WORKSHOP
PROGRAMME

12TH INTERNATIONAL WORKSHOP ON SAP FLOW

31 OCTOBER – 3 NOVEMBER 2023

ROTORUA, AOTEAROA NEW ZEALAND

#SAPFLOW2023

ISHS

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EXHIBITORS

Scottech
www.scottech.net

Monday 30th October

13.00 – 17.00	**Pre-Workshop hosted by Event Partner ICT International** Principles and Practical Applications of in-situ measurements of Plant Water Status: Integrating plant, soil and environmental measurements in the age of Internet-of-Things technology **Ben Umali, Sam Fisher & Eliana Francesca Rigato**	Scion Campus, Rotorua Transport is provided from the Millennium Hotel to Scion and returning after Icebreaker. Refer to page 15 for transport times.
17.30 – 19.30	**Icebreaker Function** Sponsored by Scion	Scion Campus, Rotorua

Tuesday 31st October

08.00 – 18.00	**Registration opens** Mokoia Room, Millennium Hotel Rotorua
08.45 – 09.15	**Mihi Whakatau & Conference Opening**
09.15 – 10.00	**Chair: Mike Clearwater**
09.15 – 10.00	**Invited speaker: Dr Steve Green**, *Plant and Food Research* Tree water use and irrigation management for salinity and drought
10.00 – 10.30	**Morning Tea**
10.00 – 12.30	**Session 1 – Crop Management Chair: Louise Comas**
10.30 – 10.50	**Rafael Fernandes** Optimizing kiwifruit quality through estimation of leaf stomatal conductance from sap flux density: the KIWIQUALI project
10.50 – 11.10	**John Ji** Apple production management with new combinational plant sensor systems
11.10 – 11.30	**Junqi Zhu** Comparing common assimilate pool and phloem carbohydrate transport models for simulating biomass variability and carbohydrate partitioning
11.30 – 11.50	**Teruko Kaneko** Isohydric stomatal behaviour alters fruit vascular flows and minimizes fruit size reductions in drought-stressed avocado
11.50 – 12.10	**Junghoon Lee** Internet of Vines
12.10 – 12.30	**Shinichi Takeuchi** Establishment of cultivation method of guava using unheated greenhouse only in winter, verification by sap flow measurement
12.30 – 13.15	**Lunch**

Tuesday 31st October (continued)

13.15 – 15.20	**Chair: Christine Scoffoni**
13.15 – 14.00	**Invited speaker: Prof Benye Xi**, *Beijing Forestry University* Evaporation-driven internal hydraulic redistribution alleviates root drought stress: mechanisms and modelling
	Session 2 – Ecophysiology and Hydrology
14.00 – 14.20	**David Whitehead** Daily estimates of whole tree photosynthesis and water use efficiency demonstrate homeostasis between leaf and canopy scales for Dacrycarpus dacrydioides and Podocarpus totara growing in a common garden experiment
14.20 – 14.40	**Paulina Dukat** Employing Sap-flux Measurements in Research Spanning Tree to Forest Ecosystem Physiology Processes
14.40 – 15.00	**Donald White** Variation between clones of P. radiata in the effect of weather and site on diurnal and seasonal patterns of diameter growth and sap velocity
15.00 – 15.20	**Bruce Dudley** Hydrological monitoring and modelling in New Zealand's 'Forest Flows' research catchments
15.20 – 15.40	**Afternoon Tea**
15.40 – 16.40	**Poster Flash Talks Chair: Matt Watson**
16.40 – 18.00	**Poster Session 1**
18:00 – 20:00	**Free Time / Dinner**
20.00 – 21.30	**Remote Presentation Session Chair: Cate Macinnis-Ng**
20.00 – 20.05	**Welcome**
20.05 – 20.20	**Brunella Morandi** The "FruitCREWS" network: a comprehensive analysis to define the best sensing technologies for irrigation scheduling
20.20 – 20.35	**Salah Er-Raki** Sap flow measurements in olive trees *(Olea europaea L.)* cultivar Menara under regulated and sustained deficit irrigation strategies
20.35 – 20.50	**Melissa Venturi** Sap flow and fruit vascular relations under progressive water stress conditions
20.50 – 21.05	**Costantino Sirca** Sap flow measurements for assessing water status in grapes
21.30	**End of Workshop Day 1**

Wednesday 1st November

08.00 - 18.00	**Registration opens** Mokoia Room, Millennium Hotel Rotorua
08.15 – 10.00	**Chair: Rafael Poyatos**
09.00 – 09.45	**Invited Speaker: Prof Christine Scoffoni,** *California State University* The dynamic multi-functionality of leaf water transport outside the xylem
9.45 – 10.05	**Early Career Highlight: Zuosinan Chen,** *University of Oulu* High-resolution in-situ water flux and water isotope measurements in northern environments: do boreal trees use more summer rainfall or less when the winter snowfall is reduced?
10.05 – 10.30	**Morning Tea**
10.30 – 12.30	**Session 3 – Vascular Functioning Chair: Benye Xi**
10.30 - 10.50	**Timo Vesala** The hidden role of gases in trees
10.50 - 11.10	**Luciano de Melo Silva** Gas diffusion kinetics in relation to embolism formation and propagation in angiosperm xylem: a mini-review of the latest experimental and modelling evidence
11.10 – 11.30	**Willem Goossens** Foliar water uptake dynamics in shade and sun leaves of Fagus sylvatica L
11.30 – 11.50	**Kris Kramer-Walter** Xylem uptake and mobilisation of exogenous sucrose in dormant kiwifruit canes
11.50 – 12.10	**Kaat De Boeck** Impact of woody tissue photosynthesis on the hydraulic function of Platanus x acerifolia
12.10 – 12.30	**Louise Comas** Do lags in hydraulic time constants of sap flow through maize stems correspond to size of capacitance tissues?
12.30 – 13.15	**Lunch**
13.15 – 15.20	**Chair: Renee Prokopavicius**
13.15 – 14.00	**Invited Speaker: Prof Brendan Choat,** *Western Sydney University* Physiological mechanisms of drought-induced mortality in woody plants
	Session 4 – Stress and Climate Change
14.00 – 14.20	**Phumudzo Tharaga** Detecting period of water stress among sweet cherry trees under rainfed conditions using sap flow during the fruit development stages
14.20 – 14.40	**Zeshan Zhang** Comparing AquaCrop simulated transpirations with sap flow measurements in cotton under drip irrigation and plastic film cover condition
14.40 – 15.00	**Wakana Azuma** The daily use of stem-water storage in two clonal cultivars of Japanese cedar estimated from sap flow and dendrometer
15.00 – 15.20	**Robert Skelton** Root stratification and small leaf sizes promote function of co-occurring shrubs during dry summer periods in a diverse shrubland
15.20 – 15.40	**Afternoon Tea**

Wednesday 1st November (continued)

15.40 – 17.20	Session 5 – Methodology Chair: Timo Vesala
15.40 – 16.00	**Josef Urban** Remembering Professor Jan Čermák
16.00 – 16.20	**Georgianne W. Moore** Developing a robust tree-specific in situ calibration for thermal dissipation sap flow sensors
16.20 – 16.40	**Matthew Rennie** Flexible external heat-pulse sap flow sensor for bi-directional measurement of sap-flow in small-diameter stems of Populus alba and Betula pendula
16.40 – 17.00	**Venkatraman Srinivasan** The role of noise on the accuracy of different sap-flow measurements using heat pulse techniques
17:.00 – 17.20	**Steve Green** Optimization of heat-pulse methods to measure sap flow in kiwifruit
17.20 – 17.40	**Break**
17.40 – 18.20	**ISHS Working Group Business Meeting**
18.20	**End of Workshop Day 2**

Thursday 2nd November

07.30 – 17.00	**Field Trip 1:** Kaingaroa and Whirinaki Forests	Return/Depart from Millennium Hotel Rotorua
08.00 – 17.00	**Field Trip 2:** Bay of Plenty Horticulture Sponsored by Croptide	
19.00 – Late	**Workshop Dinner** Urbano Restaurant is a 20 minute walk from the Millennium hotel but a shuttle bus will be provided. Refer to page 15 for transport times.	Urbano

Friday 3rd November

08.30 – 13.15	**Registration opens** Mokoia Room, Millennium Hotel Rotorua
09.15 – 10.00	**Chair: Georgianne Moore**
09.15 – 10.00	**Invited Speaker: Prof Cate Macinnis-Ng,** *University of Auckland* Saving some for later: Seasonal variations in sap flow, withdrawal and elastic storage in large trees under throughfall exclusion
10.00 – 10.30	**Morning Tea**
10.00 – 12.30	**Session 6 – Vascular Functioning Chair: Georgianne Moore**
10.30 – 10.50	**Sicong Gao** Evaluating the relationship between sun-induced chlorophyll fluorescence and transpiration in sparse Australian floodplain woodlands using sap flow measurements
10.50 - 11.10	**Katrien Schaepdryver** Quantification of sap flux density and stem water content of oak and beech by using the Sapflow+ method
11.10 – 11.30	**James Robinson** Examining the effect of sap sugar concentration on fibre embolism in sugar maple (Acer saccharum)
11.30 – 11.50	**David Moore** Modeling Winter-Dormant-Season Sap Flow and Sap Pressurization With Wood Temperature in Deciduous, Woody Angiosperms in New England
11.50 – 12.10	**Christopher Vincent** How dynamic is phloem speed in trees?
12.10 – 12:.30	**Damien Sellier** A numerical model of coupled phloem-xylem flows for dynamic long-distance transport in trees
12.30 – 13.15	**Lunch**
13.15 – 15.00	**Chair: Rob Skelton**
13.15 – 14.00	**Invited speaker: Dr Rafael Poyatos,** *CREAF* Sap flow monitoring in environmental research networks: lessons learned from SAPFLUXNET and challenges for the future
14.00 – 15.20	**Session 7 – Stress and Climate Change**
14.00 – 14.20	**Josef Urban** Effect of forest canopy density on water relations and carbon assimilation of understory herbs during drought
14.20 – 14.40	**Rafael Poyatos** Water use strategies in pines and oaks across the globe are modulated by soil water availability
14.40 – 15.00	**Kazuhiro Nishioka** Exploring the potential of acetic acid as a biostimulant to reduce water loss in grapevines in dry condition using advanced sap flow sensors
15.00 – 15.20	**Closing Session**
15.20	**End of Workshop**

Sap Flow 2023 – Poster List

Poster Number	First Name	Last Name	Poster Title
P.1	**Eduardo**	**Barragan**	Pit membrane thickness variation across vein orders and species: Impact on drought tolerance
P.2	**Yi**	**Chen**	In vivo measurement of potassium ions in pine xylem sap with implanted bioelectronics
P.3	**Yongfan**	**Chen**	Sap velocity and transpiration in cotton chemical defoliation management: optimizing spraying time to balance yield and mechanical harvest efficiency
P.5	**Taketo**	**Kogire**	Diurnal and seasonal changes in acoustic emissions and sap flow in living tree trunks
P.6	**Renee**	**Prokopavicius**	The mysterious lives of urban street trees: How does drought affect tree function and performance?
P.7	**Muthianzhele**	**Ravuluma**	Sap flow dynamics of young and mature pomegranate orchards under semi-arid conditions
P.8	**Spandan**	**Sogala Balaram**	Review of heat pulse based sap flow measurement techniques
P.10	**Shinichi**	**Takeuchi**	Long term sapflow measurements to verify avocado outdoor cultivation in Japan
P.11	**Xiao**	**Tao**	Mechanisms of different effects of nitrogen deposition on soil respiration and its components in urban-rural gradient forests
P.12	**Sarah**	**Verbeke**	Validating wheat sap velocity measured with a heat pulse sensor with PET imaging
P.13	**Christopher**	**Vincent**	Chronic versus acute impacts of tropical storms on vascular function and canopy recovery
P.14	**Moari**	**West**	Water use characteristics of planted indigenous and exotic tree species
P.15	**Xiaoning**	**Zhao**	Spatial variations of trunk sap flux density in Populus tomentosa and their influencing factors
P.16	**Xin**	**Zhuang**	Effects of sink limitation on Betula Pendula carbon translocation

Invited Speakers

Brendan Choat

Professor, HIE - Western Sydney University

Brendan Choat is a Professor at the Hawkesbury Institute for the Environment, Western Sydney University. He studies plant ecophysiology with a focus on plant hydraulics and water relations, particularly the impacts of drought on forest ecosystems. Prof. Choat has more than 100 peer-reviewed publications and is listed in the top 1% of Highly Cited Researchers in his field. His research has been published in top-ranked journals including Nature, Science, PNAS, and New Phytologist. He obtained his PhD in the field of plant physiology from James Cook University in 2003. From 2003-2005 he worked as a Post Doctoral Fellow at Harvard University and held a second Post Doctoral Fellowship in the Department of Viticulture and Enology at the University of California, Davis from 2005-2008. He returned to Australia in 2008 to work as a Research Fellow at the Australian National University, before moving to the Hawkesbury Institute for the Environment in 2011. He is Editor in Chief for Prometheus Protocols and on the editorial board of the journal Plant Biology. He was awarded an Alexander von Humboldt Fellowship in 2010 and an ARC Future Fellowship in 2013 for his work on mapping drought response in trees.

Steve Green

Senior Scientist - Plant and Food Research

Steve is a senior research scientist from the Sustainable Production – Systems Modelling group at Plant and Food Research in Palmerston North, New Zealand. Steve holds a PhD degree in Physics from the University of Edinburgh, Department of Forestry and Natural Resources. His research interests that include the design and construction of instrumentation to measure water and nutrient flows through soil, and the development of system models to predict the effect of land use activity on the receiving environment. Steve's current experimental work in New Zealand is aimed at improved understanding, through measurement and modelling, of the dynamics of water and nutrient flows in orchard systems. Steve is also working on other projects in Kenya (avocados), Dubai (salinity impacts on date palms, forestry and field crops) and Italy (kiwifruit). Steve has been active in environmental research, including sap flow for the past 40 years and has published more than 150 refereed scientific papers. Steve was awarded the 2022 Kiwifruit NZ Innovation Award for his work to understand the impact the kiwifruit industry is having on our land and water resources.

Invited Speakers

Cate Macinnis-Ng

Professor, University of Auckland

Cate Macinnis-Ng is Associate Professor and Academic Group Leader for the Ecology and Evolutionary Biology Group in the School of Biological Sciences at Waipapa Taumata Rau, the University of Auckland. In 2015 Cate received a Rutherford Discovery Fellowship to establish the first forest-based throughfall exclusion experiment in a New Zealand Forest to study the impacts of drought on kauri water use and carbon uptake. Cate is a principal investigator with Te Pūnaha Matatini, the Centre for Research Excellence in Complex Systems. She is Past President of the New Zealand Ecological Society (2018-2019) and Councilor representing the Constituent Organisations for the Royal Society Te Apārangi. She was contributing co-author on Chapter 11 (Australia and New Zealand) for Working Group II of Assessment Round 6 of the IPCC published in 2022.

Rafael Poyatos

Researcher, CREAF

I am Researcher at CREAF (Barcelona, Spain), Humboldt Fellow at the Max-Planck Institute for Biogeochemistry (Jena, Germany) and Adjunct Lecturer at the Autonomous University of Barcelona. My research focuses on plant functioning at multiple spatial and temporal scales, in the context of global change and with a strong focus on trees and forests. In particular, I am interested in understanding plant water and carbon fluxes, studying the interactions between plant traits, whole-plant physiology and ecosystem processes. I have experience in measuring water and carbon fluxes in Temperate, Mediterranean and Subarctic terrestrial ecosystems. I currently coordinate the SAPFLUXNET initiative (https://sapfluxnet.creaf.cat/), in which we curate the first global database of sap flow measurements and we use it to disentangle the determinants of tree water use and drought responses at the global scale.

Invited Speakers

Christine Scoffoni

Professor, California State University

Christine Scoffoni is a Professor of Plant Biology in the Department of Biological Sciences at California State University, Los Angeles, and an international leader in research on hydraulic functioning in plants. Christine is French and American, completing her MSc at the University of Bordeaux, and her PhD at the University of California, Los Angeles, in 2014. She currently leads a research group that uses experimental and comparative approaches in plant physiology, ecology and evolution to answer fundamental questions regarding the function of plant diversity, with an emphasis on plant adaptation to environmental stresses such as drought. Why do species exhibit such diversity in leaf size, shape and venation architecture? What are the physiological and anatomical traits that drive species' resistance to drought? Christine's graduate students and collaborators work on a broad range of questions relating to plant hydraulics and leaf venation architecture, species adaptation to drought, and to the evolution of plant traits.

Benye Xi

Researcher, Beijing Forestry University

I am Benye Xi from Beijing Forestry University, China. My research field is silviculture. I have been focusing on developing innovative and high-efficient forest management techniques based on a deep understanding of tree-water relations, root function, and structure. I am particularly interested in developing and refining the measurement and estimation methods of plant water use in both individual tree and stand scales.

Pre-Workshop Presenters

Sam Fisher

Sam is an Environmental Scientist with a broad experience in the field of hydrography and remote data acquisition systems and Internet of Things (IoT) technologies. He leads product development in the area of IoT-integrated sensors. He has supported customers from around the world in IoT sensor applications and in field deployment.

Eliana Francesca Rigato

Fran has a Master of Science degree in Forestry and Environmental Science from the University of Padova (Italy). She gained extensive field work experience in the plant industry, native ecosystems management and protection after migrating to Australia in 2016. She has been a Forestry scientist at ICT since 2019 and worked mainly in technical sales, field installations and training customers in soil, plant and environmental monitoring solutions.

Ben Umali

Ben has backgrounds in forestry, GIS and soil science and obtained his PhD in Agriculture from the University of Adelaide. He is Plant Application Scientist at ICT International. This role enables him to work with many scientists across the world in the measurement of plant water status.

Field Trips

Date: Thursday 2 November 2023
Field Trip 1: 07.30 - 17.00 | Field Trip 2: 08.00 - 17.00
Departure and Return to workshop venue - The Millennium Hotel Rotorua

Field Trip 1: Kaingaroa and Whirinaki Forests

A visit to both an exotic forestry research site, and an outstanding natural podocarp forest. At 2900 square kilometers, Kaingaroa forest is the largest plantation forest in New Zealand. First planted in the early twentieth century, the forest is located on volcanic plateau soils to the south of Rotorua. The trip will begin by crossing the forest to visit a Pinus radiata research site established by Scion (NZ Forest Research Institute) that includes sap flow and dendrometer sensor networks. In the afternoon we will visit Whirinaki Te Pua-a-Tāne Conservation Park, a precious area of natural, old-growth lowland forest, featuring towering indigenous podocarp trees. Often described as a natural wonder, Whirinaki is one of the best remaining examples of this forest type in NZ.

Lead: Dean Meason (Scion)

Field Trip 2: Bay of Plenty Horticulture

A tour of the horticultural industry of the Bay of Plenty, heart of the NZ kiwifruit industry. Known for it's deep, fertile soils and moderate climate, the Te Puke area is where commercial kiwifruit production first began outside of China, and is also now an important area for avocado production. This trip will include a visit to a high-productivity gold kiwifruit orchard, site of long-term monitoring of orchard water and nutrient fluxes. Sensors in use at the site include sap-flow and water potential sensors, light sensor arrays and soil groundwater flux meters. The group will then continue to Plant and Food Research Te Puke, for a tour of their extensive kiwifruit and avocado breeding and research facilities.

Leads: Steve Green and Jonghyun Choi (Plant & Food Research)
Kindly supported by: Croptide

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Icebreaker & Dinner

Icebreaker

Date: Monday 30 October
Time: 17.30 - 19.30
Venue: Te Whare Nui o Tuteata, Scion, Titokorangi Drive, Whakarewarewa, Rotorua 3010

The Icebreaker Reception will take place at **5:30pm on Monday 30 October** at the Eastwood Café which is a new vibrant and bustling cafe on the Scion campus. Come along for a fantastic networking opportunity over drinks and nibbles; a great way to meet with colleagues and fellow delegates prior to the workshop commencing the following morning.

Workshop Dinner

Date: Thursday 2 November 2023
Time: 19.00 - Late
Venue: Urbano Bistro, 289 Fenton Street, Glenholme, Rotorua 3010
www.urbanobistro.co.nz

The Workshop Dinner will take place in the evening at Urbano Bistro at **7pm on Thursday 2 November.** Come along for a great evening with your fellow delegates.

A multi-award winning eatery serving breakfast, lunch and dinner, making Urbano a go-to for casual and intimate dining, business meetings, or functions.

Bistro dining by night - serving modern, innovative contemporary cuisine. Licensed bar with comprehensive range of beer, wine, spirits and non-alcoholic beverages.

Workshop Venue

The Millennium Hotel Rotorua
1270 Hinemaru Street, Ohinemutu, Rotorua 3010
Phone: 07 347 1234
www.millenniumhotels.com

Centrally located, the Millennium Hotel Rotorua is ideal as an international conference venue and base from which to enjoy the many superb activities available in this diverse region. Designed to pamper this deluxe hotel offers luxury accommodation and warm, hospitable service.
Millennium Hotel Rotorua is endorsed with a Qualmark 4 Plus Star and Enviro Gold rating for its sustainability practices. The hotel is also a member of the Rotorua Sustainable Tourism Charter.

Transport

The workshop organisers have arranged shuttle busses between the main workshop venue and the social function venues.

Monday 30 October

Pre-Conference Workshop:	12.15	- Pickup from Millennium Hotel, drop off at Scion Campus
Icebreaker Function:	17.10	- Pickup from Millennium Hotel, drop off at Scion Campus
	19.30	- Pickup from Scion Campus (café), drop off at Millennium Hotel

Thursday 2 November

Field Trip 1 - Kaingaroa and Whitinaki Forests:

Departure:	07.30	- Pickup from Millennium Hotel
Return:	17.00	- Drop off at Millennium Hotel

Field Trip 2 - Bay of Plenty Horticulture:

Departure:	08.00	- Pickup from Millennium Hotel
Return:	17.00	- Drop off at Millennium Hotel

Workshop Dinner:	18.45	- Pick up from Millennium Hotel, drop off at Urbano
	21.45	- Pick up from Urbano, drop off at Millennium Hotel