

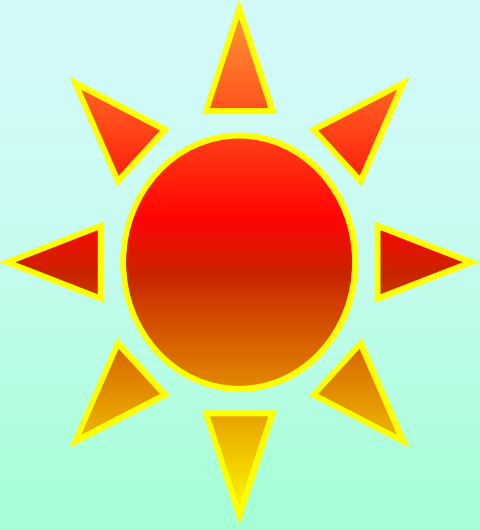


Dynamax

- Manufacturer of Flow32, FLGS-TDP, & SapIP Wireless Sap Flow Systems, HPFM, DEX, and Sensors
- US Representative for Delta-T Devices, Ltd.
- US Representative for Gill sonic anemometers
- US Representative for ForceA
- Systems Integrator for Campbell Scientific
- A Primary Source for Plant Science Research Equipment



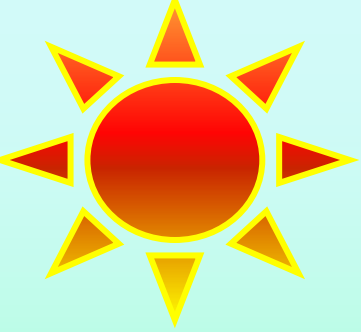
Introducing SapIP Remote Sensor Logger & Agrisensors.NET



All water transpired moves via Sap Flow through the trunk, branches, and stems where it may be measured by sap flow sensors

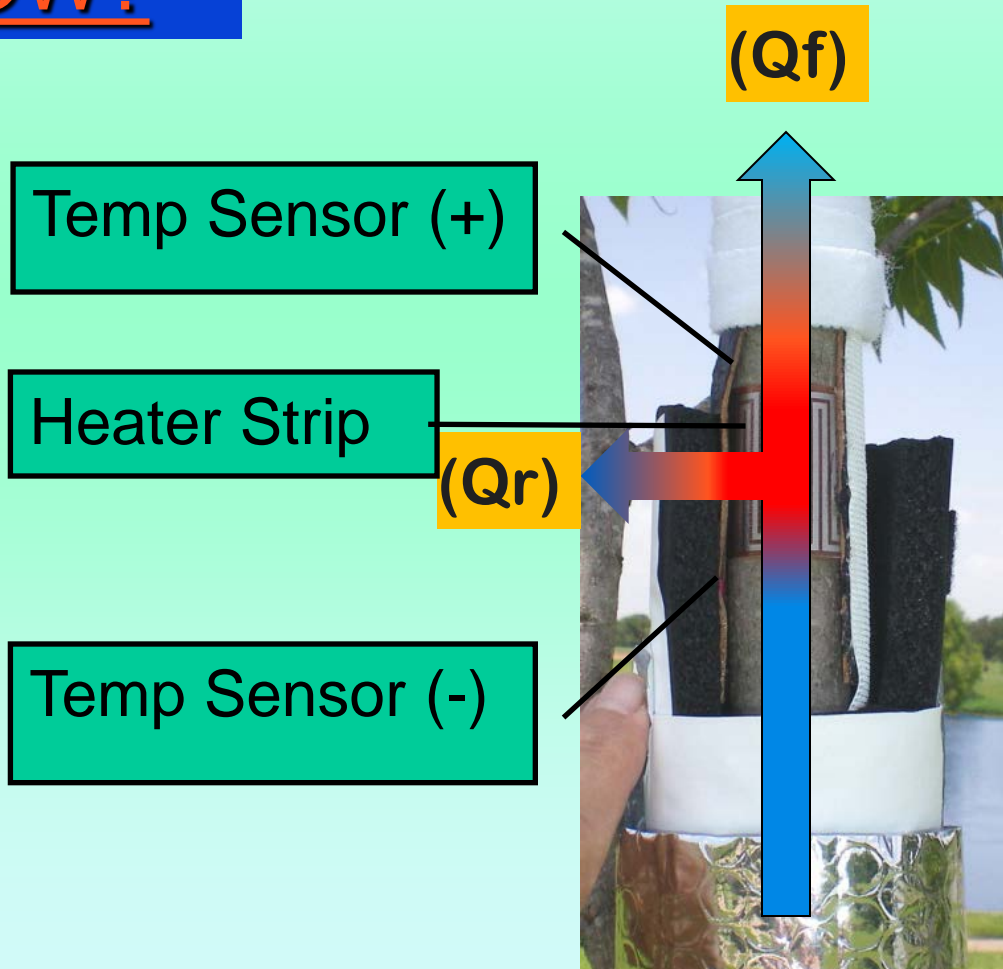


Sap flow sensors wrap completely around the branch or stem



HOW?

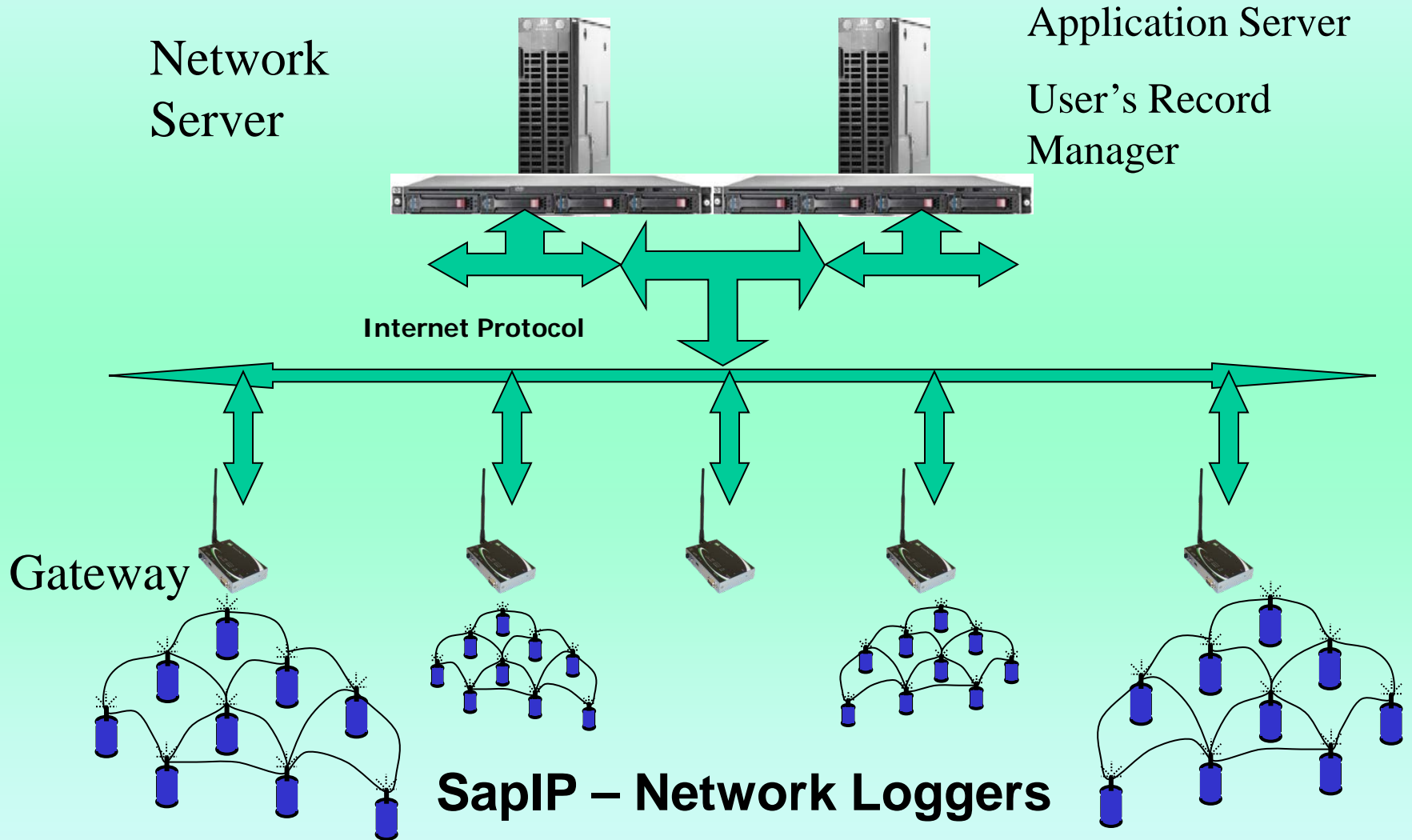
Heat balance sensors heat the stem using a heater strip with constant power. Measure the heat loss to the ambient (Q_r). The remaining heat is carried by the sap (Q_f)*



Measure the temperature increase (+) and convert the heat to a flow rate based on the cooling effect of water (Specific Heat = C_p).

* Stem Heat Balance Method (S.H.B.)

Agrisensors.NET Remote Logging Network



SapIP Advantages

- Data on the spot with wireless mesh radio network
- Remote access from anywhere with Internet
 - Remote Control and Monitoring Status
 - “Real-Time” Data updated in minutes
- Reduce cable cost and travel costs
- Improve data storage capacity and multi-point access
- Logger storage and automatic network storage
- NO user programming required – all systems preconfigured
- Password protected data access

SapIP System Features



Nodes:

- 30,000 Records
- 8 Analog Channels
- 2 Digital Channels
- Heater power
- Excitation

Gateway:

- GSM or LAN Versions
- Power 120 or 220 Volt
- UPS battery backup
- Solar – battery option

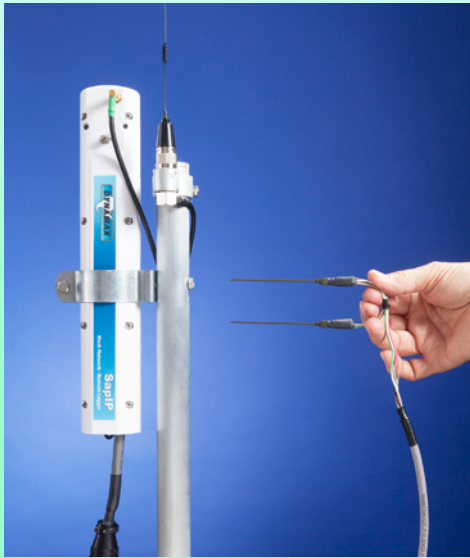


Easy Mounting



Comes Complete:
Wiring, grounding,
antenna, surge,
mounting hardware
provided

SapIP Nodes



Sap Flow or TDP



Micro-Climate Kit

Weather Parameters, ET



Soil Moisture Node
w/ Soil Moisture
Profile



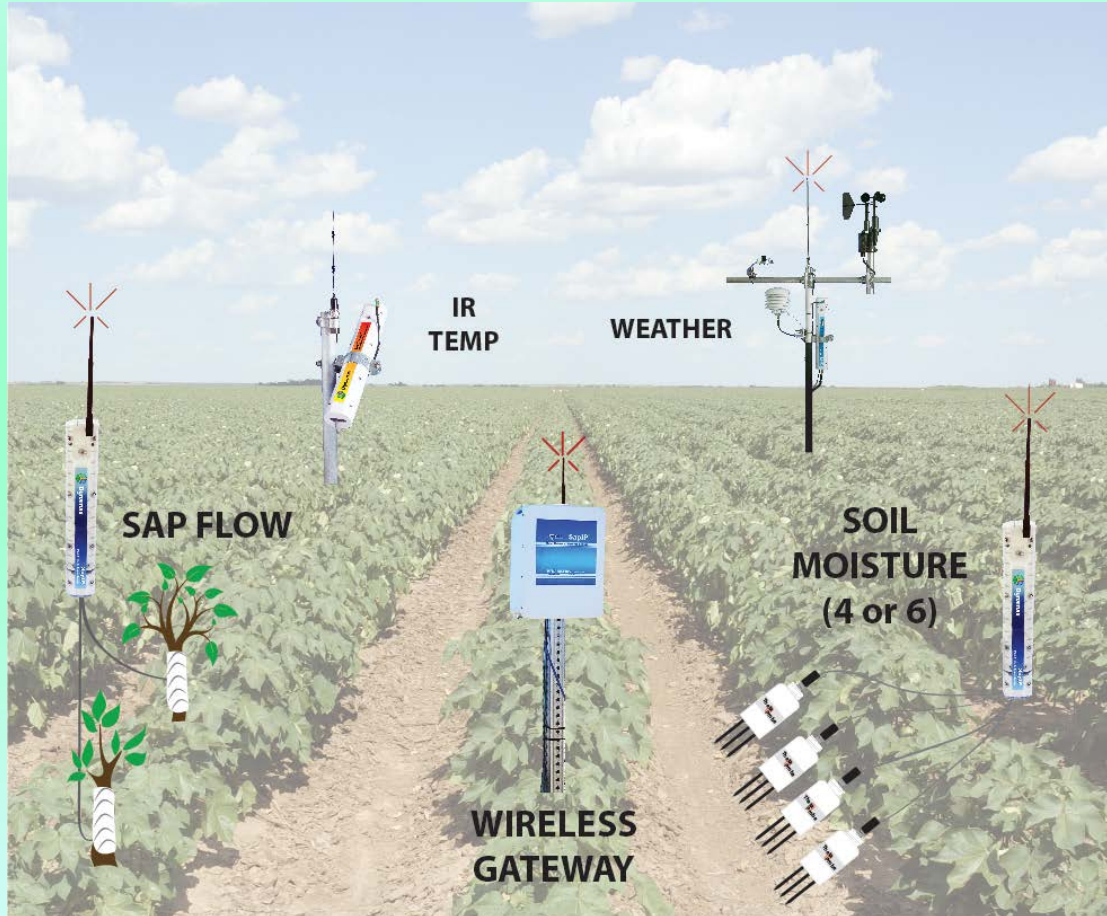
2.4 Ghz High Gain - 500 m
Range

900 Mhz High Gain – 1000 m
Range

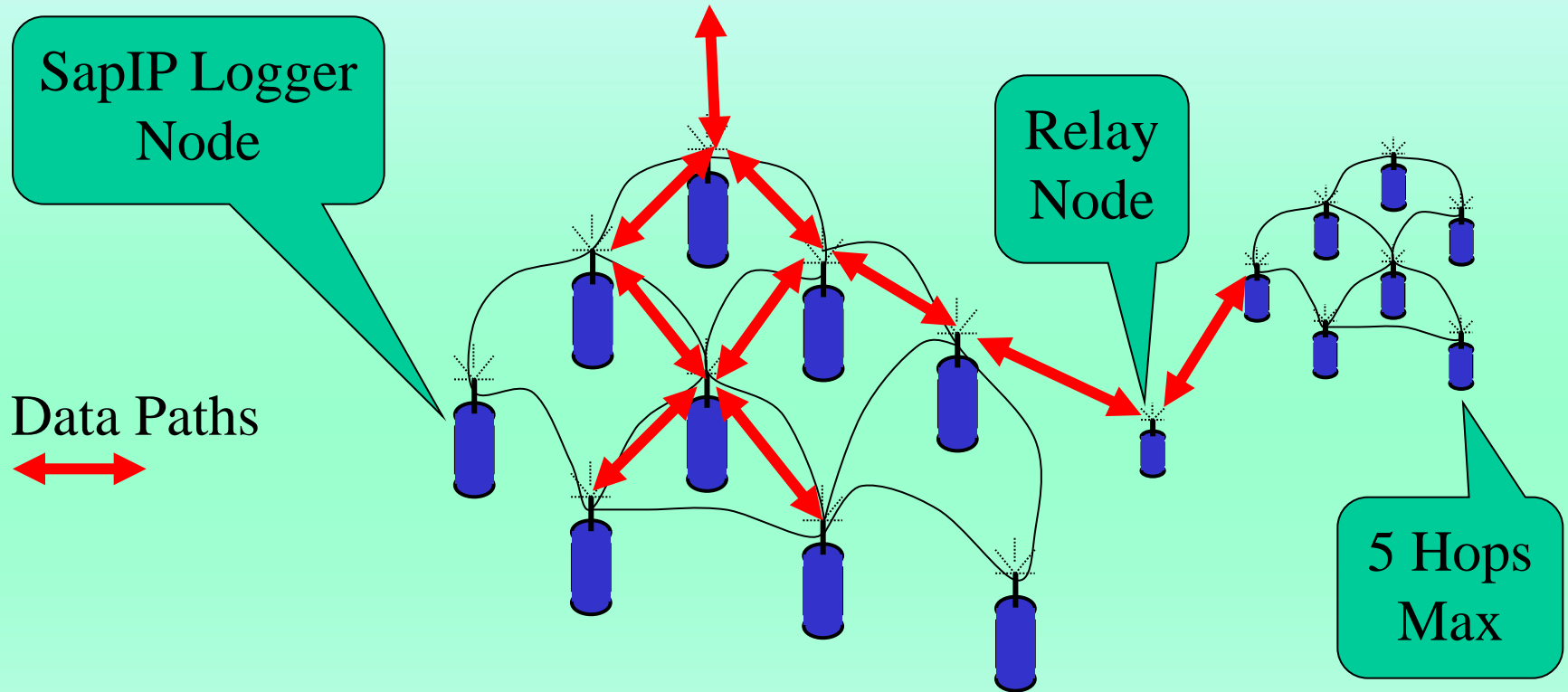


SapIP REP Repeater
700 m hops to SapIP
Nodes

SapIP Loggers for Different Purposes



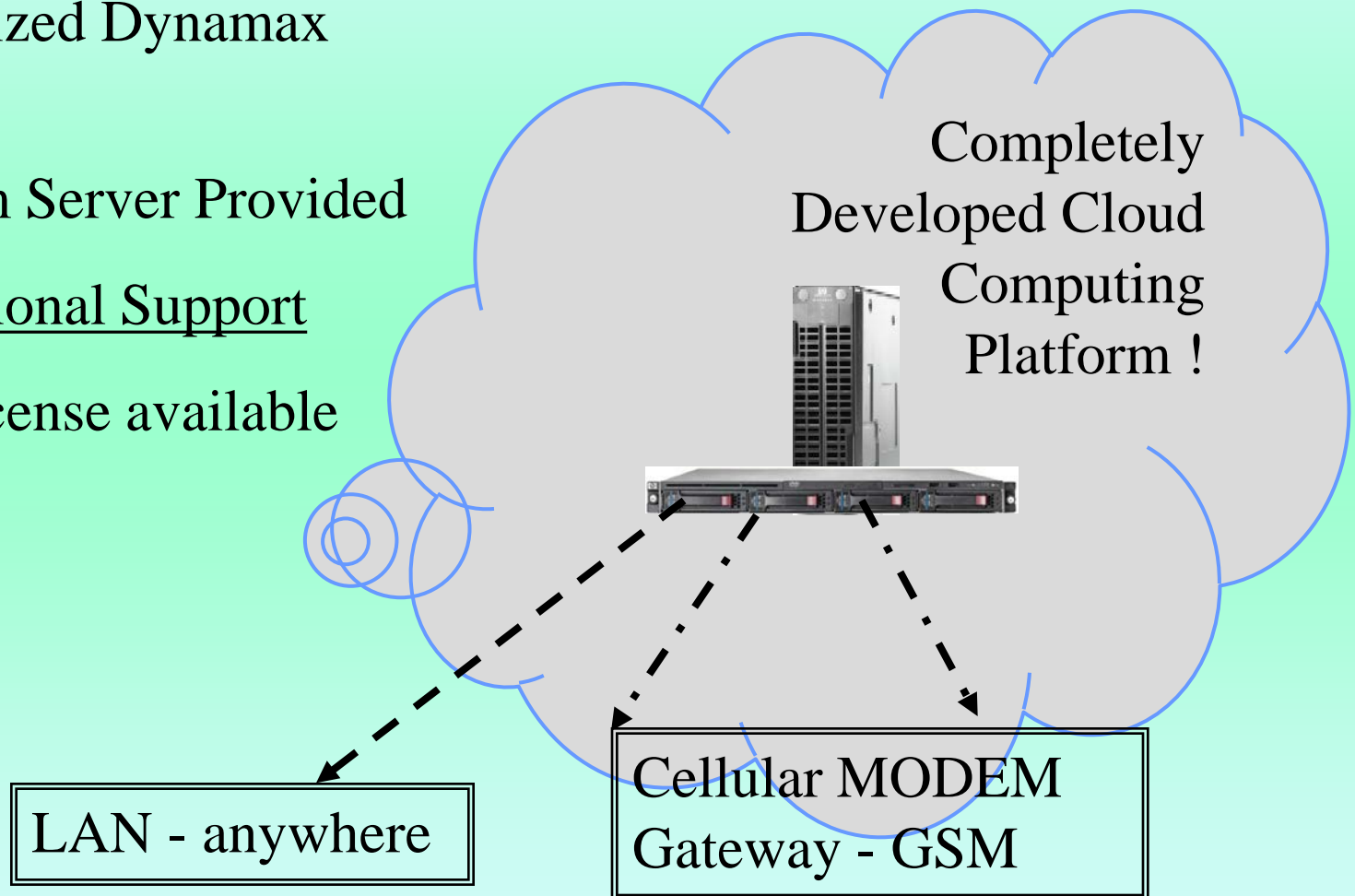
What is a Mesh?



Mesh is like a net, with many points interconnect.

Platform Included

- Customized Dynamax Gateways
- Platform Server Provided
- International Support
- 1-5 yr license available



WEB Access Data Agrisensors.NET

Dynamax Server

Access & Data Security

Control SapIP Devices

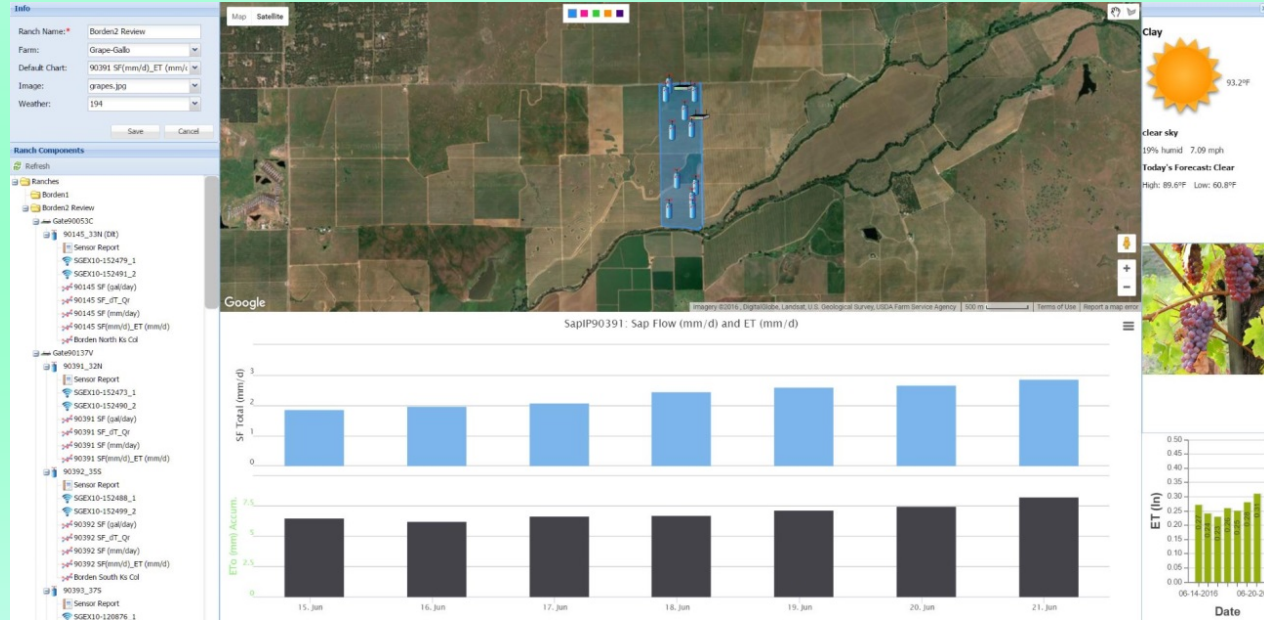
Start & Stop Devices

Modify Setup

Download Data

Report Data Integrity

Locate on Satellite Map



Agrisensors Server for SapIP

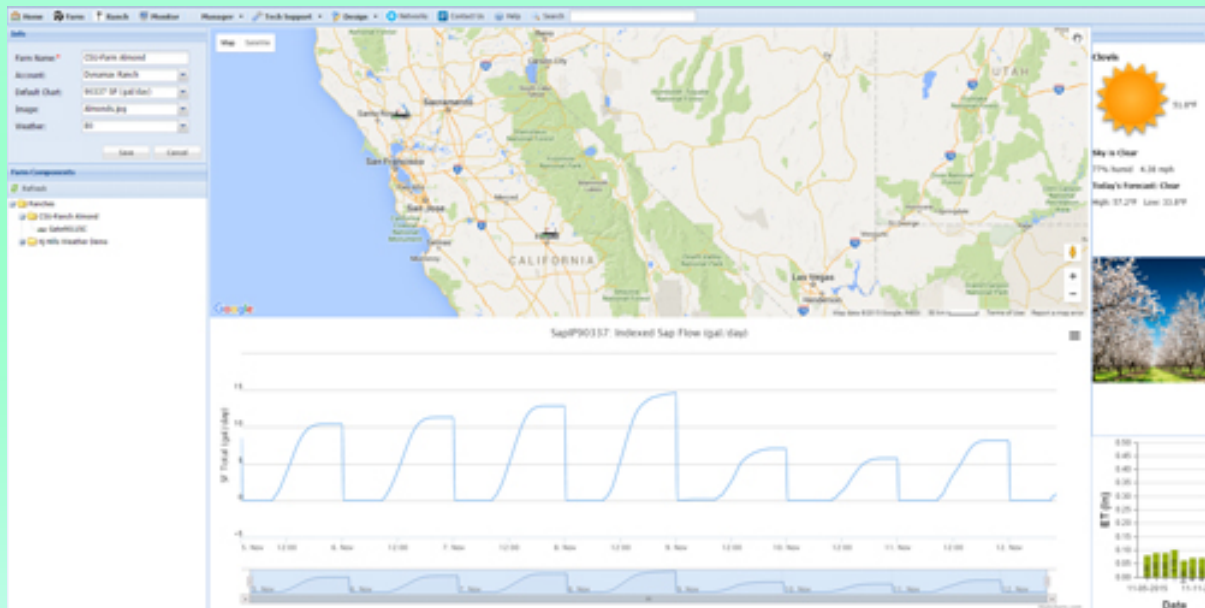
Complete logging &
control

User specified
graphics

Download or upload
data remotely

Records
configuration
changes

On-Line support
services!



Home Farm Ranch Monitor Manager Tech Support Contact Us Help Search

Info

Device ID: 90337_notused
 Sapip Name: 90337_SF_W
 Gateway: Gate90115C-2014-15
 Longitude: -119.72535
 Latitude: 36.82031
 Address: not used

Save Cancel

Data Links

Reports

Stats

Battery: 13.585
 Delay Data: 16
 Signal: 83
 Driver: V200.012

Version Radio DB

Device Operations Location Channel Config History Sensors Grouped Calculations

Status

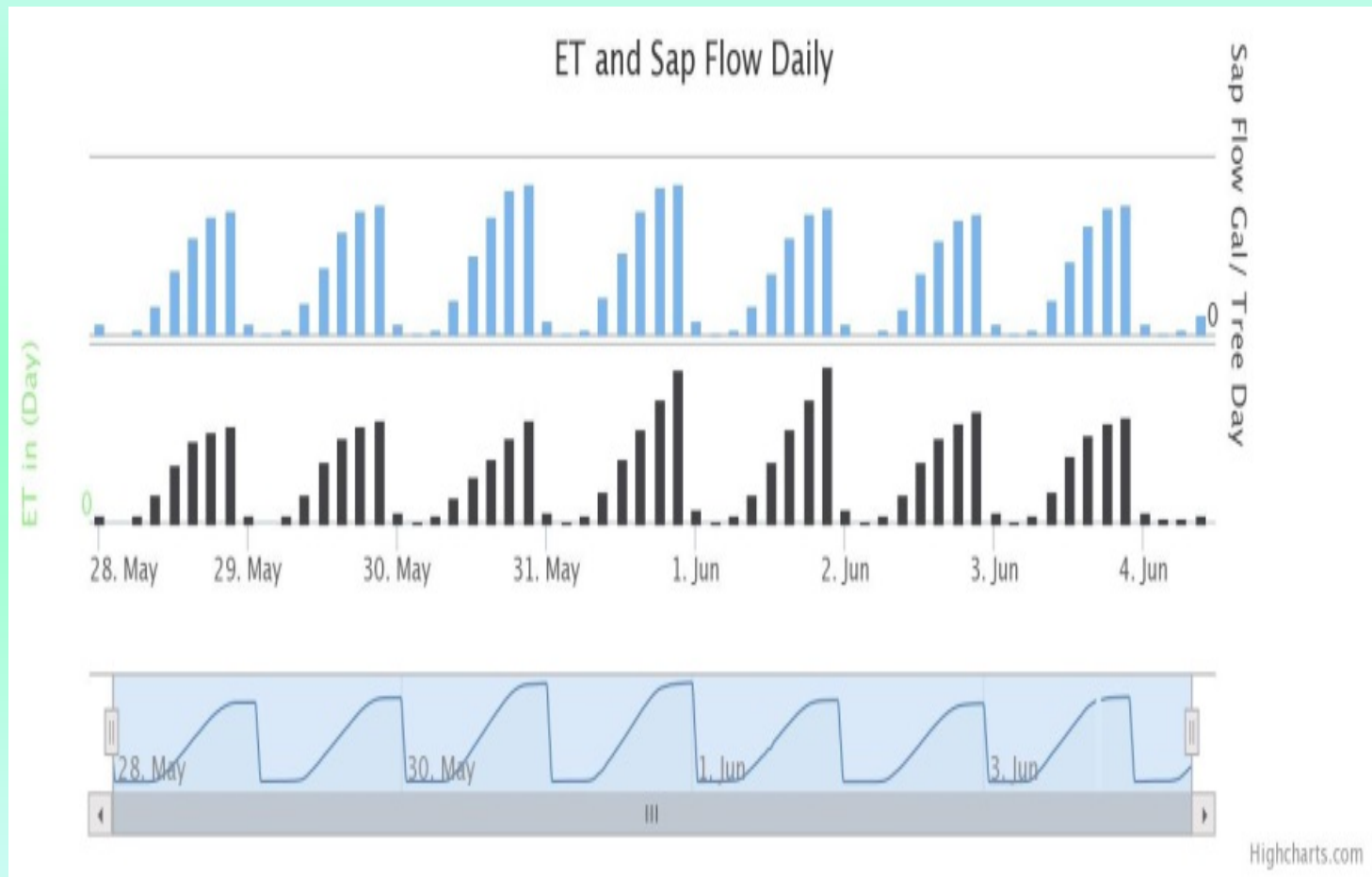
Get Sample Reading
 Repeat Last Reading
 Show Device Config
 Start Logger
 Stop Logger
 Reboot Remote
 Erase All Data
 Update Date/Time
 Data Reports
 Get Data from Device

Error: N
 Num. Record: 3994
 Trigger Count: 0
 Status dtStamp: 173
 Status Date/Time: 2016-04-21T10:29:29
 Logging Enabled:
 Net Active:
 DC Config: 112100000000853750N2004
 AVRO: 4022
 AVRI: 173
 Battery: 13585
 Error Code: KKKKKKKKKUK
 Start Record: End Record:

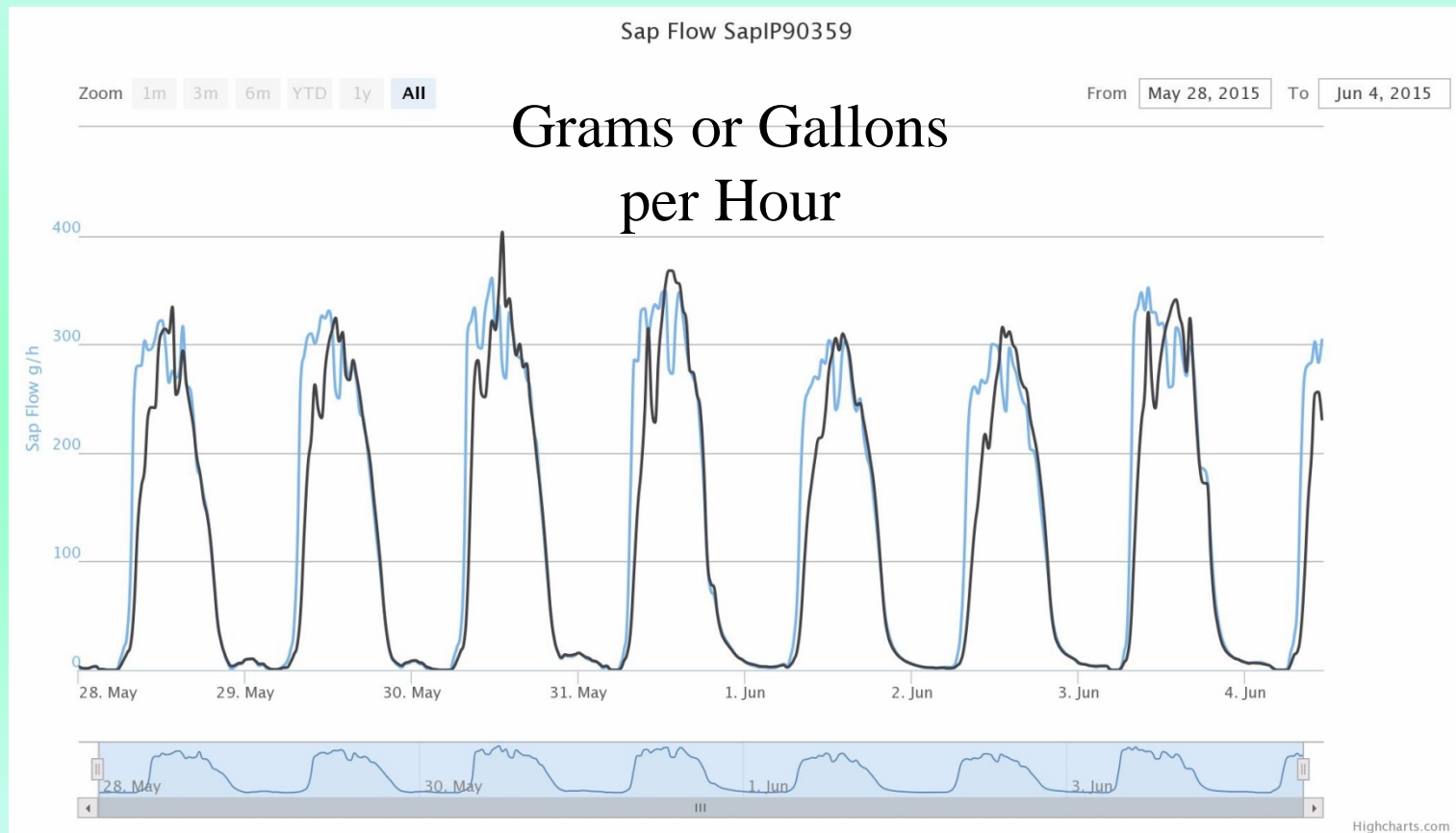
**Get Status Report
 from individual
 SapIP nodes**

**View Sensors,
 Channels, and
 Configuration**

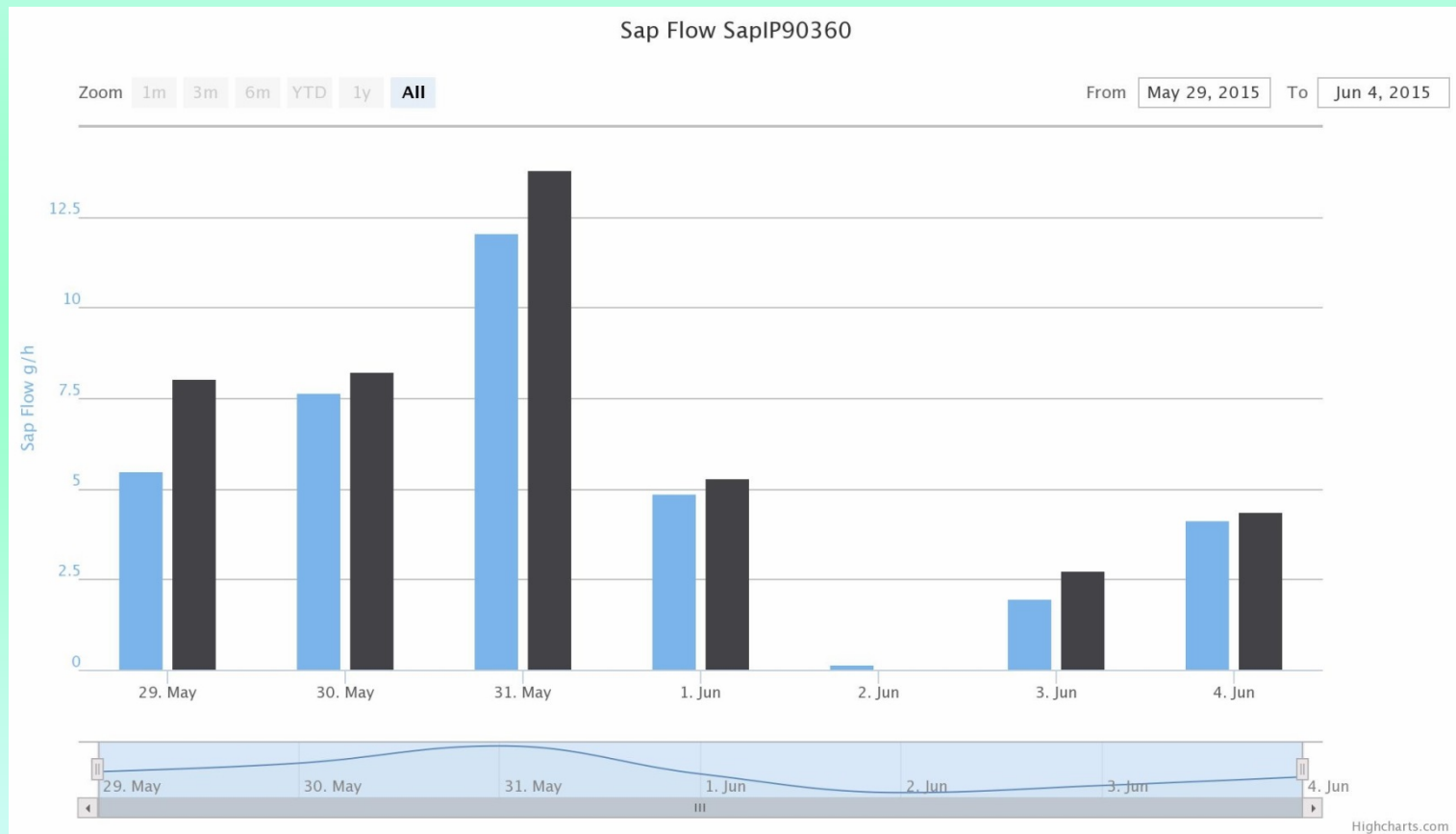
Compare ET & Plant Water Use



Daily Sap Flow of Tangerine



Accumulated Sap Flow of Tangerine



Download Raw Data and Calculated Results

Microsoft Excel - CalculatedData_2011-10-01-2011-11-12.csv [Read-Only]

File Edit View Insert Format Tools Data Window ACT! Help Adobe PDF

100% Arial

F1 = date

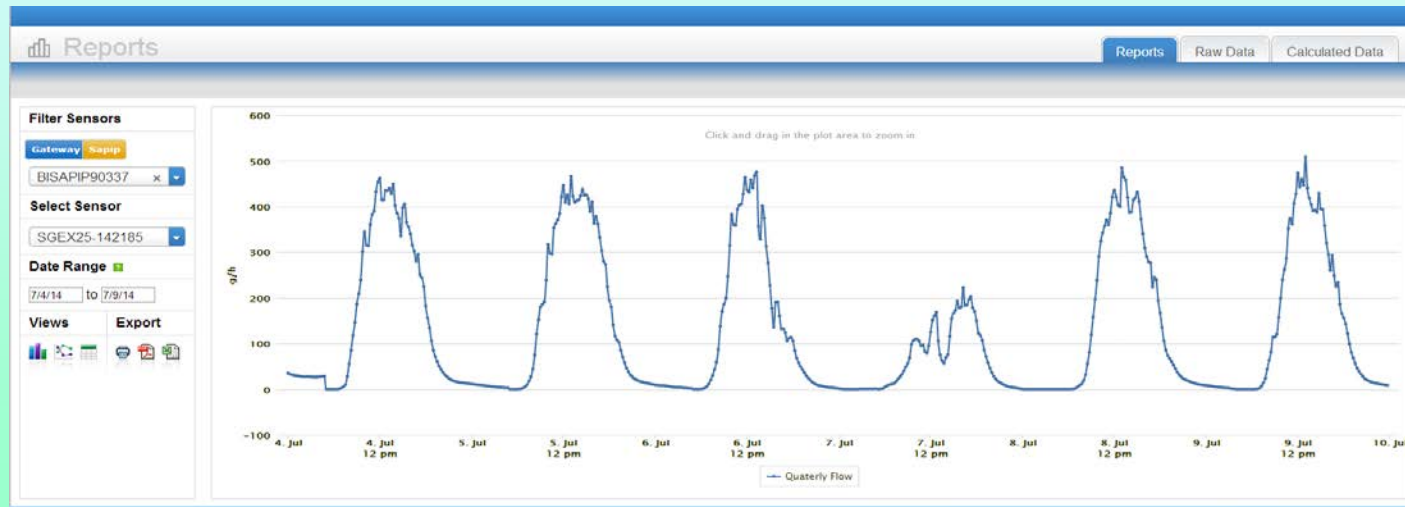
	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
1	date	date_time	value	status	filtered_v	create_da	create_da	Pin	Qv	KSH App	KSH in us	Qr	Qf	Dt	
16	11/8/2011	20:15:00	14.4407	N		14.44067	11/9/2011	15:20:06	2.61739	0	8.15387	7.5	2.4075	0.209891	12.5
17	11/8/2011	20:30:00	17.4675	N		17.46747	11/9/2011	15:20:06	2.61523	0	8.32876	7.5	2.355	0.260232	12.8125
18	11/8/2011	20:45:00	19.6209	N		19.62087	11/9/2011	15:20:06	2.61523	0	8.46353	7.5	2.3175	0.297732	13.05
19	11/8/2011	21:00:00	23.7059	N		23.70589	11/9/2011	15:20:06	2.61523	0	8.71744	7.5	2.25	0.365232	13.25
20	11/8/2011	21:15:00	19.6631	N		19.66311	11/9/2011	15:20:06	2.61523	0	8.49101	7.5	2.31	0.305232	13.35
21	11/8/2011	21:30:00	21.0534	N		21.05342	11/9/2011	15:20:06	2.61523	0	8.57453	7.5	2.2875	0.327732	13.3875
22	11/8/2011	21:45:00	25.7512	N		25.75118	11/9/2011	15:20:06	2.61523	0	8.86519	7.5	2.2125	0.402732	13.45
23	11/8/2011	22:00:00	29.0272	N		29.02716	11/9/2011	15:20:06	2.61523	0	9.08067	7.5	2.16	0.455232	13.4875
24	11/8/2011	22:15:00	28.0707	N		28.07071	11/9/2011	15:20:06	2.61523	0	9.01804	7.5	2.175	0.440232	13.4875
25	11/8/2011	22:30:00	29.2462	N		29.24615	11/9/2011	15:20:06	2.61739	0	9.08816	7.5	2.16	0.457391	13.45
26	11/8/2011	22:45:00	23.7399	N		23.73987	11/9/2011	15:20:06	2.61955	0	8.73184	7.5	2.25	0.369551	13.3875
27	11/8/2011	23:00:00	17.6745	N		17.67453	11/9/2011	15:20:06	2.61955	0	8.36917	7.5	2.3475	0.272051	13.2375
28	11/8/2011	23:15:00	13.4933	N		13.49331	11/9/2011	15:20:06	2.62171	0	8.14196	7.5	2.415	0.206712	13.175
29	11/8/2011	23:30:00	6.19681	N		6.196807	11/9/2011	15:20:06	2.62171	0	7.77956	7.5	2.5275	0.094212	13.075
30	11/8/2011	23:45:00	1.76543	N		1.765426	11/9/2011	15:20:06	2.62171	0	7.5772	7.5	2.595	0.026712	13.0125
31	11/9/2011	0:00:00	-1.20635	L		0	11/9/2011	15:20:06	2.62171	0	7.44805	7.5	2.64	-0.01829	13.0375
32	11/9/2011	0:15:00	-4.14691	L		0	11/9/2011	15:20:06	2.62171	0	7.32322	7.5	2.685	-0.06329	13.125
33	11/9/2011	0:30:00	-6.66318	L		0	11/9/2011	15:20:06	2.61955	0	7.21639	7.5	2.7225	-0.10295	13.2875
34	11/9/2011	0:45:00	-6.91764	L		0	11/9/2011	15:20:06	2.62171	0	7.20251	7.5	2.73	-0.10829	13.4625
35	11/9/2011	1:00:00	-4.51343	L		0	11/9/2011	15:20:06	2.61955	0	7.2968	7.5	2.6925	-0.07295	13.9

Ready NUM

Basic Data Collection

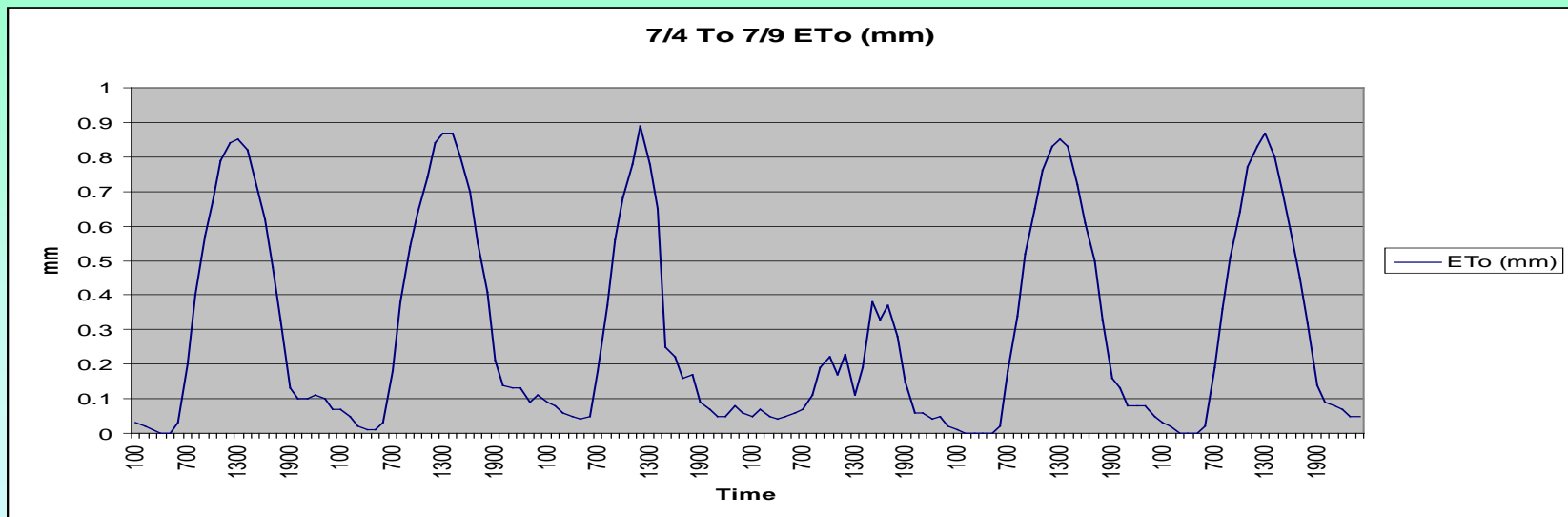
- ✓ Sap flow data & actual plant water use
- ✓ Accumulated daily total water use
- ✓ Weather Data - ETo Plant water use comparisons
- ✓ Soil Moisture profiles, 4 or 6 levels
- ✓ Weekly irrigation schedule
- ✓ Chill Portion, Frost Warnings
- ✓ Growing Degree Day

Agrisensors site data



Select the Reports Tab and select the SapIP

SITE 1 7/4 TO 7/9 1-6 days shows the quarter hourly sap flow readings. (g/hr). CIMIS data from Fresno State reported below.



Plant Stress Data Analysis

- ✓ Sap Flow data
- ✓ Weather data, ETp
- ✓ Calculate Kc on wet days, Ks on dry days

Two Kinds – Crop Water Stress Index

$CWSI = (E_{tm} - E_t) / E_{tm}$ (Textbook definition)

Water “**Stress Factor**” $CWSF = K_s / K_c$

So if Stress Factor = 0.75

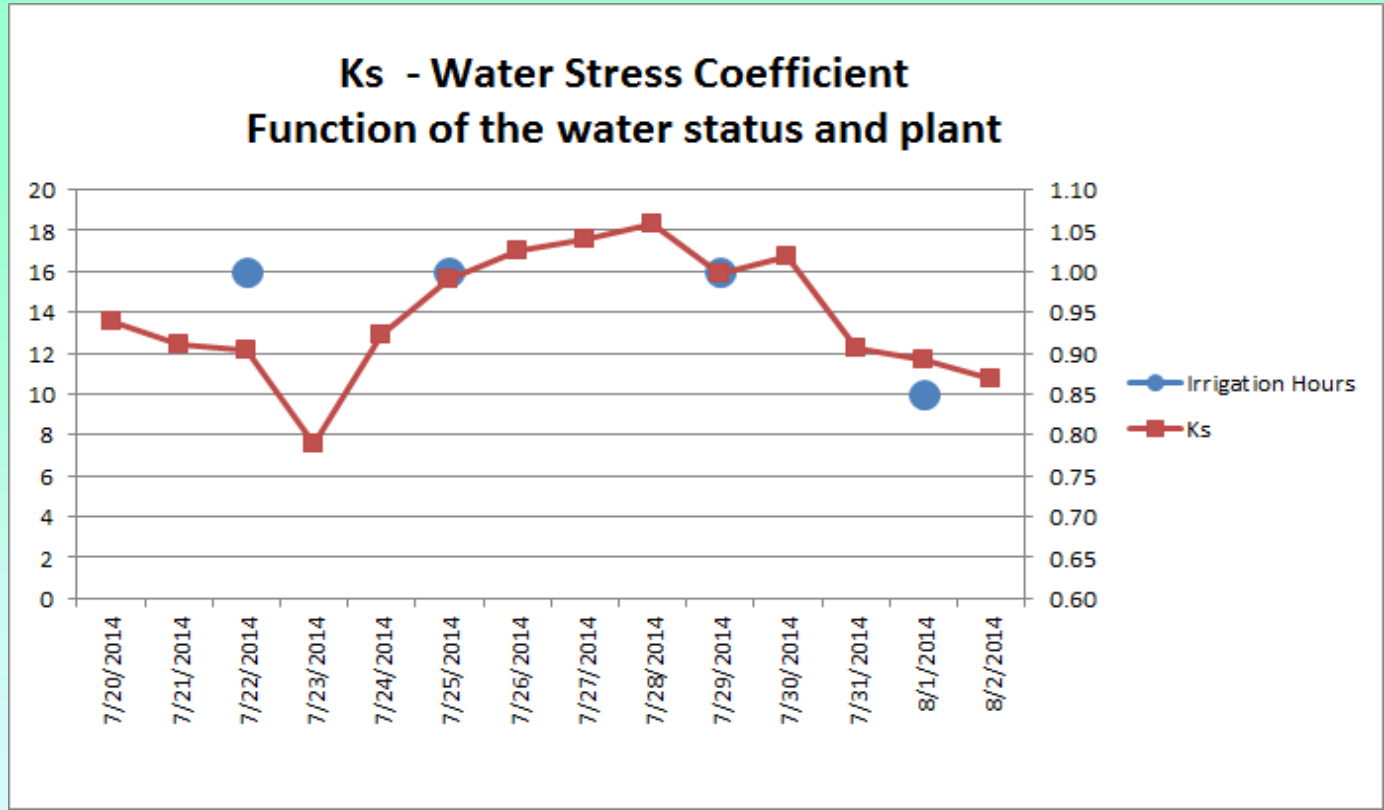
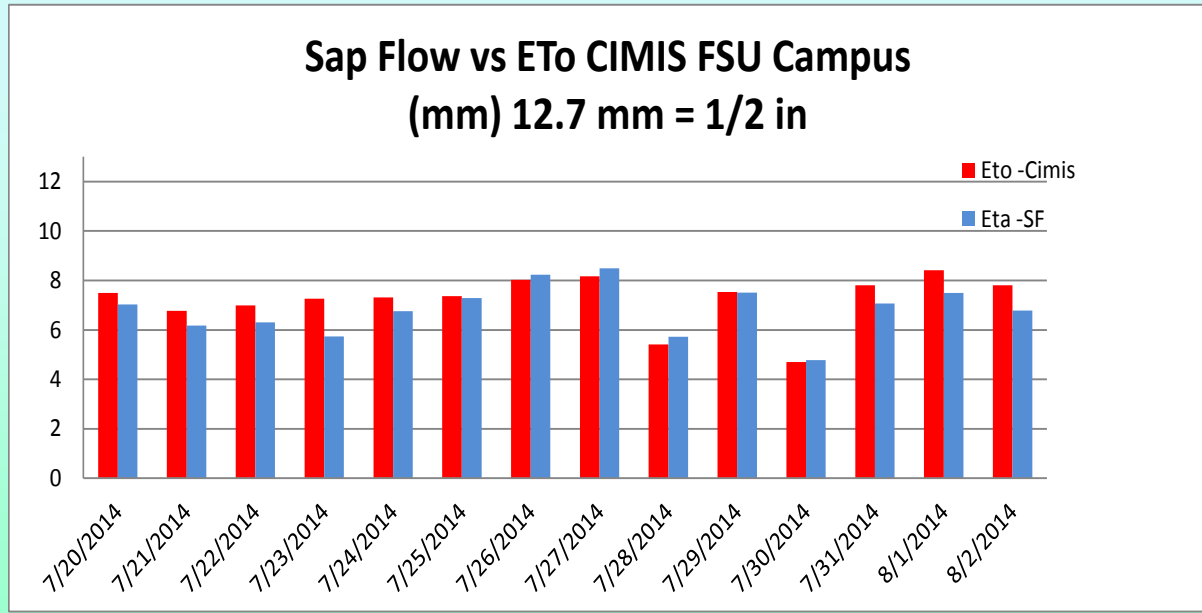
Transpiration is 75 % of maximum T

New terminology, but simple for sap flow

Ratio of Sap Flow / ETo = Stress Factor

Kc = 1.0 to 1.05

Note that the 28th and the 30th are low ET days. Cooler weather are not normally days to set Kc for July.

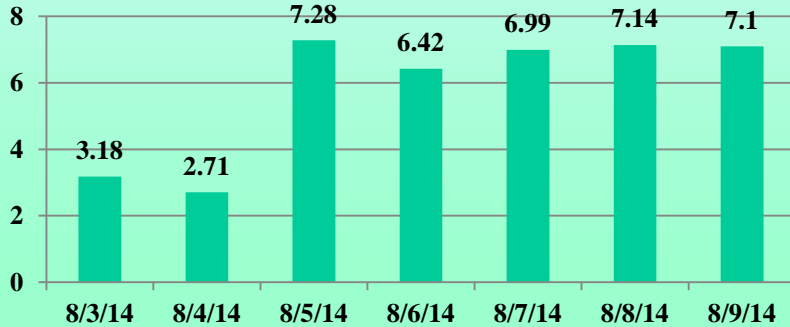


Ks after stress induced – 7 days before shaking

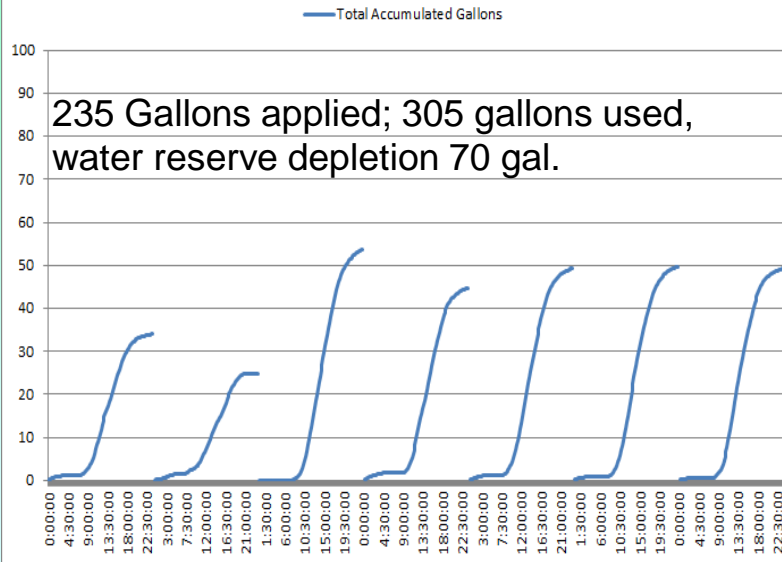
10 hrs @ Aug 5

7 hrs @ Aug 8

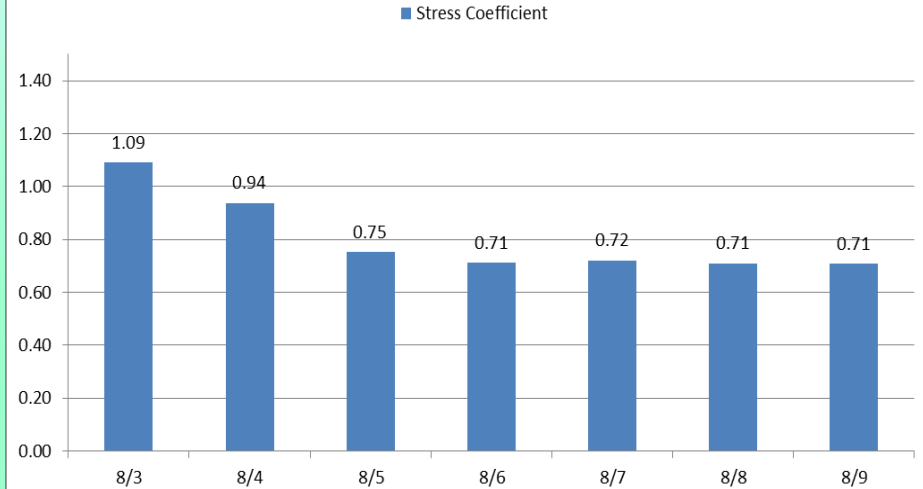
**ET Accumulated(mm)/Day
Average 5.8 mm /day**



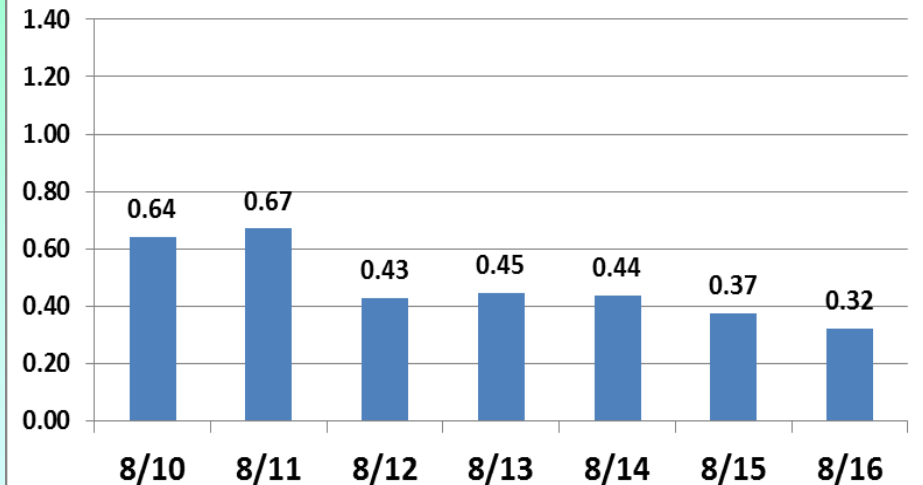
**Gallons per Day Accumulated Sap Flow
305 Gallons per tree 8/3 to 8/9
(Highest day 53gal, lowest 24gal, avg 43**



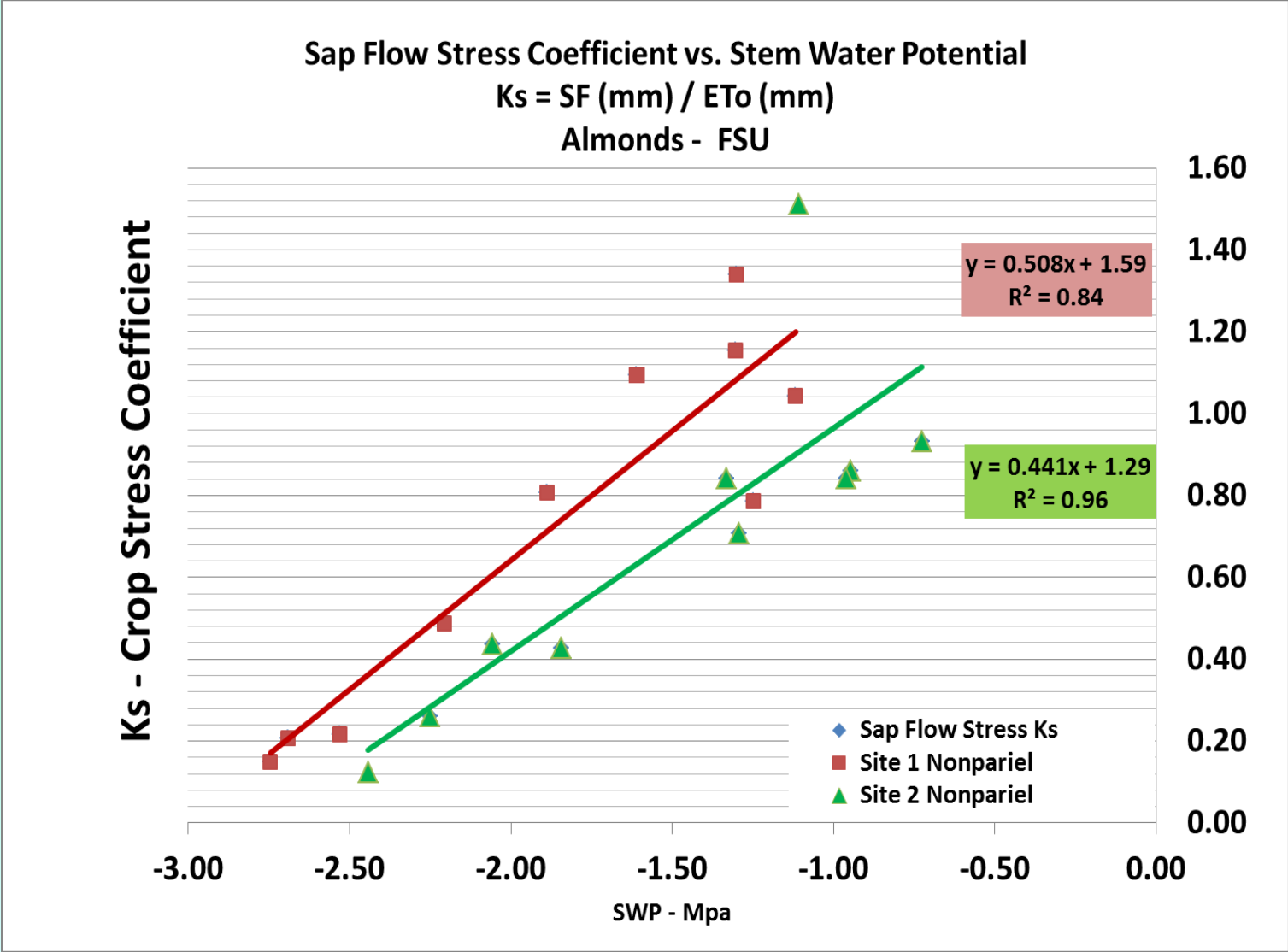
Stress Coefficient - Ks



Stress Coefficient - Ks



Sap Flow Ks is highly correlated to Stem Water Potential



Simple Data Presentation

- Plant water use curves, hourly water use
- Total daily water use - extrapolated to whole plants
- Stress Factor bar chart
- Growers need only decide how much plant stress can be tolerated before irrigating
- Growers also know about how much water should be applied
- Water can be conserved if irrigation schedule is reduced and Stress Factor remains at 1.0

Use SapIP Direct-Connect Dashboard To collect data directly from the SapIP Node

Attach Windows PC to the USB port of the SapIP to control, and monitor.

Used for stand-alone operation as well.

Retrieves data and exports raw results to Excel, Agrisensors, or local charts.

SAP IP Interface - [Dashboard]

File Help Data Interface Connect - Dashboard Connect - USB Command

Logger Name: SPIP20039 Location: Tesda Area Version: Ver116.012

Date / Time: 05/20/2013 10:34:38 Log: [T] Interval: TN Record: 2 Mesh Status: [F] LPM: [F]

Disconnect Refresh Status Reboot Help

Battery Heater(mV) Heater(mA) Heater(mV): [Set Heater] Warmup Delay: [Set Delay]

Memory(%)

Channel Configuration			
Channel ID	Channel Type	Range	Label
Channel - 0	0	5	Ch1
Channel - 1	0	5	Ah1
Channel - 2	0	5	Bh1
Channel - 3	0	0	V1
Channel - 4	0	5	Ch2
Channel - 5	0	5	Ah2
Channel - 6	0	5	Bh2
Channel - 7	0	0	V2
Channel - 8			Pont
Channel - 9			ACFre
Excitation	1000		
Heater	ON	-5000 mV - 4895 mV - 0039 mA	

Save Channel Config

Data Commands

Start Logging - Display Real Time Stop Logging Import into Database Cancel Import / Display Hist. From SAPIP Export Data

Date Range: 5/20/2013 5/20/2013

Display From Database Display Hist. From SAPIP Erase All Data from SAPIP Erase All Data from Database

Settings

Log Interval: [] Set Interval Sync Date Time

SapIP Benefits

- Using the plant to determine crop water use and stress levels
- Irrigation scheduling using “Stress Factor”
- Water conservation
- Monitor sap flow, soil moisture, and weather, all through one network
- Agrisensors.NET data graphs and charts

SapIP Applications

- Irrigation Scheduling
- Works on - Almond, Grape, Citrus, Pecan, Peach, Plum, Pistachio, Corn, Cotton, Soybean, Sunflower, Walnut, and many more crops and trees
- Stress management
- Scalable to cover large areas
- Water balances
- Soil moisture or weather station networks
- Phytoremediation and Water Balances
- Drought tolerance evaluation

IRT – IR Leaf Temp System

- Wireless IR Temperature
- Leaf temperature
- Plant stress measurement
- Irrigation scheduling
- For center pivot or other irrigation systems
- Uses low-cost Zigbee coordinators
- Developed with USDA-ARS



Dynamax IRT Sensors



- Measure IR temperature +/- 0.5 C
- 10 degree Field of View
- Leaf temperature relates to plant stress
- Wireless, Analogue, & SDI versions
- Compare to CWSI or other Stress Model
- Excellent for use with drip or center pivot irrigation systems
- For use on crops where sap flow will not work, or on moving platforms

XBIB Coordinator

- XBIB Coordinator connected to PC
- “IRT Watcher” Software
- Will handle up to (10) IRT Sensors or Repeaters
- 300 to 500 meter “Line of Sight”
- Use Repeaters to add distance, 500 meters
- Up to (25) IRT possible with Repeaters

IRT-SALH Data Loggers

- Monitors up to (25) IRT
- Stress Accumulator Software
- ZB Link Transmitter
- Memory for 65,000 records
- SD Card Slot for Data
- WiFi for data collection, 20-50 ft
- Webpage data access, Mapping for locations



Thanks!
Any questions?

admin@dynamax.com

800-896-7108

www.dynamax.com