

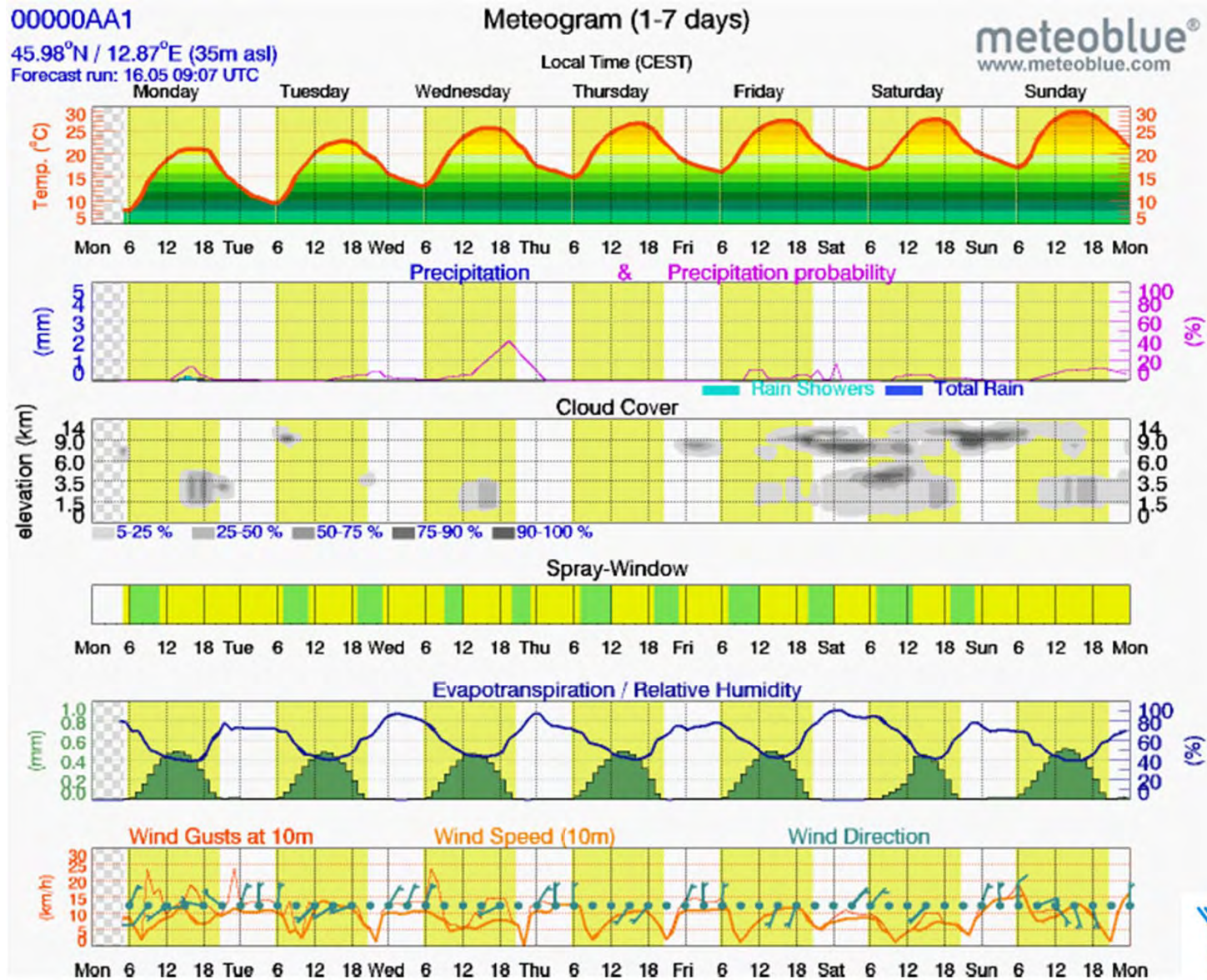


Satellites

meteoblue_Model_calculation (Müller/Gulbrod)



Graphic



iMETOS = Internet based

- GPRS or CSD-Dial in based internet connection
- Sends data periodically to a web based database
- Database is hosted by
 - Pessl Instruments
 - Pessl Instruments and mirrored by client organization
 - Client organization
- PHP – MySQL or PostgreSQL scripts available
- Station settings and data handling needs web browser no PC software



Pessl Instruments - Fieldclimate - Mozilla Firefox

http://www.fieldclimate.com/pikernel/index_new.php

Welcome, 1 1 Add new station User settings Log out Go to old Fieldclimate

All sensors(Pessl Instruments Company Weather, Sernum. 00000146)

Expand | Collapse

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Date from 2009-05-09 11:00:00 Show: 48 Hour(s) Show Data

Group by

- Hour
- Day
- Month
- None

Sensors

Date	Soil tempe [°C]	Solar radi [W/m²]	Solar radi [W/m²]	Air temper [°C]	Precipitat [mm]	Wind speed [m/sec]	Batte volt [mV]	Leaf Wetne [min]	HC Air te [°C]	HC Relativ [%]	Dew Point [°C]
2009-05-09-11:00:00	aver mini maxi	aver	aver	aver mini maxi	sum	aver maxi	last	time	aver mini maxi	aver	aver mini
	18.00 13.20 18.60	592	857 21.72 20.00 22.40		0.0 0.70 1.60	6004			0.23 0.42 1.42 22.50	46	0.50 8.70

2008 Pessl Instruments GmbH

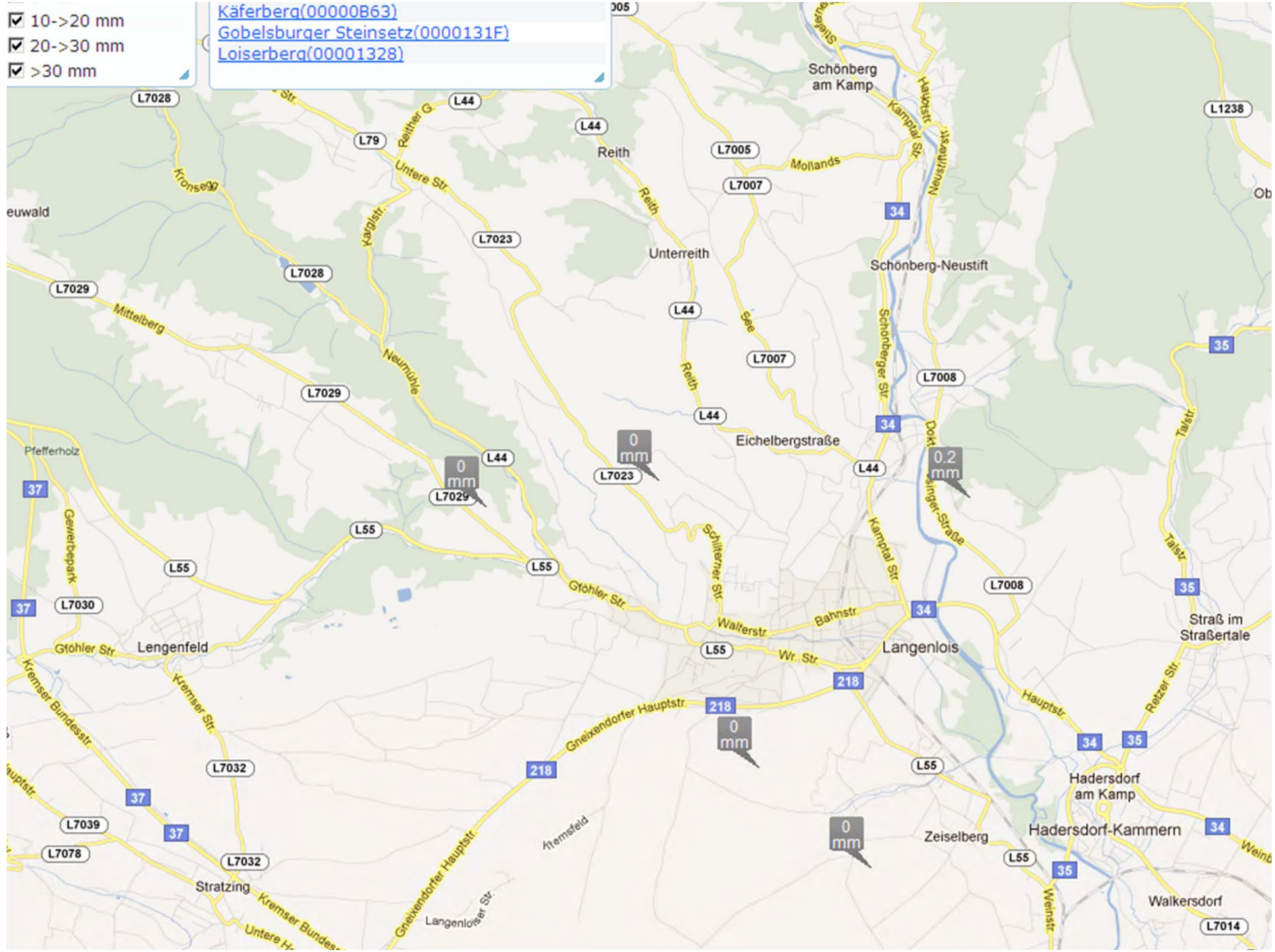
Warten auf www.fieldclimate.com...

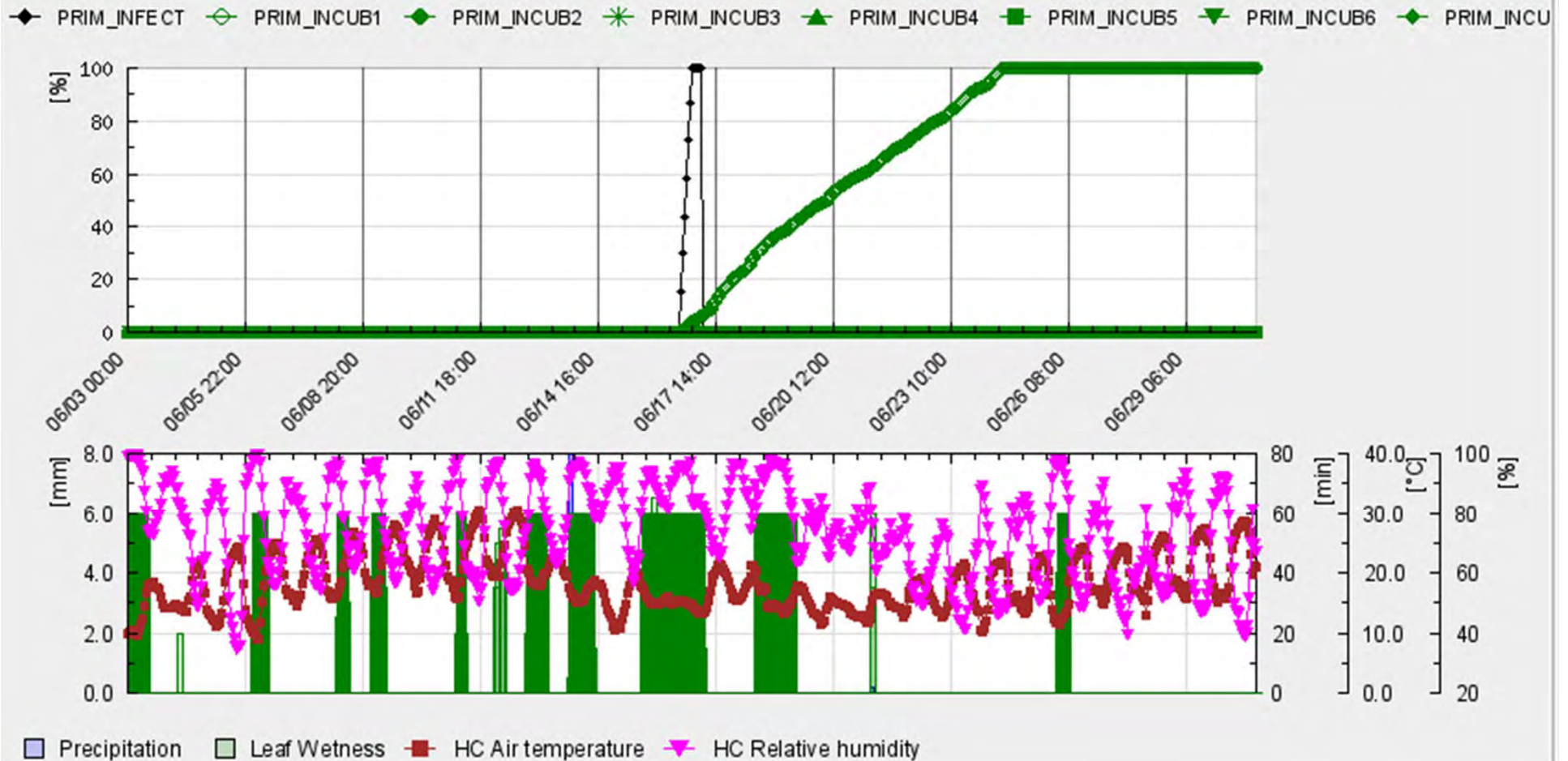
Data presentation in FieldClimate.Com



- 10->20 mm
- 20->30 mm
- >30 mm

[Käferberg\(00000863\)](#)
[Gobelsburger Steinsetz\(0000131F\)](#)
[Loiserberg\(00001328\)](#)





Graphische Darstellung der Peronospora Primärinfektion an einem Standort im nördlichen Weinviertel 2010

Disease Models List

Please select the plant, for which you would like to learn more about the pest and disease decision support systems.



Apple



Grape
Vine



Pears



Potato



Tomato



Asparagus



Carrot



Onion



Corn



Wheat



Rice



Banana



Rape



Strawberry



Citrus



Lettuce



Coffee



Olive



SugarBeet



Cherries

>

>



Using iMETOS Electronic Weather Stations in the Control of Black Sigatoka

The FieldClimate.Com
Sigatoka Information
System

Pessl Instruments GmbH., Weiz,
Austria July 2009



HD5

Black Sigatoka Infection Model on base of Weater Data



- **Conidia formation and discharge:** 24 hours of 27°C with more than 70% relative humidity will lead to the optimum conidia formation. Discharge can be by dry wind and by water droplets (Gauel, F. 1989).
- **Ascospore discharge:** Every rain and every dew period will lead to ascospore discharge (Gauel, F. 1989)..
- **Infection is finished under optimum conditions 27°C within 12 hours of leaf wetness or relative humidity $\geq 91\%$.** It can only start with leaf wetness. Under sub optimum conditions 17°C or 37°C it will take 48 hours (Gauel, F. 1989).
Germinated Conidia and Ascospore which can not finish infection will die.

HD5

Alternativ to an Risk Model we can formulate an Infection model. Most the data we need to construct such a model are coming form the work of Guel.

Heiner Denzer; 30.06.2009

HD7

Fungicide Coverage Models on base of Weater Data



- Looking for wash of do to rain
 - The rate is depending on rain stability of the formulation. Big differences within the same active ingredient do to differences in formulaitons
- Looking for plant growth rate
 - Leafs are infected immidiately when they start to unfold
 - It is importend to know if there has been a new leaf since the last spray

HD7

Another important impact in the successful control of Black Sigatoka is given by the pesticide coverage over time. This is influenced by pesticide persistence which is depending on the chemical and physical feasibilities of the product. The rainfall since the application and the rain stability of the product and most important the number of leafs expanded since the last application.

Heiner Denzer; 30.06.2009

Elements of the Sigatoka Information on FieldClimate.Com

HC

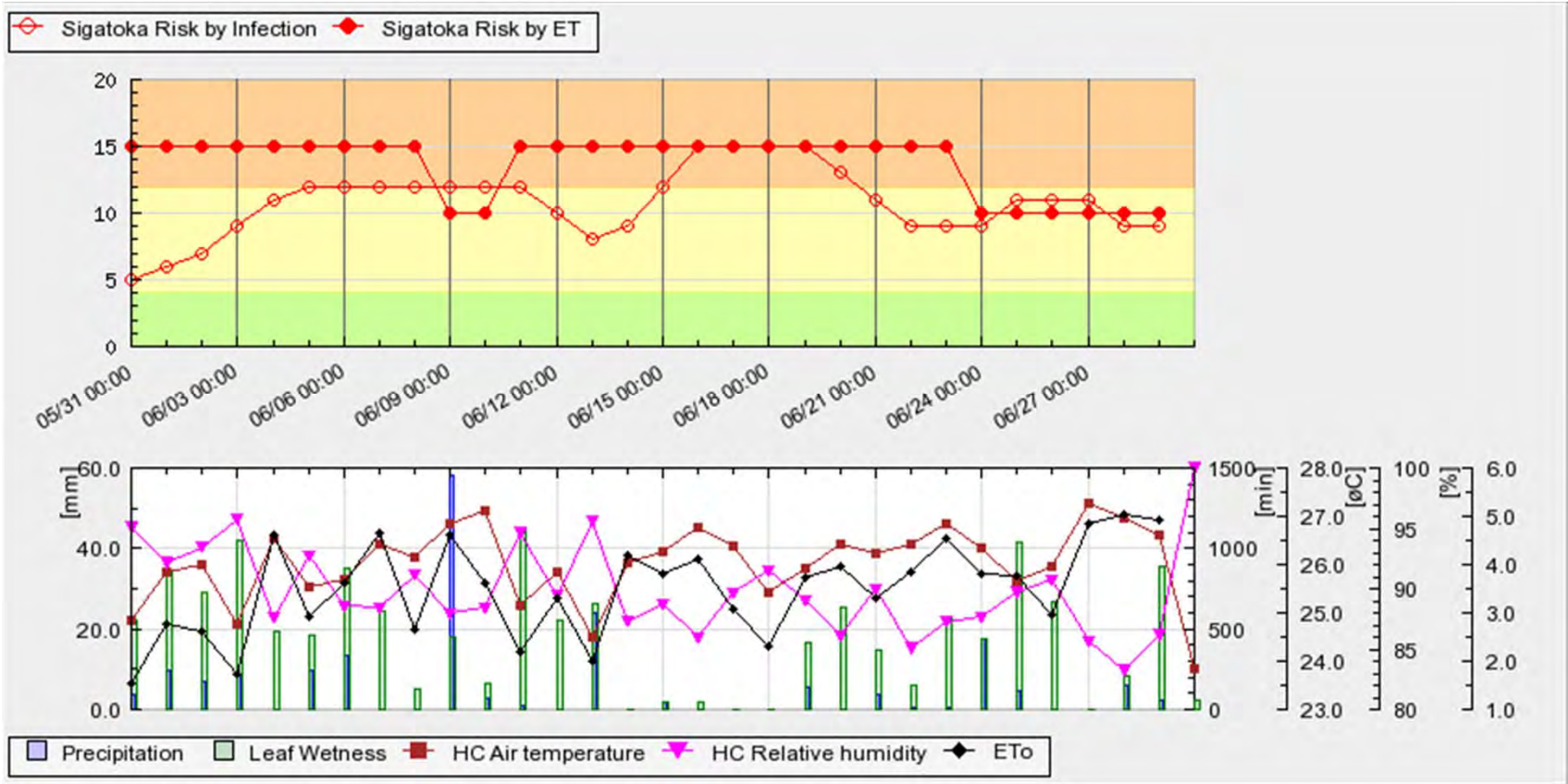


- **Sigatoka Risk by**
 - Evapotranspiration
 - Infection and intensity of rain at the begin of infection
- **Sigatoka Infection**
 - Conidia Fromation
 - Ascospore Discharge
 - Infection
- **Fungicide Presence**
 - Looking for wash of do to rain
 - Looking for plant growth rate

HD8

We wanted to choin all thees elements together to a Black Sigatoka Informaiton System.

Heiner Denzer; 30.06.2009



Black Sigatoka Risk in a Banana Orchard in Costa Rica in June 2009

HD9

Both models are showing the Sigatoka Risk in this period mostly to be very high.

Heiner Denzer; 30.06.2009

Sigatoka Conidia Formation Conditions on FieldClimate.Com



If relative humidity is $\geq 70\%$ Conidia formation is possible and reaches the maximum level :

- At 12°C – 14°C after 96 hours
- At 15°C – 17°C after 48 hours
- At 18°C – 26°C after 32 hours
- At 27°C – 30°C after 24 hours
- At 31°C – 33°C after 32 hours
- At 34°C – 36°C after 96 hours

Sigatoka Ascospore Formation Conditions on FieldClimate.Com



If relative humidity is $\geq 70\%$ Ascospore formation is possible and reaches the maximum level (100%):

- At 12°C – 14°C after 192 hours
- At 15°C – 17°C after 96 hours
- At 18°C – 26°C after 64 hours
- At 27°C – 30°C after 48 hours
- At 31°C – 33°C after 64 hours
- At 34°C – 36°C after 96 hours

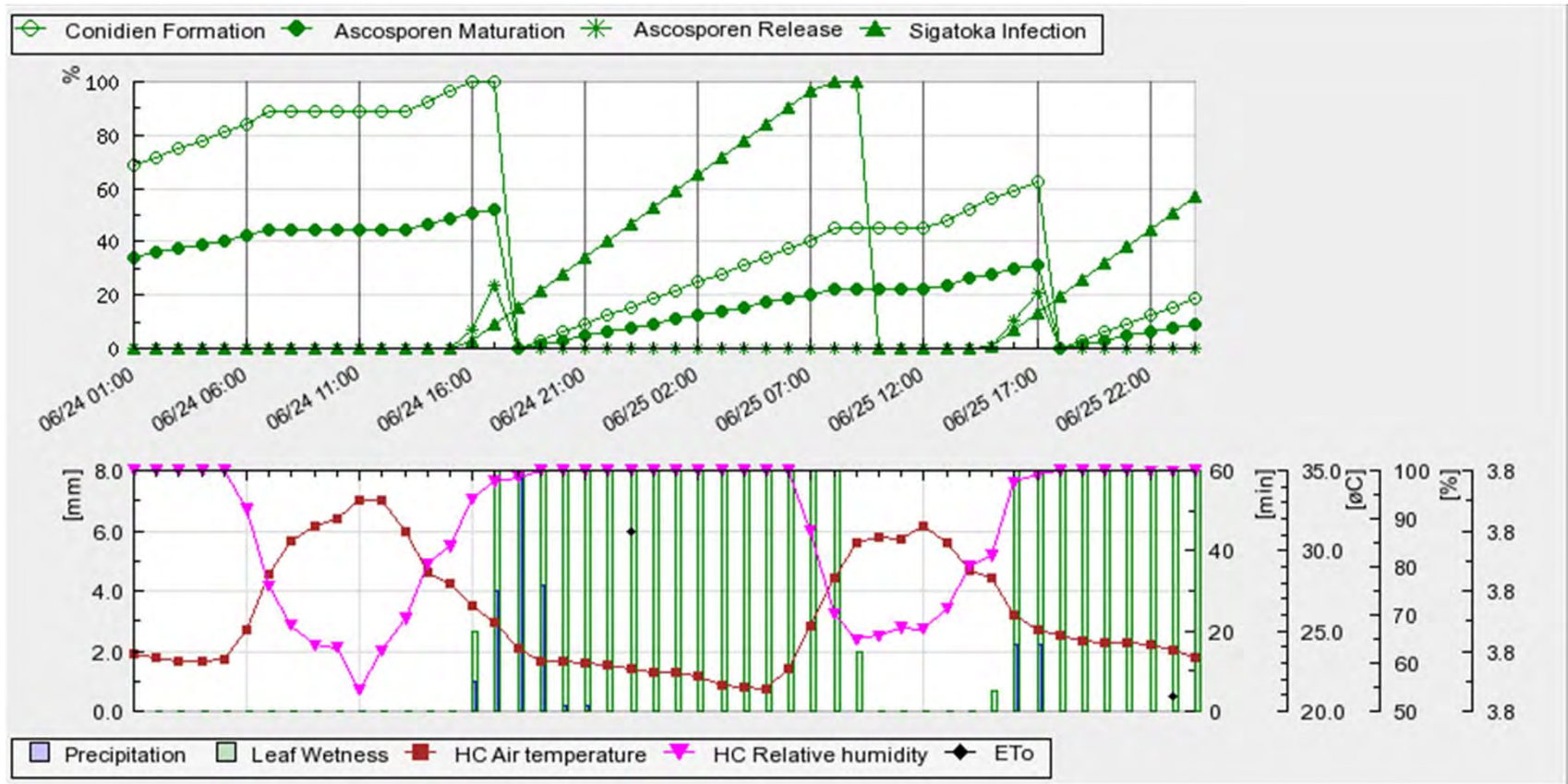
The leaf wetness needed for ascospore discharge is part of the infection model.

Sigatoka Infection Conditions on FieldClimate.Com



If relative humidity $\geq 90\%$ follows a leaf wetness period Infection will be completed (100%):

- At 12°C – 14°C after 48 hours
- At 15°C – 17°C after 24 hours
- At 18°C – 26°C after 16 hours
- At 27°C – 30°C after 12 hours
- At 31°C – 33°C after 16 hours
- At 34°C – 36°C after 24 hours



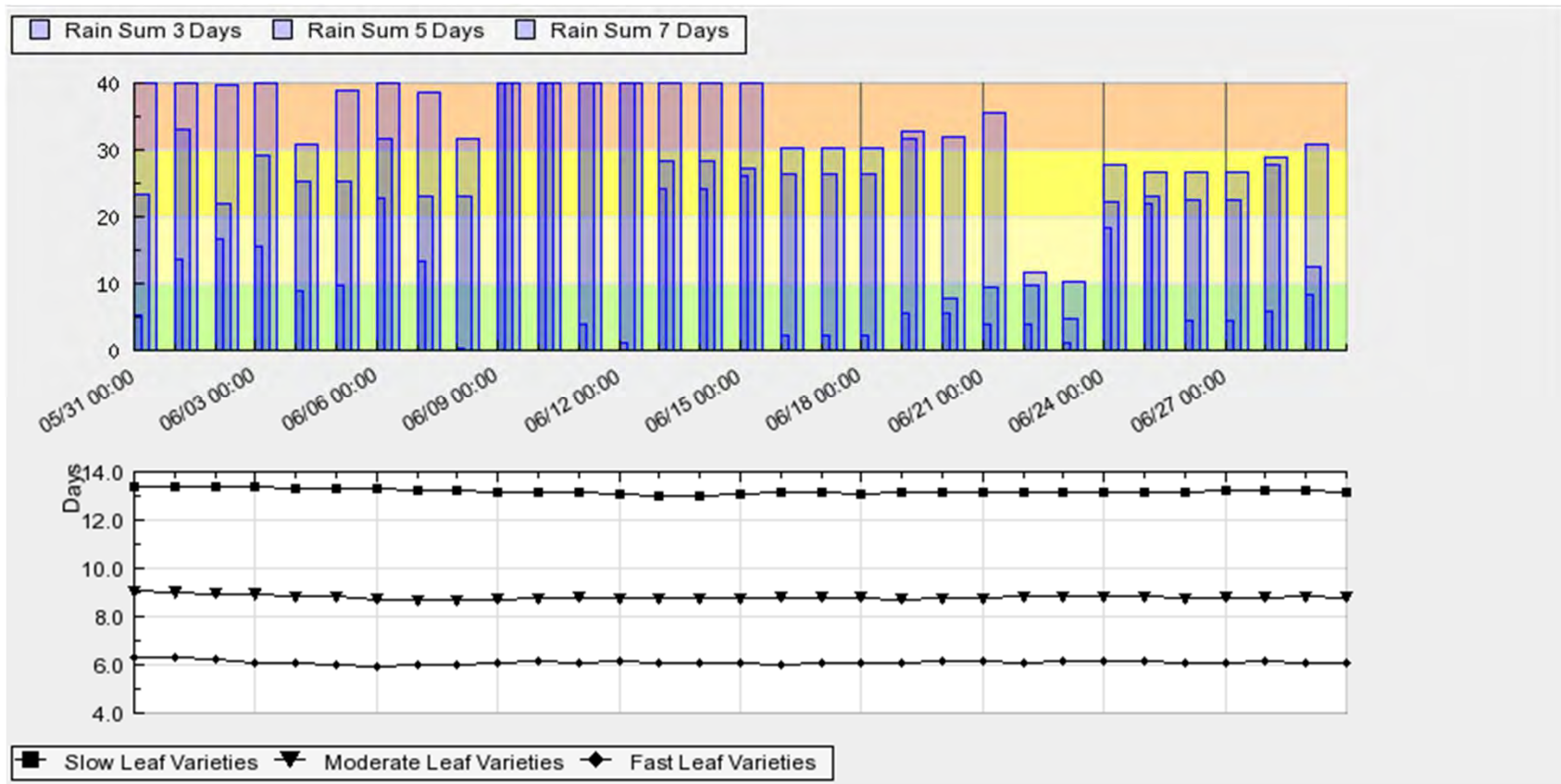
Black Sigatoka Infections, Coidia Fromation, Ascospore Formation and Ascospore discharge presented by FieldClimate.Com

HD10

Due to the high relative humidity lots of conidia and ascospore has been formed during the night and the morning of the 24th of June. The ascospore has been released in the rain in the afternoon of the 24th of June. The leaf wetness period following the rain was long enough for a Black Sigatoka infection.

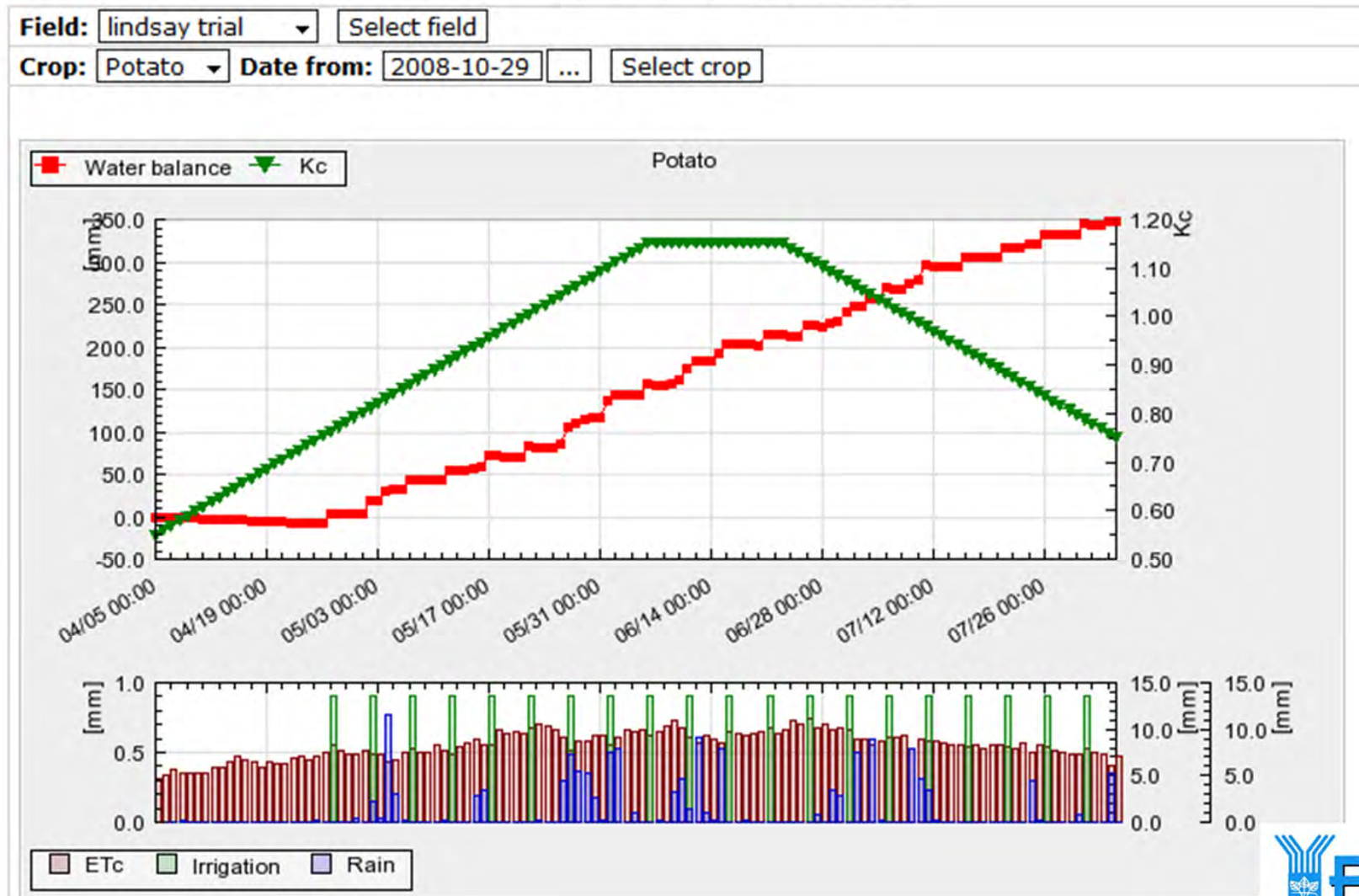
After the rain conidia and ascospore formation started again. The next rain in the following afternoon was causing the discharge of the ascospores and a new infection started.

Heiner Denzer; 30.06.2009

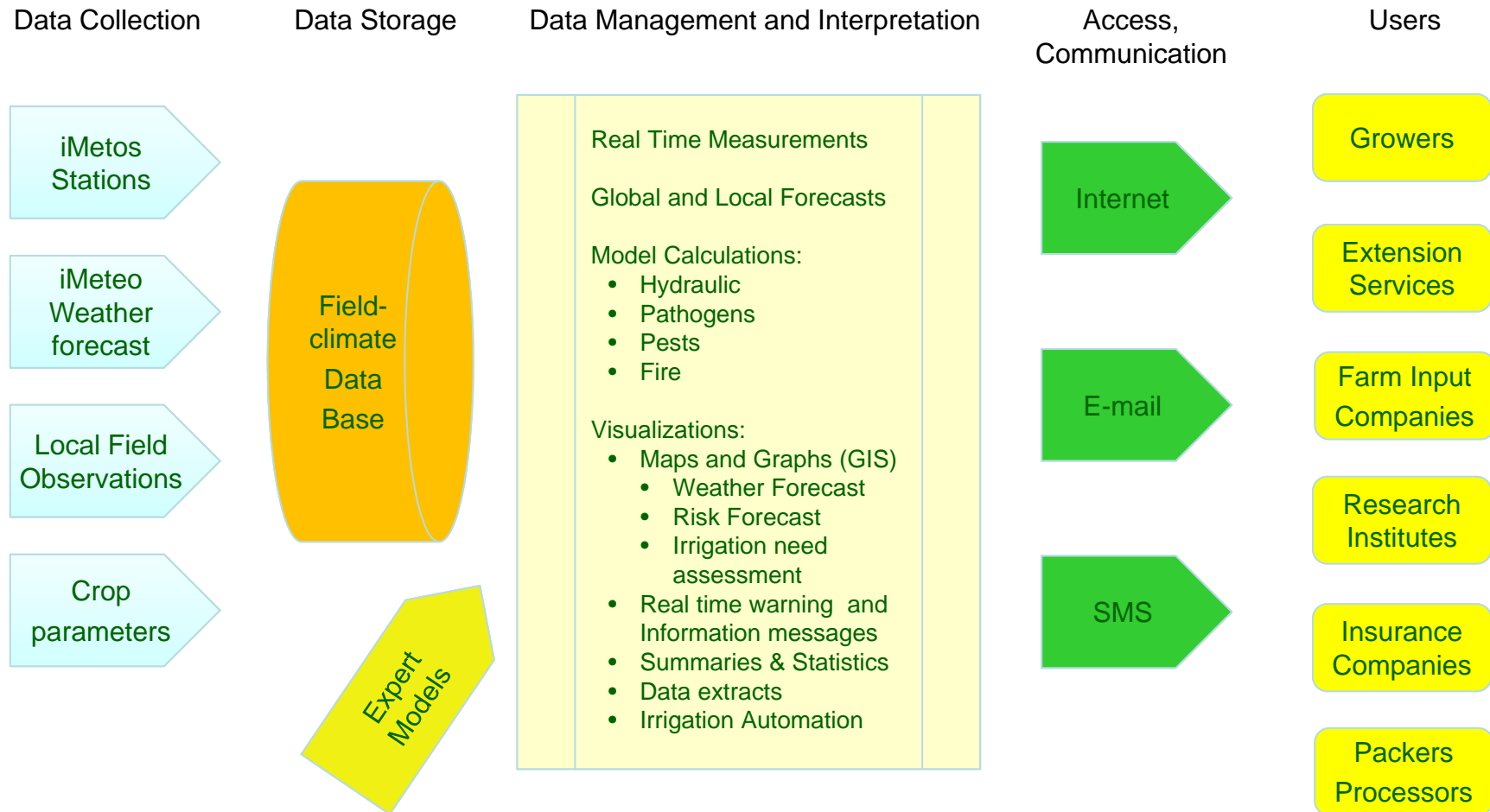


Rain Sums and Duration needed for Leaf Formation of Banana presented by FieldClimate.Com for a period in June with data from an iMETOS in a banana field in Costa Rica.

ET & Water balance graph - overview



Pessl Instruments – Holistic Approach



Thank you for your attention

