Viticultural effects on sparkling wine

BROCK
UNIVERSITY
June 2015

Fiona Kerslake
Research Fellow

tia
TASMANIAN INSTITUTE OF AGRICULTURE

UNIVERSITY of TASMANIA

Tasmanian Government

THANK YOU

- CCOVI
- The Dr Don Martin Sustainable Viticulture Fellowship
- Dr Belinda Kemp
- My husband and parents-in-law

ACKNOWLEDGEMENTS

- TIA and the vine to wine team
- The Australian Wine Research Institute
- Clover Hill Wines
- Frogmore Creek Wines
- Jansz Tasmania
- Josef Chromy Wines
- Meadowbank Wines
- Moorilla Wines
- Pooley Wines
- Tamar Ridge/Brown Brothers
- Tolpuddle Vineyard
- Winemaking Tasmania
- Flextank, Croplands

MY BACKGROUND

- B.Agr.Sc (Hons) – University of Tasmania 2003
- Vineyard labour, cellar labour, cellar door
- PhD – 'The effect of vineyard management practices on Pinot Noir fruit and wine composition' 2011
    - Drs Jo Jones, Dugald Close, Bob Dambergs and Richard Smart
    - Industry collaboration with Tamar Ridge Estates
        - It's all about the season!
- Internship with Dr Nick Dokoozlian at E&J Gallo winery 2008

MY BACKGROUND

Post-doctoral position 2009-2012

- Sparkling wine viticulture
- Federally funded $1.8M grant 50:50 with local industry consortium
    - Leaf removal
    - Crop load
    - Pruning method (cane versus spur pruning)
    - Objective measures of sparkling wine
    - Sparkling press fraction analysis

- WSET Level 3 2012

MY BACKGROUND

Post-doctoral position 2012-present

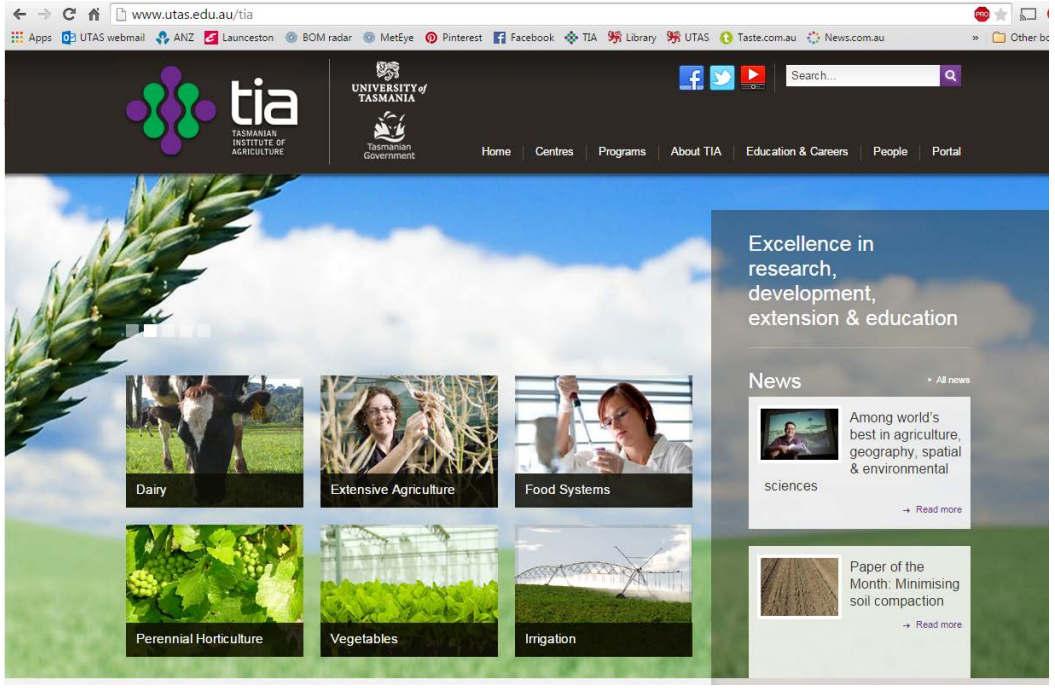
- Collaborative project with Brown Brothers
  - 'Factors that underpin the certainty of yield and quality for cool climate viticulture'
  - Mechanical leaf removal (table Pinot and Chardonnay)
  - Weather conditions and effect on fruitfulness
  - Cane versus spur pruning (sparkling Pinot and Chardonnay, table Pinot and Sauvignon Blanc)

MY BACKGROUND

- Current ‘side project’
- Knowledge cascade from sparkling wine work to craft cider industry
- Student last year
  - Maturity
  - Size
  - 3 varieties, red delicious, pink lady, royal gala

TIA

- Tasmanian Institute of Agriculture
  - Joint venture of state government and University of Tasmania
- www.tia.tas.edu.au



TIA VINE-TO-WINE GROUP

Fiona Kerslake

– Pinot noir and sparkling wine viticultural practices and effect of grape and wine quality

Jo Jones

– Fruitfulness and yield prediction

– Carbohydrate cycle and analysis

TIA VINE-TO-WINE GROUP

Kathy Evans

– Grapevine pathology, TIA D&E convenor

Pip Bricher

– Sense-T sensor network project manager

TIA VINE-TO-WINE GROUP

Anna Carew

– Controlled phenolic release (CPR) techniques for Pinot noir production

Angela Sparrow

– ACE macerations for Pinot noir wine production

TIA VINE-TO-WINE GROUP

Bob Dambergs

– AWRI node

– Rapid analysis, chemometrics expertise

Dugald Close

– Group leader

– Vine to wine to market

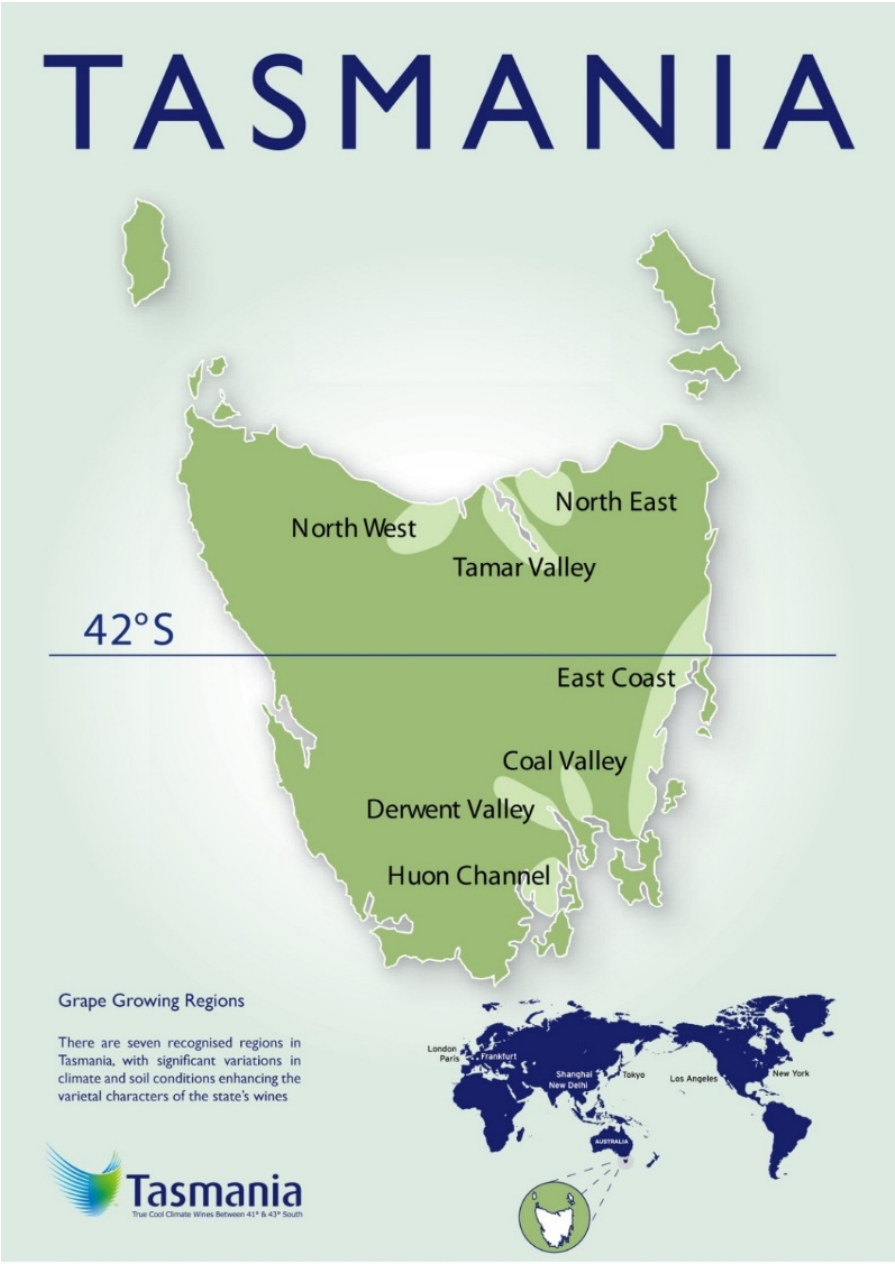
TIA VINE-TO-WINE GROUP

David Sanderson

– Embedded industry development and extension officer

Michele Buntain

– TIA extension officer


TASMANIA
North East
North West
Tamar Valley
42°S
East Coast
Coal Valley
Derwent Valley
Huon Channel
Grape Growing Regions
There are seven recognised regions in Tasmania, with significant variations in climate and soil conditions enhancing the varietal characters of the state's wines
Tasmania
True Cool Climate Wines Between 41° & 43° South
London
Paris
Frankfurt
Shanghai
New Delhi
Tokyo
Los Angeles
New York
AUSTRALIA

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TASMANIAN INDUSTRY 2014

	Bearing Area (ha)	Yield (tonnes)	Mean tonnes/ha
Pinot No	641	2683	4.2
Chardonnay		1199	3.5
Sauvignon Blanc		1134	7.0
Pinot Gris	131	345	2.6
Riesling	107		5.2
Cabernet Sauvignon	46		4.1
Merlot	19	79	
Traminer	19	56	
Total (including minor varieties)	**1611**	**6,624** **2013 – 11,392**	**4.1** **2013 ~ 7.1**

0.4 % of Australia's 2014 crush

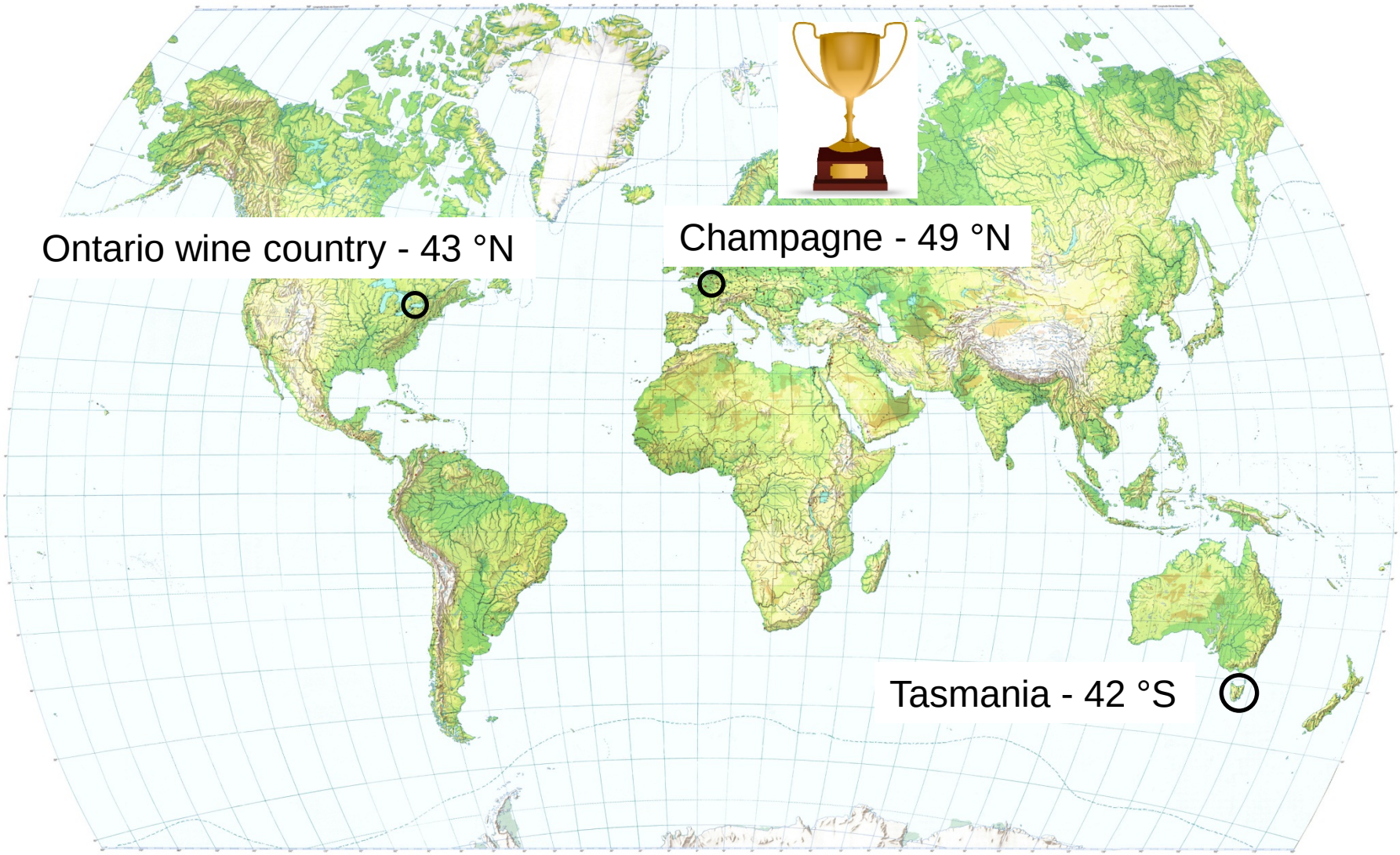

TASMANIA
AUSTRALIA
TOTAL SALES
By Volume
0%
BELOW $15 *°
100%
ABOVE $15 *°
93%
BELOW $15 **
7%
ABOVE $15 **
AVERAGE PRICE
$ = $1
$ = $100
$12.01
Per Litre #
Export Markets 2013
$2400
Per Tonne – All Wine
2013
$4.72
Per Litre #
Export Markets 2013
$499
Per Tonne – All Wine
2013
44% Pinot Noir
23% Chardonnay
12% Sauvignon Blanc
11% Pinot Gris
5% Riesling
5% Other Varieties
NB: 31.6% Sparkling
24% Shiraz
22% Chardonnay
14% Cabernet Sauvignon
5% Sauvignon Blanc
3% Pinot Gris
2% Pinot Noir
2% Riesling
28% Other Varieties
* Centaurus Partners | ° Wine Tasmania 2013 | • Wine Australia 2012 | # bottled wine only

com.au)

TASMANIAN SPARKLING INDUSTRY 2014

Variety	Total tonnes	Sparkling tonnes	
Pinot Noir	2683	1206	45 %
Chardonnay	1199	905	75.6 %
Total (including other varieties)	**6624**	**2197**	**33 %**

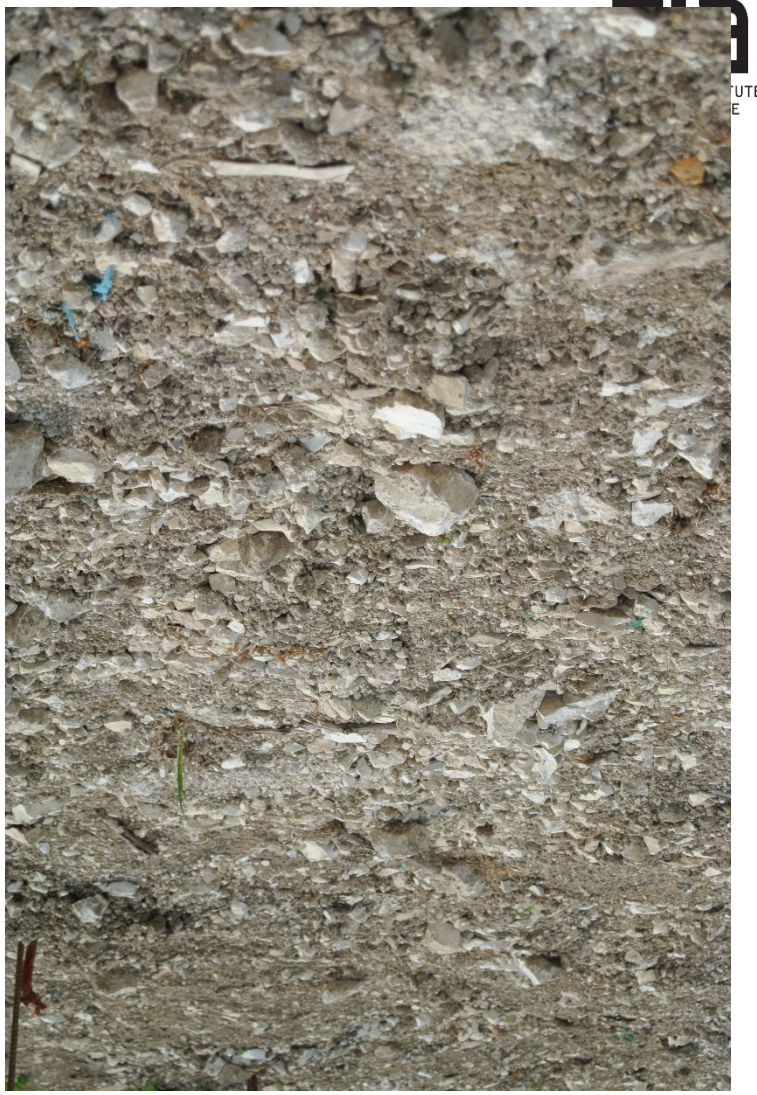
Table Pinot = 41 %


Ontario wine country - 43 °N
Champagne - 49 °N
Tasmania - 42 °S

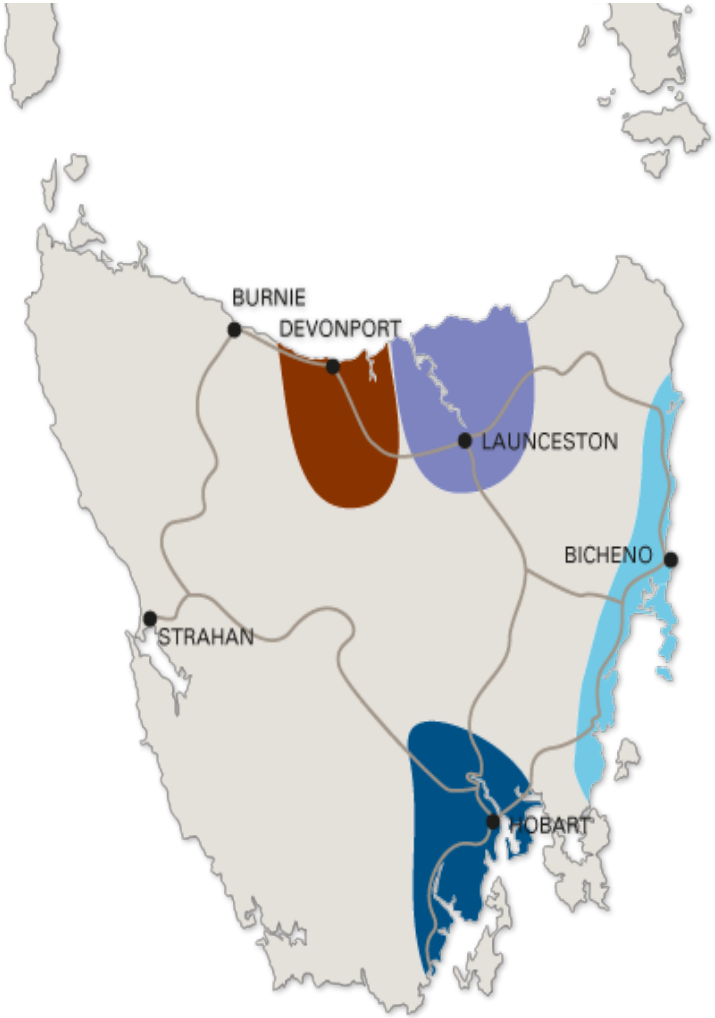
CHAMPAGNE SOILS

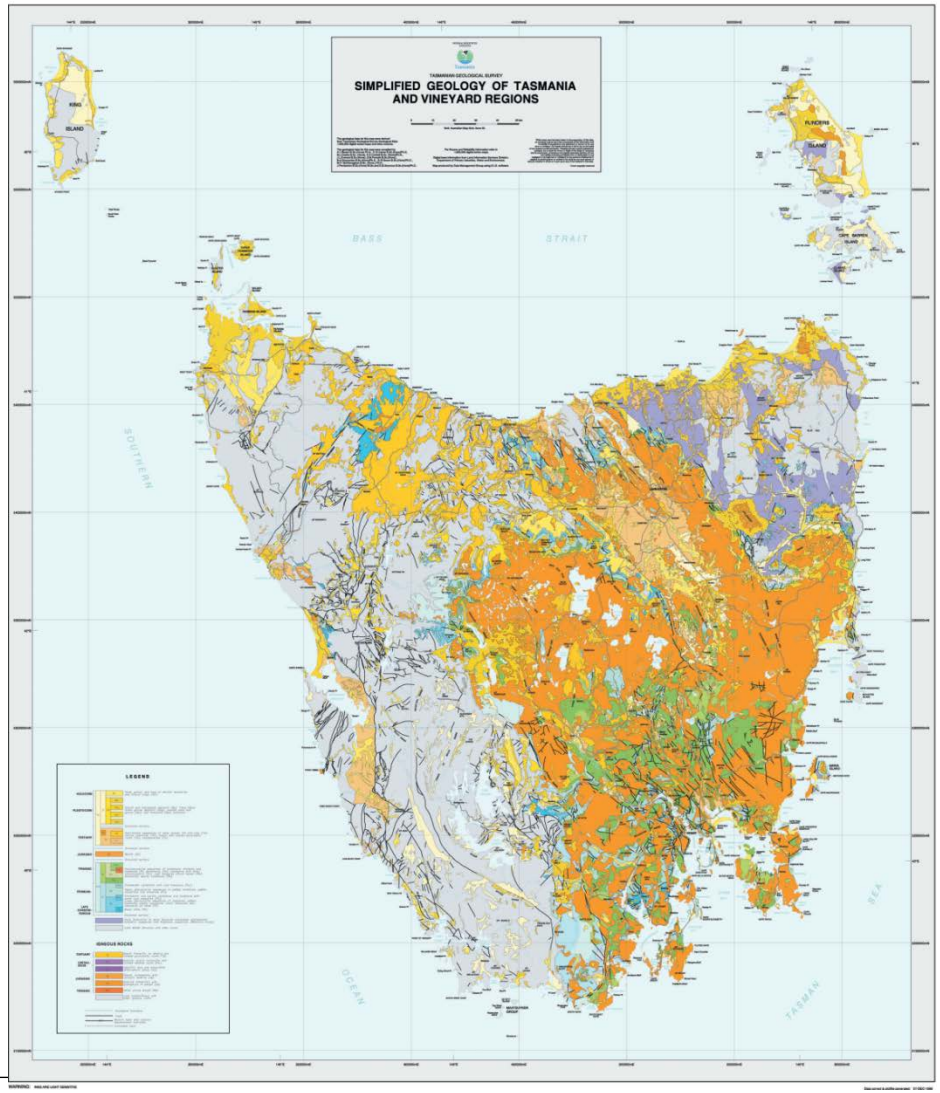
- Chalk dominant
  - Good drainage
  - Sufficient water retention
  - Nutrient poor

- Côte des Bar = Kimmeridgian clay
  - Calcareous clayey soil

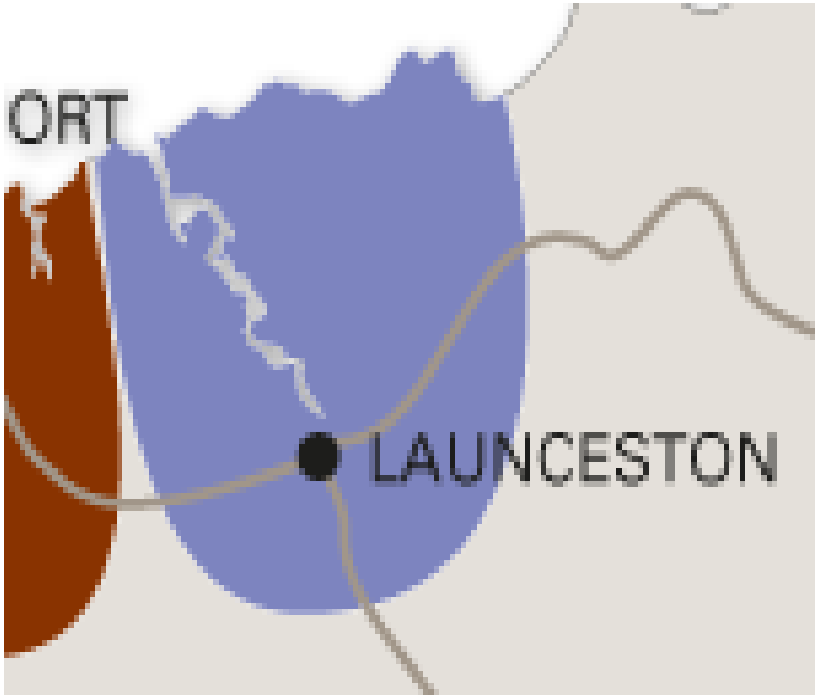


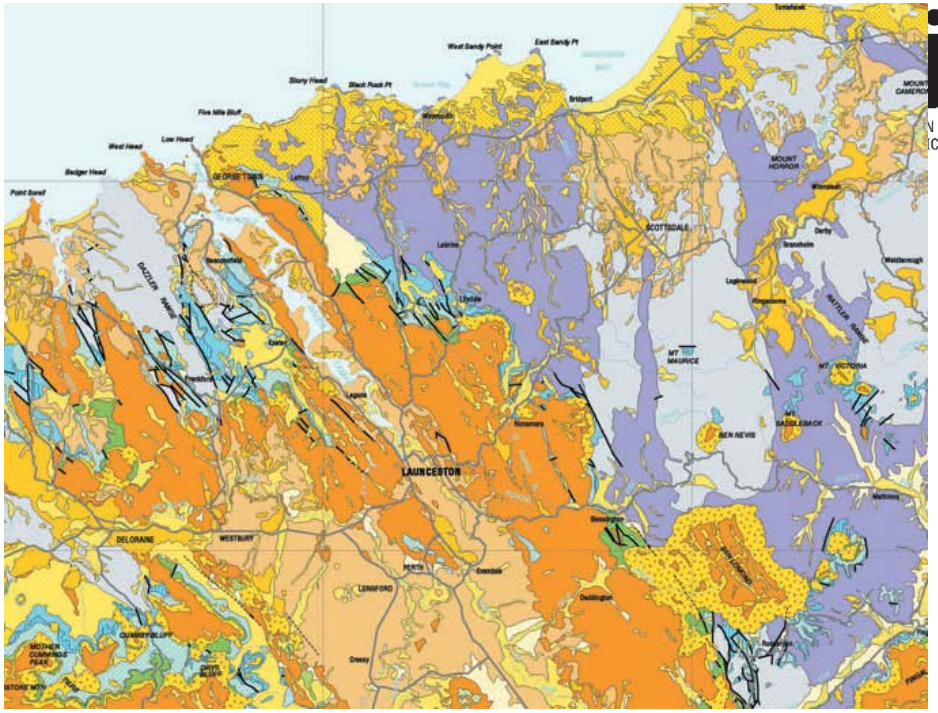
TASMANIAN SOILS





TAMAR VALLEY/PIPERS RIVER





- Vary from the sandy, free-draining, nutrient poor soils to the deep, reddish brown, well structured light clay soils
- Huge viticultural challenge

TASMANIAN SOILS

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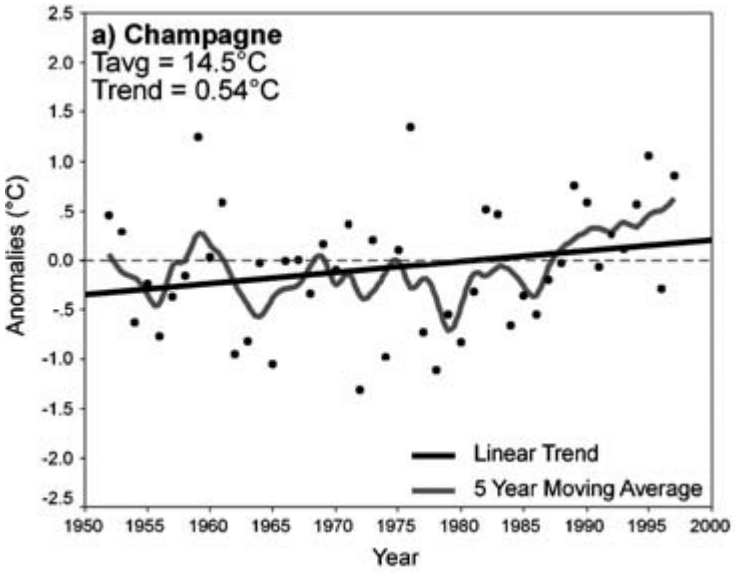
CHAMPAGNE CLIMATE

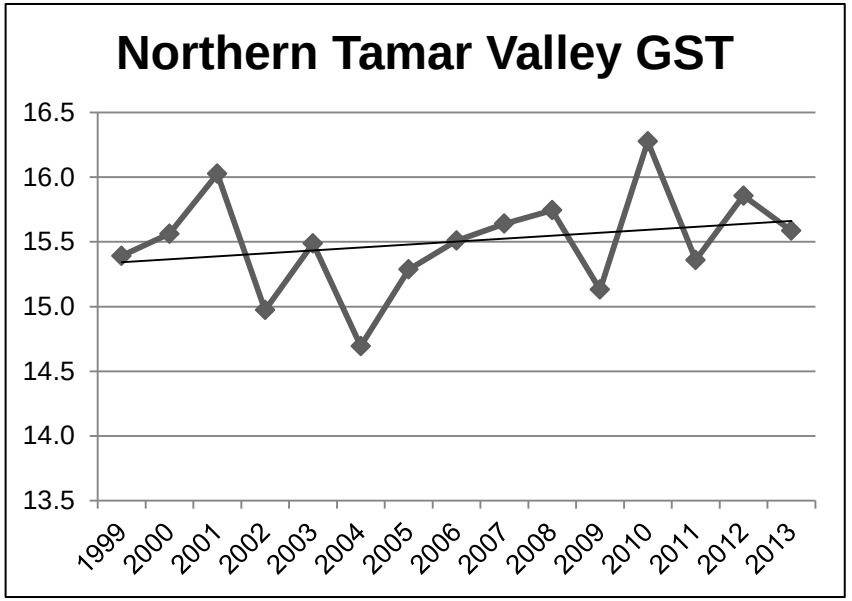
- 49 ° N
- GST = 14.5 °C (Jones et al 2005)
- Some winter freeze
- Spring frosts
- Inclement season and harvest weather
- Low sugar and high acid

Changing



TASMANIAN CLIMATE

- GST – 15.5 °C
- Mild winters (no freeze)
- Spring frosts (sometimes late autumn)
- Inclement season and harvest weather
- Managing sugar and acid balance more variable



SHAW (2012)

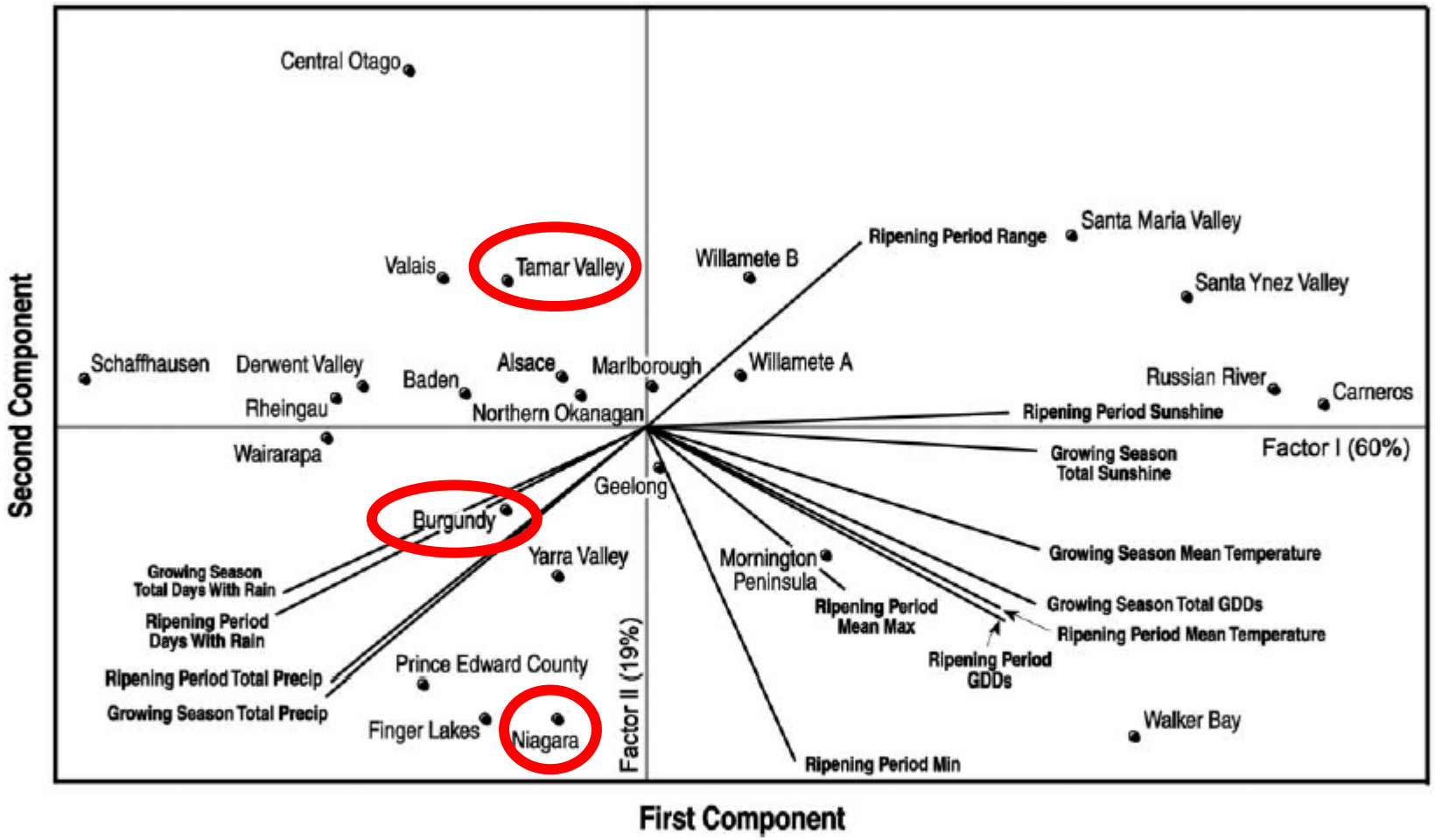
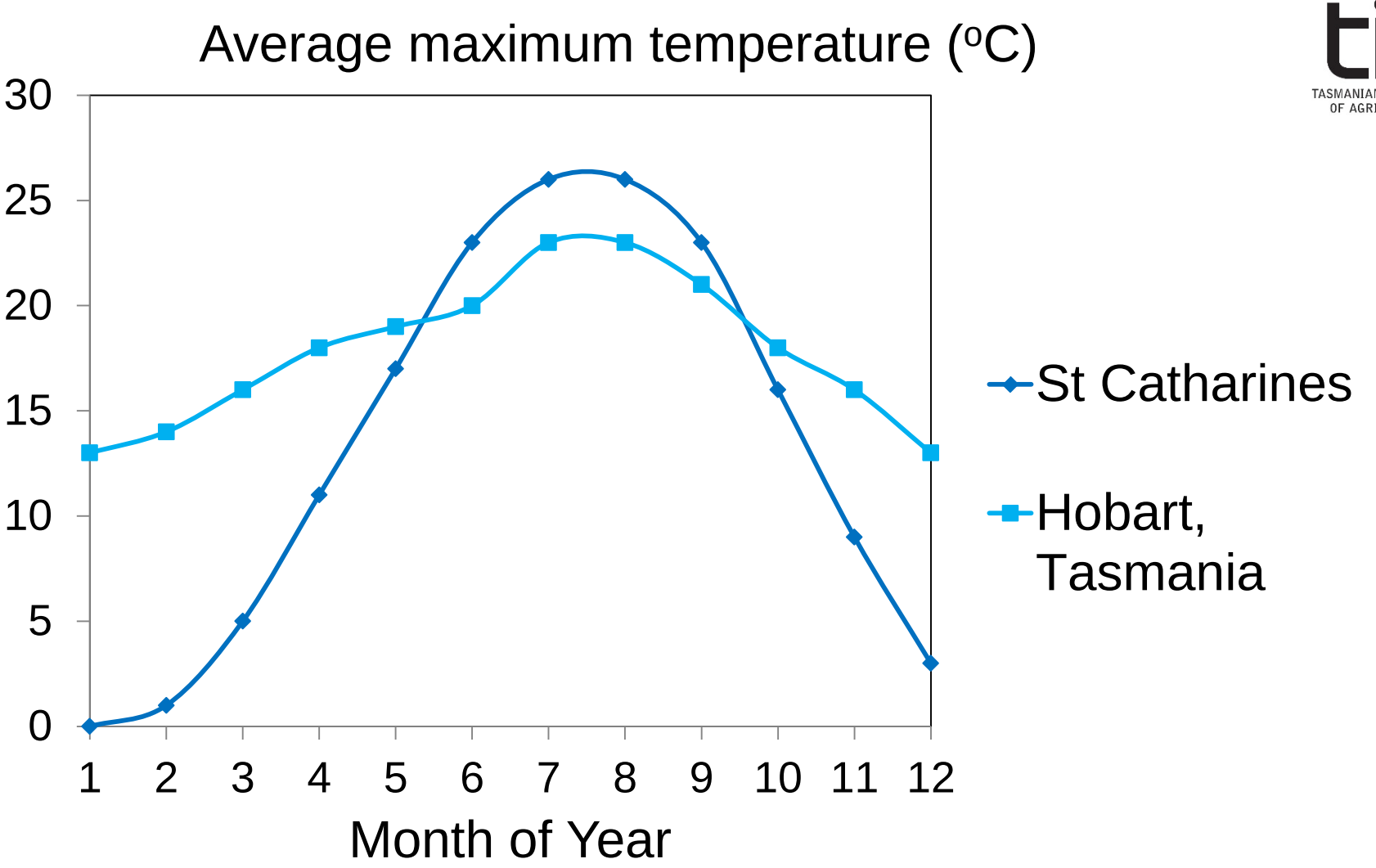
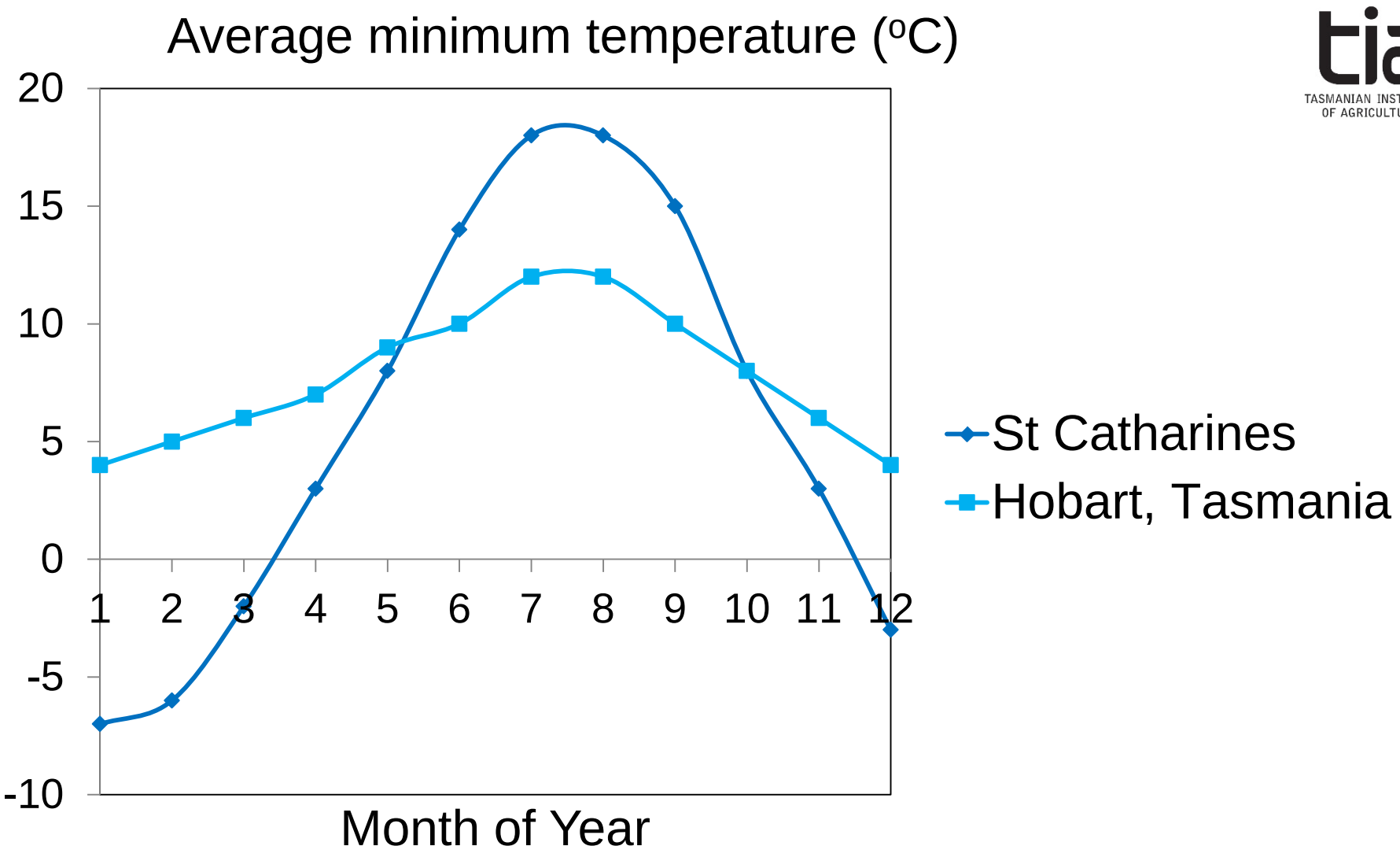


Figure 2. PCA of wine regions based on 13 temperature and precipitation variables estimated for the growing season (April–October for the northern hemisphere and October–April for the southern hemisphere) and ripening period (September–October and February–March).


Average maximum temperature (ºC)
30
25
20
15
10
5
0
1
2
3
4
5
6
7
8
9
10
11
12
Month of Year
St Catharines
Hobart, Tasmania



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Early spring freeze events

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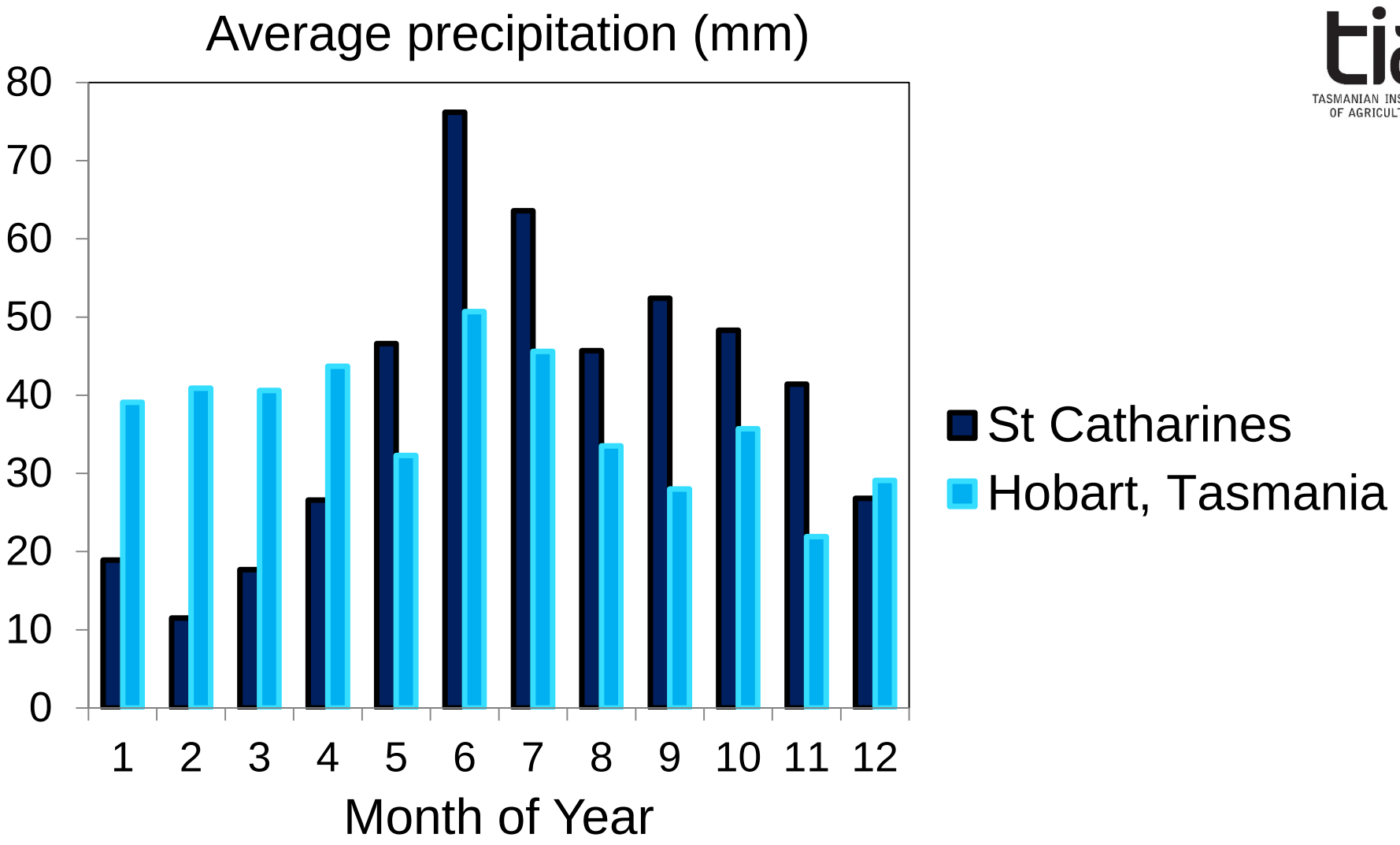

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DR ANDREW PIRIE

- Australia's first PhD in viticulture
  - Pirie and Mullins (1977)
    - Inter-relationships of Sugars, Anthocyanins, Total Phenols and Dry Weight in the Skin of Grape Berries during Ripening
- Tasmanian wine industry pioneer
- Has been establishing vineyards since 1974 in Tasmania
  - Pipers Brook and Ninth Island
- Ran the largest company
  - Tamar Ridge (320 ha)
- Established Apogee vineyard (2 ha)

ED CARR

- Arras and Bay of Fires (Hardys – Accolade)
- Australia’s most awarded sparkling winemaker
- Believes that Tasmania can, and should, produce exceptional sparkling wines equal to the world's best.
- Premium parcels of Chardonnay and Pinot Noir
- Separate vinification until blending
- Long maturation

NATALIE FRYAR

- Jansz (Yalumba) winemaker 2001-2014
- Now under own label and Ghost Rock
- "You've really got to get to know the fruit you're working with and form a close relationship with the viticulturists and grape growers."
- Her winemaking philosophy is firmly focused on the vineyard with a great deal of time spent walking the rows looking at the vines and tasting the grapes through the various stages of ripeness.

INDUSTRY CONSENSUS

- It's all about the fruit quality
- Without good fruit there is no good sparkling

QUESTIONS ABOUT TASSIE?

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ORGANIC/BIODYNAMIC?

GiESCO – GRUISSAN

– Viticultural research scientists congress

– Prof Andy Reynolds

IDENTIFICATION DE PRATIQUES VITICOLES CAPABLES D'ASSURER LA CONSERVATION DE LA BIODIVERSITÉ DES SOLS DE CHAMPAGNE

IDENTIFICATION OF VINEYARD CULTIVATION PRACTICES ABLE TO ASSURE CONSERVATION OF CHAMPAGNE SOIL BIODIVERSITY

Daniel CLUZEAU[1*], Arnaud DESCÔTES[2], Cédric GEORGET[2], Rémi CHAUSSOD[3], Rachida NOUAIM-CHAUSSOD[3], Guénola PERES[1], Muriel GUERNION[1], Daniel CYLLY[1], L. ROUGÉ[1], Olivier GARCIA[2], Laurent PANIGAI[2], Dominique MONCOMBLE[2]

[1] OSUR, Université de Rennes 1 – Agrocampus Ouest, France

[2] Comité Interprofessionnel du Vin de Champagne (CIVC), Epernay, France

[3] Services & Études en Microbiologie des Sols et de l'Environnement (SEMSE), France

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GiESCO

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INTEGRATED, ORGANIC AND BIODYNAMIC VITICULTURE (INBIODYN) : A COMPARATIVE STUDY OVER A 7-YEARS-PERIOD

VITICULTURE INTÉGRÉE, BIOLOGIQUE ET BIODYNAMIQUE (INBIODYN): SYNTHÈSE DE SEPT ANS D'OBSERVATIONS

Johanna DÖRING[1,*], Georg MEISSNER[1], Manfred STOLL[1] and Randolf KAUER[1]

[1]Hochschule Geisenheim University, Von-Lade-Str. 1, 65366 Geisenheim, Germany

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THE RELATIVE SUSTAINABILITY OF ORGANIC, BIODYNAMIC AND CONVENTIONAL VITICULTURE

LA DURABILITÉ RELATIVE DE LA VITICULTURE BIOLOGIQUE, BIODYNAMIQUE ET CONVENTIONNELLE

Cassandra COLLINS[1,*], Christopher PENFOLD[1], Luke JOHNSTON[1], Susan BASTIAN[1], Petra MARSCHNER[1]

[1]*School of Agriculture, Food and Wine, University of Adelaide, Waite Research Institute, PMB 1, Glen Osmond, SA 5064*

[*]*Corresponding author: Dr Cassandra Collins Ph +61 8 313 6813, email cassandra.collins@adelaide.edu.au*

TIA'S CONTRIBUTION TO INDUSTRY

- Industry's contribution to TIA
- 2008-2012 Federal Government funding matched by local producers totalling $1.8M
  - Pinot Noir viticulture
  - Pinot Noir oenology
  - Sparkling viticulture
  - Sparkling oenology
  - Tunnel sprayer
- ICCS, Hobart, February 2012

THE STARTING POINT

- Online survey 2010
  - Viticultural management practices
  - Winemaking methods
  - Helped develop trial methodology both in the vineyard and in the winery

TASMANIAN ONLINE SURVEY RESULTS 2010

- Clones
  - Pinot Noir
    - D5V12 (77.3 %)
  - Chardonnay
    - Penfolds (58.8 %)
    - I10V1 (41.2 %)

D5V12 This clone is originally French but comes via California (FPS19). It is a Pinot 'droit' type with erect foliage. Yields are higher and wine generally inferior.

- Rootstocks or own roots?
  - 96% of vines are grown on own roots (now ~90-92 %)
  - New large plantings going in on rootstocks
- Designation of parcels of fruit for sparkling production
  - 45.5% designated sparkling blocks based on previous years
  - 31.8% decision is made by the winemaker annually
  - 22.7% decide at pruning
  - 18.2% decide close to harvest
  - 4.5% decide when the crop load is known to be too high for table wine

TASMANIAN ONLINE SURVEY RESULTS 2010

- Pruning
  - Cane pruning preferred
  - 95 % of Chardonnay cane pruned
  - 91 % of Pinot Noir cane pruned
- Cluster removal
  - 40 % Chardonnay
  - 52 % Pinot Noir
- Shoot thinning
  - 47 % Chardonnay
  - 46 % Pinot Noir
  - Suspect this is mainly crown thinning
- Leaf removal
  - 38 % Chardonnay
  - 47 % Pinot Noir

PROJECT METHODOLOGY

- Further investigation of common viticultural management practices in dedicated sparkling vineyards:
  - Timing of leaf removal
    - Anecdotal evidence of impact on phenolics
  - Crop load/target yield (pruning level)
    - Where is the yield ‘sweet spot’
  - Pruning method (cane or spur pruning)
    - Some moves to mechanisation (larger plantings)

- Measure fruit and base wine parameters, including phenolic profiles

PROJECT METHODOLOGY

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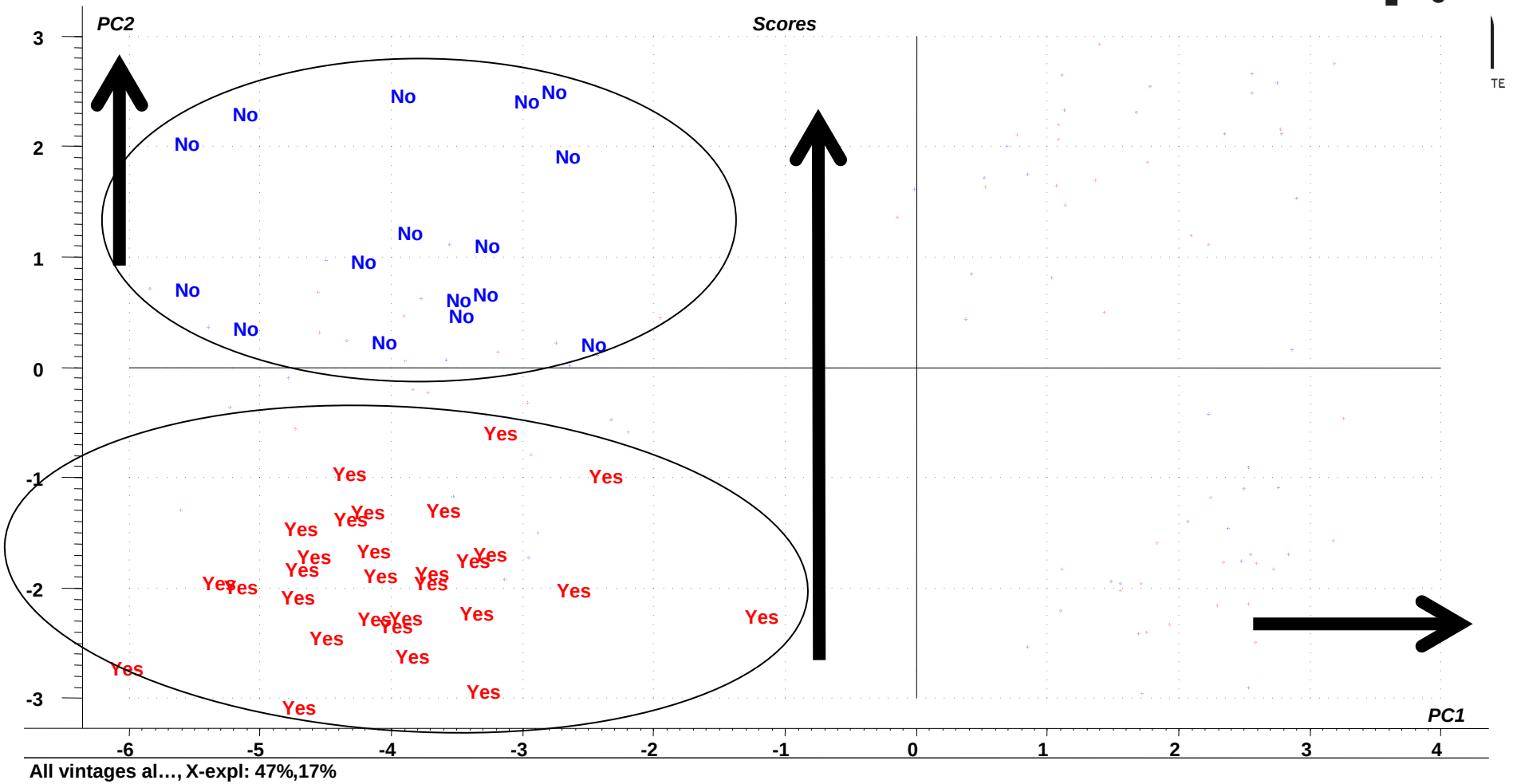
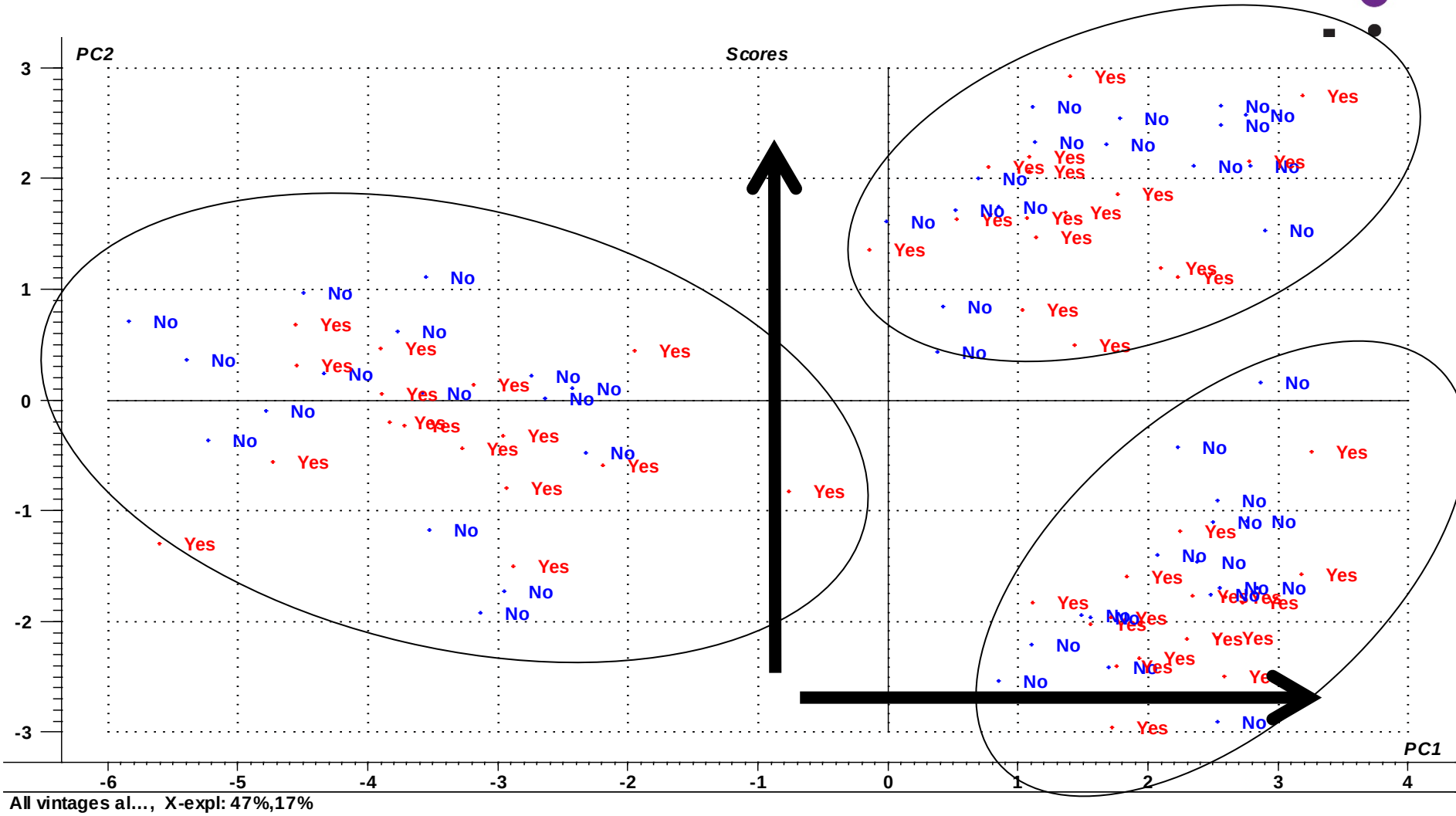
- Use Principal Component Analysis (PCA) to reduce the 300 wavelengths used to a single point to determine if they are different from one another
- Data reduction method
  - Takes multiple variables and recalculates new values and plots them against each other
  - Shows relationships between samples and variables

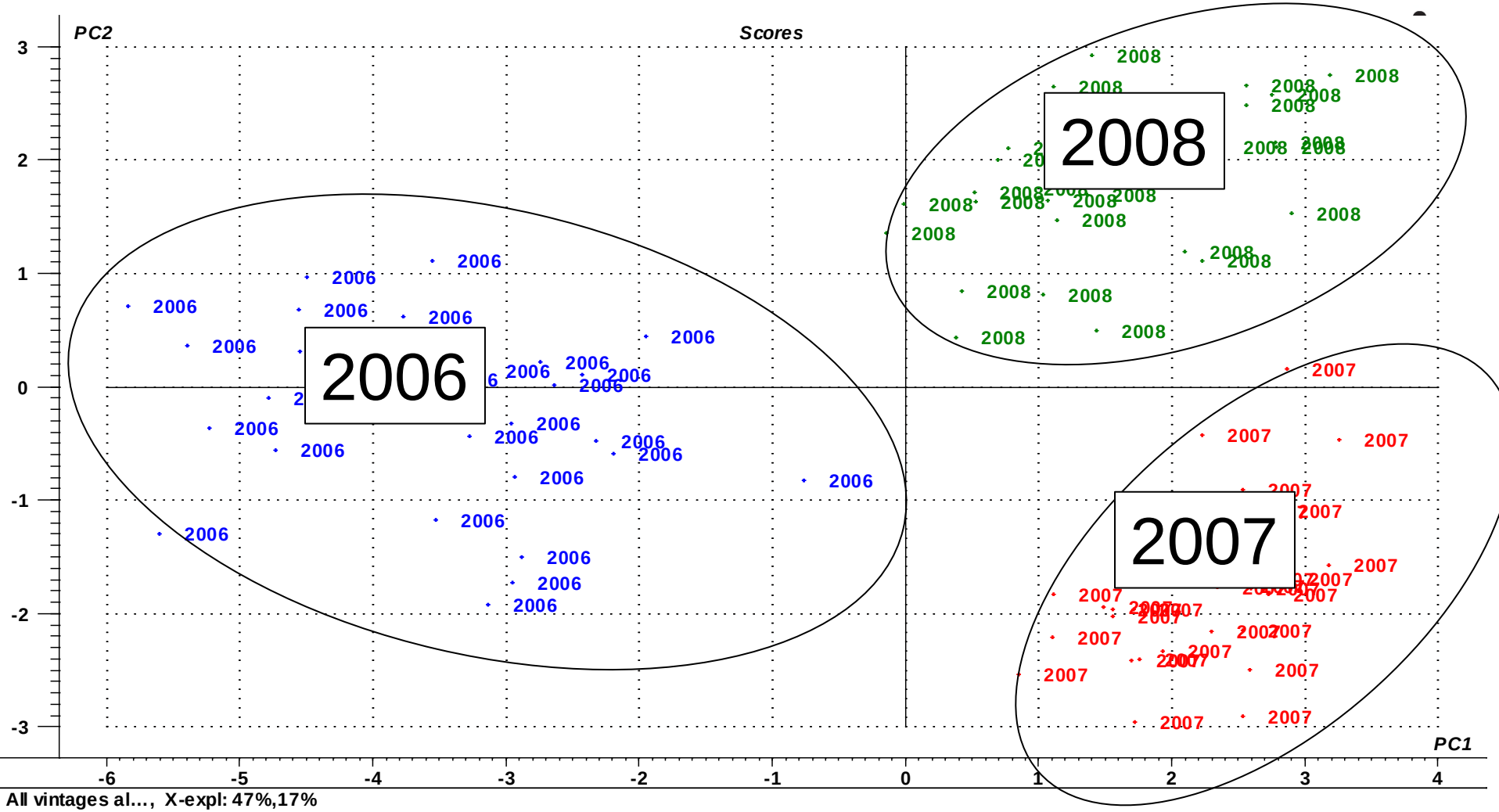
PCA 101


PC2
Scores
PC1
3
2
1
0
-1
-2
-3
-6
-5
-4
-3
-2
-1
0
1
2
3
4
No
Yes
All vintages al..., X-expl: 47%,17%

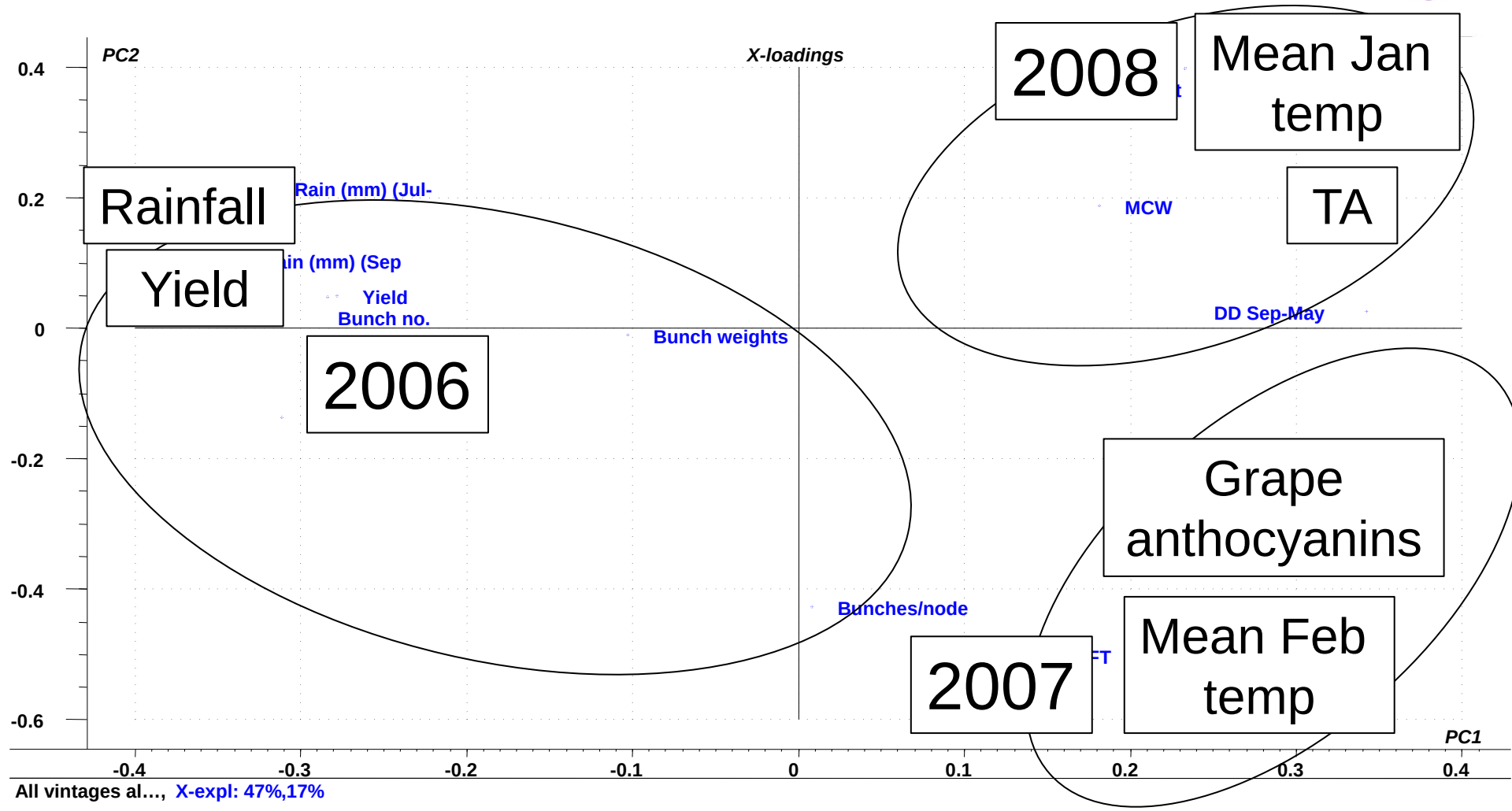
PCA 101



PCA 101



PCA 101

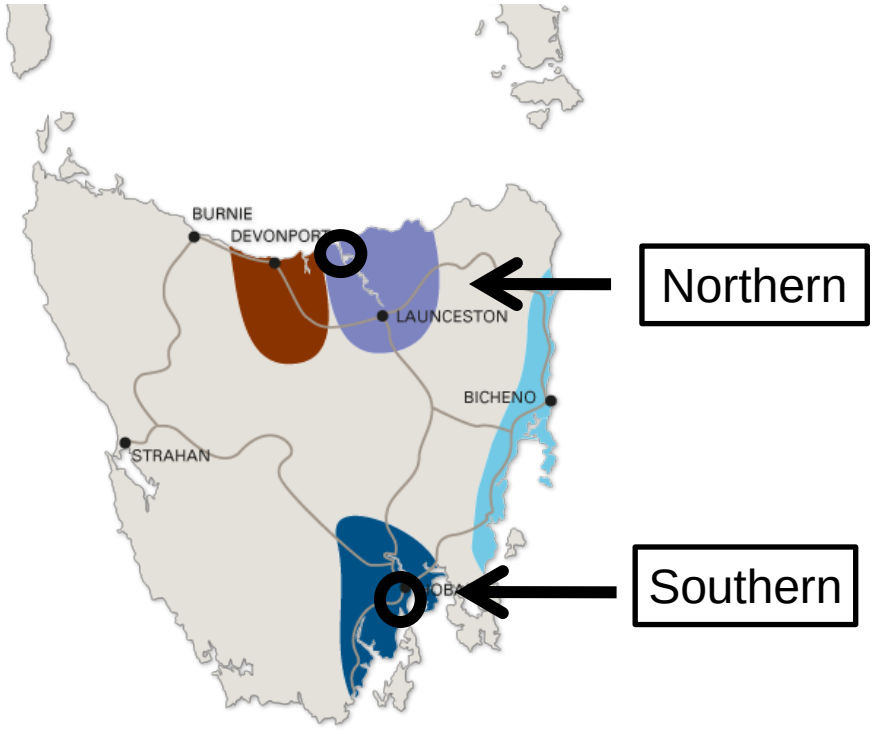

PC2
X-loadings
0.4
0.2
0
-0.2
-0.4
-0.6
Rainfall
Rain (mm) (Jul-
in (mm) (Sep
Yield
Yield
Bunch no.
2006
Bunch weights
2008
Mean Jan temp
TA
MCW
DD Sep-May
Grape anthocyanins
Bunches/node
2007
Mean Feb temp
PC1
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
All vintages al…, X-expl: 47%,17%

TIME FOR THE GOOD STUFF - VITICULTURE!

LEAF REMOVAL

– 2 locations

- Southern Tasmania, Coal River Valley
- Northern Tasmania, Tamar Valley



CLIMATE CONDITIONS

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Site	Vintage	GDD (Sep-Mar)	GST (Sep-Mar)	Rain (Sep-Mar)	MJT (°C)	MFT (°C)
North	2010	1190.0	15.6	414.0	17.8	19.6
	2011	983.6	14.6	676.0	17.6	16.5
	2012	1161.1	15.4	457.8	17.7	17.6
South	2010	1150.5	15.2	349.4	17.5	18.0
	2011	987.2	14.5	372.4	17.7	16.5
	2012	1120.7	15.1	314.4	18.7	17.9

LEAF REMOVAL

- 2 varieties
  - Pinot Noir (D5V12) and Chardonnay (I10V1)
- 3 treatments removing basal leave + control (4 replicates)
  - Pre-flowering LR
  - Pea size berry LR
  - 50 % veraison LR

LEAF REMOVAL AT PEA-SIZE BERRIES

PINOT NOIR YIELD COMPONENTS

- No effect on
  - Yield per vine
  - Bunch weight
  - Bunch number/vine

- 2011 and 2012 berry weight
  - Northern Tasmania only
  - Veraison and control > pre-flowering and pea sized

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

PINOT NOIR FRUIT ANALYSIS

- TSS
  - No change over 3 seasons
- pH
  - South 2012
  - ↓ pre-flowering LR
- TA
  - South 2011
  - ↓ control

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

PINOT NOIR FRUIT ANALYSIS

- Anthocyanins
  - North 2011
    - ↑ pre-flowering LR
  - South 2011
    - ↓pre-flowering LR
    - ↑ control
  - North 2012
    - ↑ pre-flowering LR
  - South 2012
    - ↓ pea-sized LR
    - ↑ control

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

PINOT NOIR FRUIT ANALYSIS

- Phenolics
  - No effect 2010 and 2011
  - North 2012
    - ↑pre-flowering LR
  - South 2012
    - ↑ pre-flowering LR

But which phenolics?!

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

CHARDONNAY YIELD COMPONENTS

- No effect on
  - Yield per vine
  - Bunch weight
  - Bunch number/vine

- Berry weight
  - North 2012
    - ↓pre-flowering

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

CHARDONNAY FRUIT ANALYSIS

- TSS
  - Southern 2011
    - ↓ control
  - Southern 2012
    - ↑ control
- pH
  - Northern 2011
    - ↑control
- TA
  - Southern 2011
    - ↑pre-flowering LR

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

CHARDONNAY FRUIT ANALYSIS

- Total phenolics
  - Northern 2011
    - ↑control
  - Southern 2011
    - ↑pre-flowering LR
  - Southern 2012
    - ↑pre-flowering LR

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

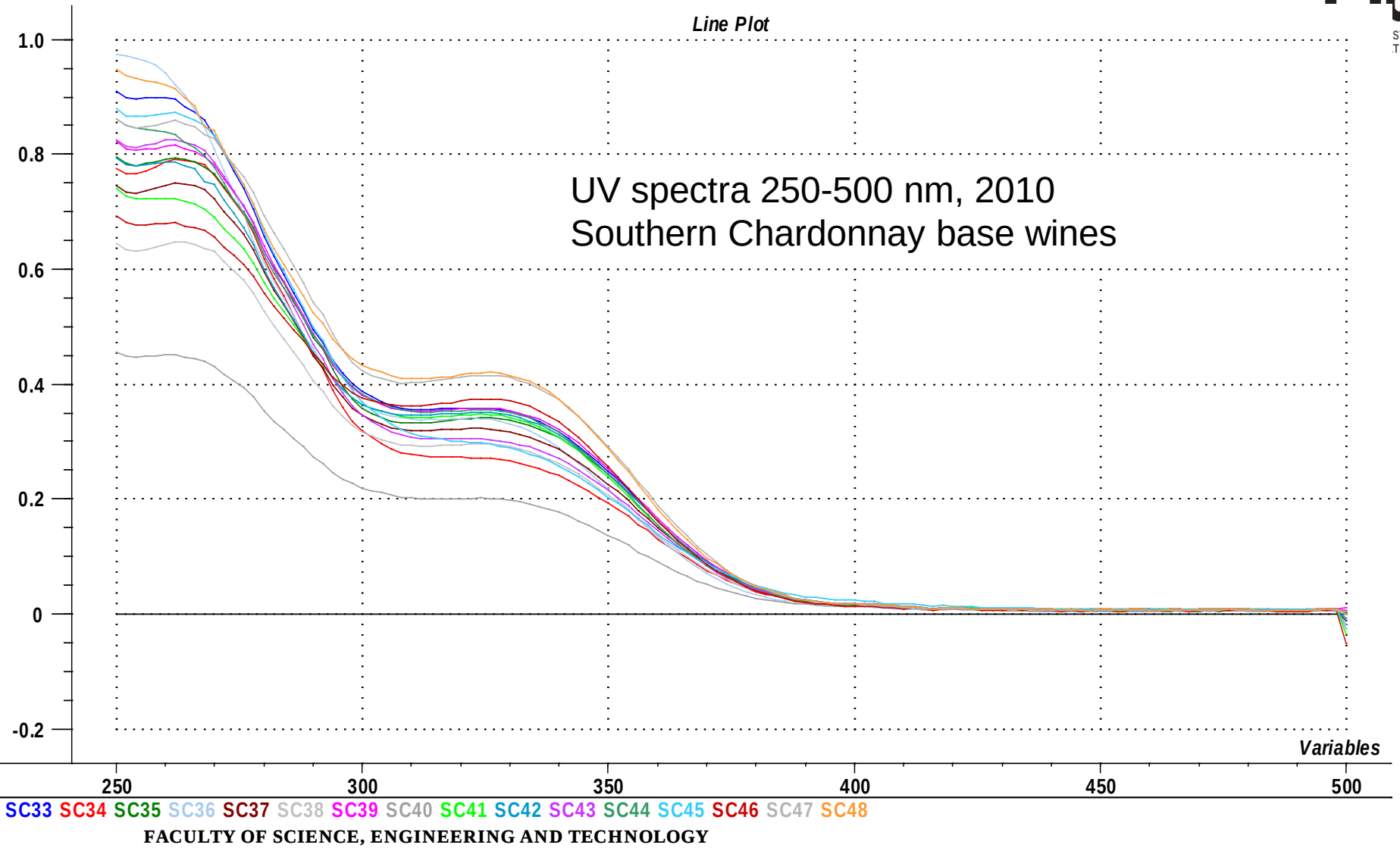
WINE TIME

- 10 kg batches
- Flat bed, whole bunch press up to 2 bar
- 15 °C fermentation room
- EC1118
- To base wine stage for analysis
- Wine are still on lees for analysis early next year

2010 SOUTHERN CHARDONNAY

- No yield differences
- No fruit composition differences
- So why do the winemakers prefer dappled light exposure?

UV-VIS SPECTRAL FINGERPRINTING

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CAFFEIC AND FERULIC ACID UV-VIS SPECTRA

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WHAT DOES THAT MEAN?

- Similar peaks and troughs
  - Indicative that we are influencing hydroxycinnamates
  - Validation is ongoing with AWRI

- Wines were tiraged 2011, 2012 and 2013
  - Analysis 2016, 2017 and 2018 (tasting and HPLC)

CHARDONNAY BASE WINE EFFECTS SUMMARY

- South
  - 2010 veraison LR ↑ hydroxycinnamates
  - 2011 pre-flowering LR ↑ hydroxycinnamates
  - 2012 pre-flowering LR ↑ hydroxycinnamates
- North
  - 2010 all LR ↑ hydroxycinnamates
  - 2011 all LR ↑ hydroxycinnamates
  - 2012 all LR ↑ hydroxycinnamates

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

PINOT NOIR BASE WINE EFFECTS SUMMARY

- South
  - 2010 pea sized berries LR ↑ hydroxycinnamates
  - 2011 little LR effect
  - 2012 pre-flowering LR ↑ hydroxycinnamates
- North
  - 2010 little LR effect
  - 2011 all LR ↑ hydroxycinnamates
  - 2012 little LR effect

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

BUT

- Which hydroxycinnamates?
  - Quality not quantity
- What do they contribute to the wine?
  - Nobody likes overly phenolic sparklings
- This is all keeps me in a job …

SUMMARY

- Not huge fruit composition effect or traditional measure of total phenolics
- Spectral fingerprinting of juice and base wines indicates individual phenolic compounds are affected by the leaf removal treatments
- **Varietal effect**
- **Regional effect**
- **Seasonal effect**


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PRESS FRACTIONS

- Higher absorbances around 330 nm region are desirable based on press fractions
- Higher absorbances around 260 nm region are more closely associated with pressings

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COMMERCIAL CHARDONNAY 2012

COMMERCIAL PINOT NOIR 2012

COMMERCIAL PINOT NOIR 2012

CANE OR SPUR PRUNING FOR SPARKLING WINE PRODUCTION

Dr Joanna Jones

Dr Fiona Kerslake

BACKGROUND

- Cane pruning preferred
- Perceived basal bud infertility is the basis for pruning decision (canopy management)
- Cane pruning = $$$
- Increasing mechanisation (our high labour costs)

TRIAL SITE

- Over 3 seasons; 2010, 2011 and 2012
- Southern, pruned by hand to 20 buds
- Pinot Noir (clone D5V12), Chardonnay (clone I10V1)
  - Spur pruned
  - Cane pruned

RESULTS: CANOPY

– Pronounced terminal dominance under cane pruning

CANOPY - CHARDONNAY

– Point quadrat assessment; pre-flowering, post-flowering and veraison

	Spur Pruned			Cane Pruned		
	25-Nov	22-Dec	28-Jan	25-Nov	22-Dec	28-Jan
Cluster contacts	2	8	10	3	7	8
Gaps %	0	0	0	35	20	0
Leaf Layer Number(LLN)	2.3	2.9	3.7	1.4	2.3	2.6

CANOPY - CHARDONNAY

Spur Pruned

Cane Pruned

YIELD

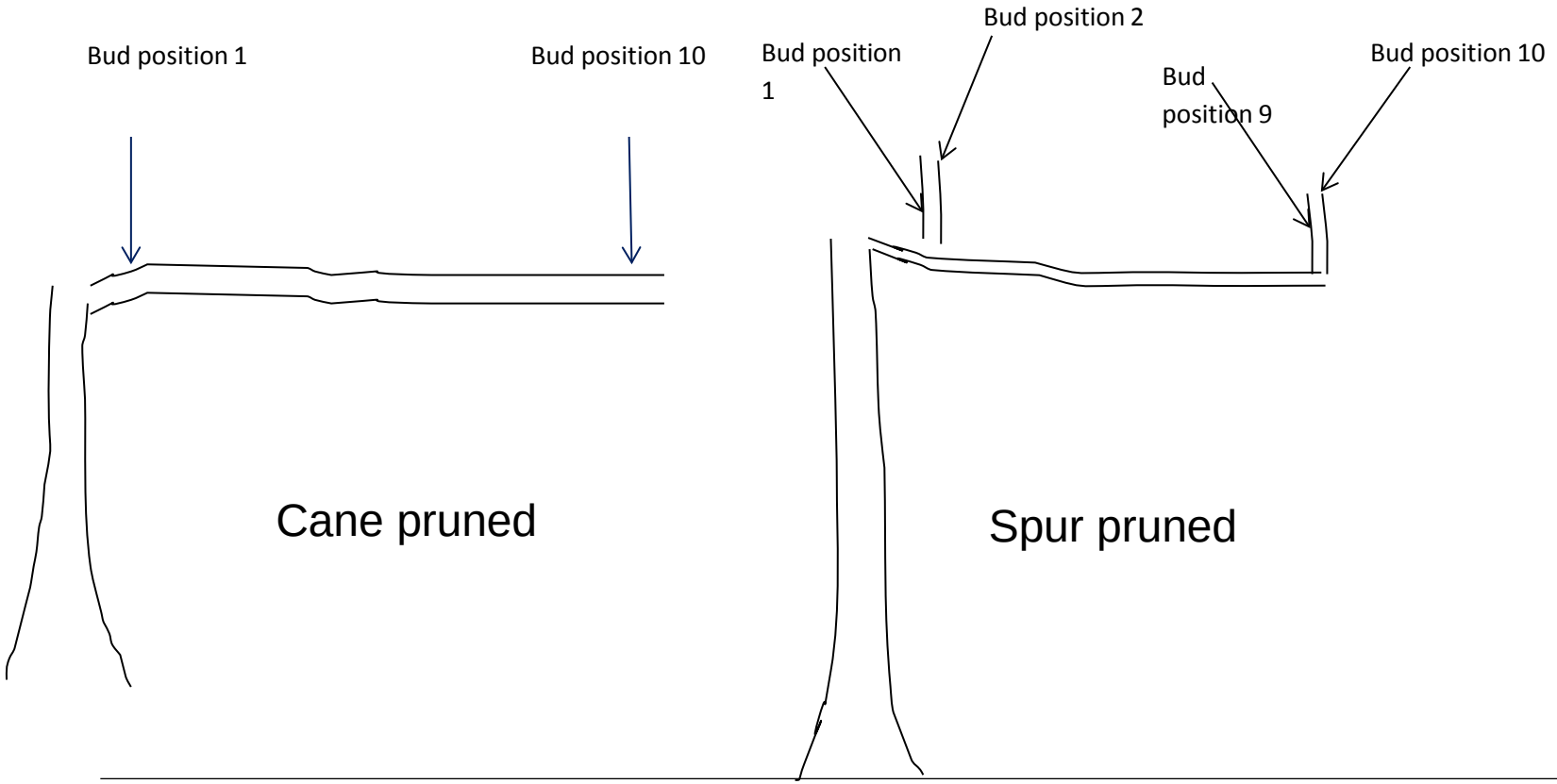
– Terminal dominance in canopy growth in Chardonnay was mirrored in yield

2010	Basal (buds 1-3)	Mid (buds 4-7)	Apical (buds 8-10)
Yield distribution along cane	13.2%	30.4%	56.4%

– Large seasonal variability in yield

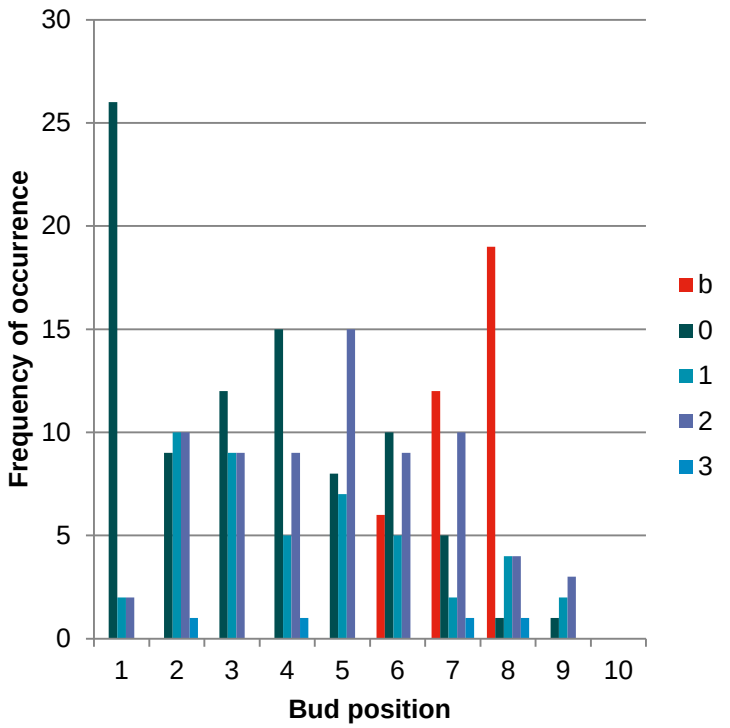
YIELD

– Distribution of fruitfulness for Chardonnay 2012

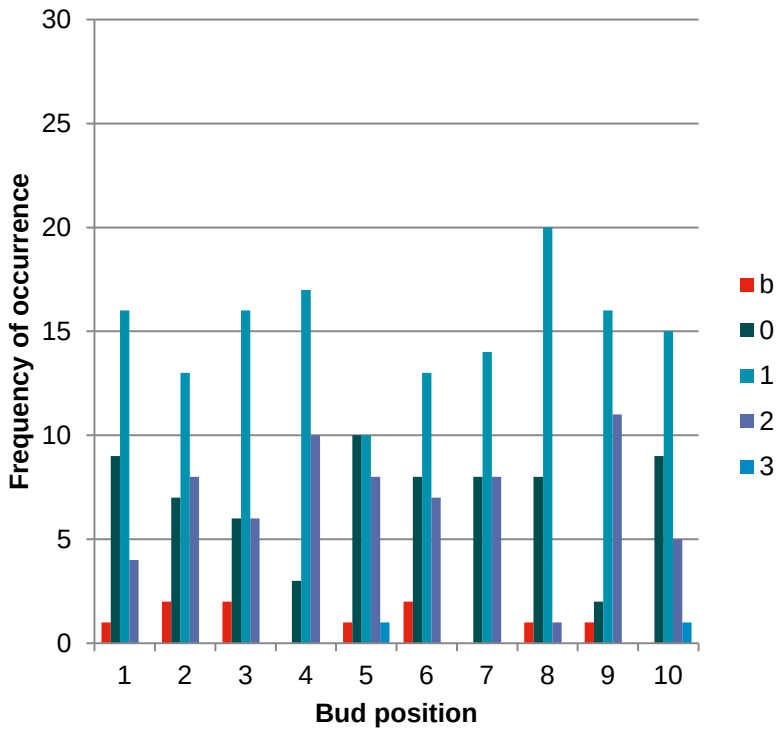


YIELD

– Distribution of fruitfulness for Chardonnay 2012



Cane Pruned



Spur Pruned

YIELD

– In all cases, cane pruned vines had fewer, but larger bunches

		Bunch number per vine		
		2010	**2011**	**2012**
Pinot Noir	Cane	22.9	26.2	17.4
	Spur	25.1	31.9	21.0
	Sig	ns	<0.005	<0.05
Chardonnay	Cane	13.3	21.2	13.3
	Spur	18.7	26.3	19.5
	Sig	<0.001	<0.01	<0.001

YIELD

- No difference for Pinot
- Only 2012 spur pruned higher yield than cane for Chardonnay (<1 kg/vine for both treatments)

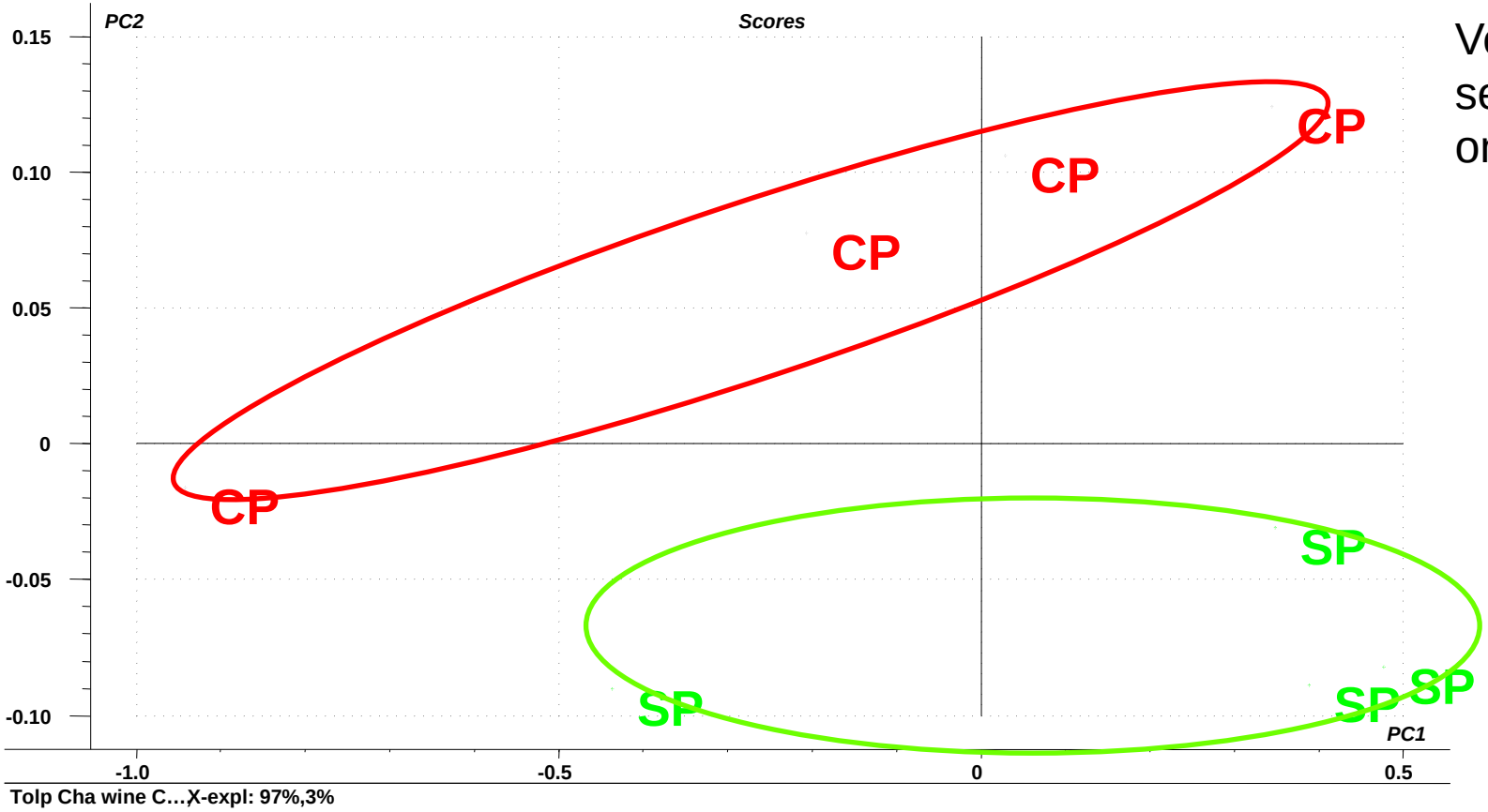
		Bunch weight (g)		
		2010	2011	2012
Pinot Noir	Cane	123.0	131.1	105.6
	Spur	100.7	101.9	85.0
	Sig	0.0003	0.013	0.021
Chardonnay	Cane	104.6	105.2	57.3
	Spur	79.4	90.4	47.9
	Sig	<0.01	ns	ns

FRUIT COMPOSITION

- Chardonnay (2 treatments)
  - No significant difference between and cane and spur pruned fruit composition

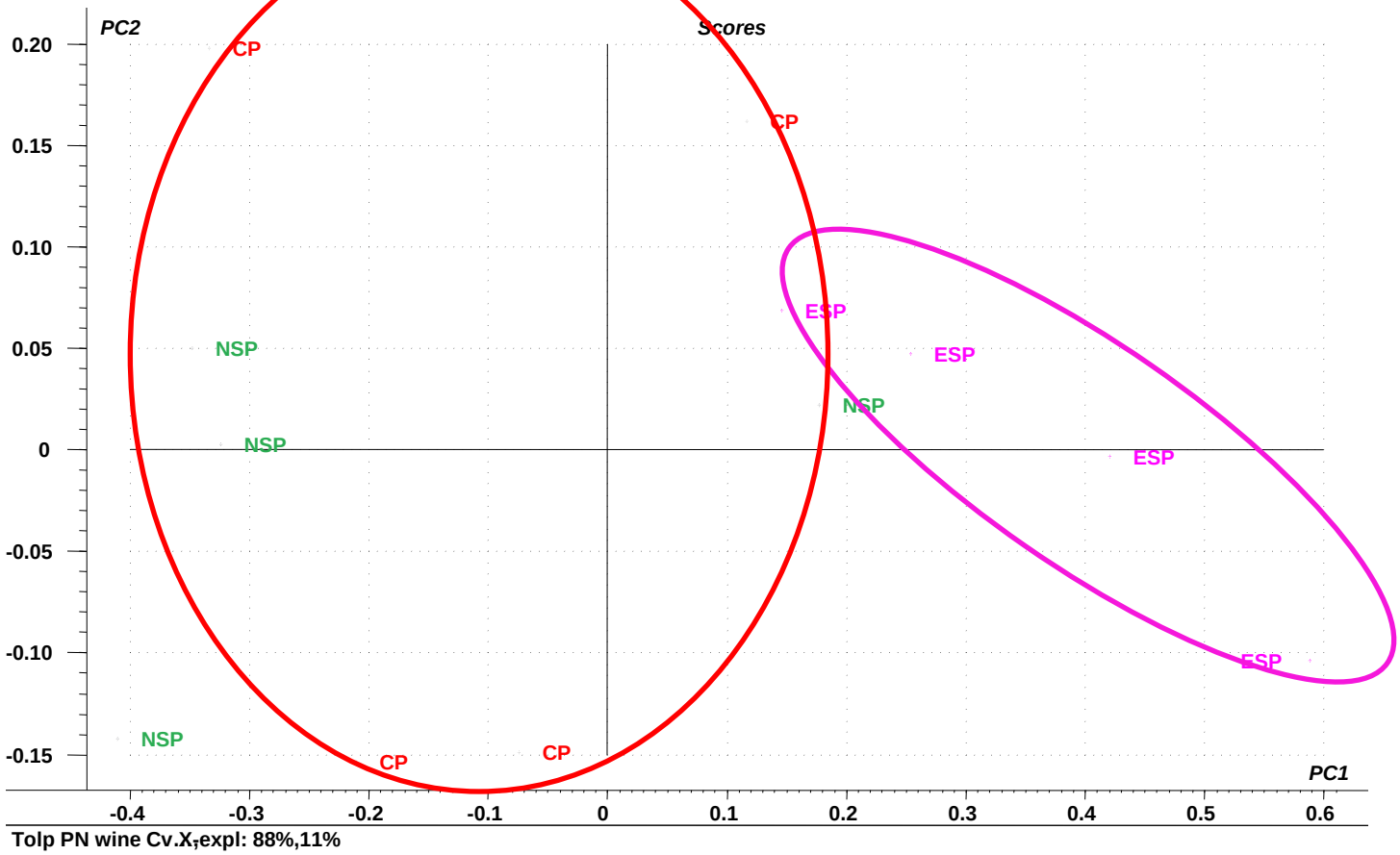
- Pinot Noir (3 treatments)
  - Newly spur pruned vines had significantly lower total grape phenolics
  - No significant difference between established spur pruned and cane pruned

2010 CHARDONNAY BASE WINE PCA UV SPECTRA



Very distinct separation on PC2

2010 PINOT BASE WINE – PCA UV SPECTRA



- Established spur pruned differs most from cane pruned and new spur pruned on PC1

RESULTS: CARBOHYDRATES

		Cane starch (mg/g)	
		2010	2011
Pinot Noir	Cane pruned	77.81	53.20
	Spur pruned	71.64	64.07
	Significance	ns	<0.01
Chardonnay	Cane pruned	78.53	56.02
	Spur pruned	80.03	54.70
	Significance	ns	ns

- Expected to see a difference in overwintering starch but we didn't (except in 2011 Pinot Noir vines)
- Also no significant difference in soluble sugars between pruning treatments
- Large seasonal difference in stored starch and soluble sugars

IN SUMMARY…

- Not different
  - Yield per vine
  - Juice
- Spur pruned
  - Canopies established more quickly
  - Canopies more even
  - More, smaller bunches
  - Slight more starch in PN in winter 2011

ONGOING

- 2014 the first season of a long term fruitfulness trial – 2024
  - Sparkling
  - Pinot noir (MV6)
    - Cane pruned
    - Spur pruned
  - Chardonnay (I10V1)
    - Cane pruned
    - Spur pruned

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QUESTIONS?

PINOT NOIR CROP LOAD

– 3 treatments – cane pruned, clone 114, north

- Low – 10 nodes/vine
- Medium – 40 nodes/vine
- High – 60 nodes/vine

PINOT NOIR CROP LOAD

- Increasing crop load
  - ↑ yield (~2 t/ac, 4 t/ac, 7.5 t/ac)
  - ↑ bunch number
  - 2012 ↓ bunch weight
  - 2010 ↓ berry weight
  - 2010 and 2012 ↑ Y:P

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry

PINOT NOIR CROP LOAD

- Increasing crop load
  - ↓ TSS
  - pH
    - 2010 no response
    - 2011 and 2012 ↓
  - TA
    - Not affected
  - Anthocyanins
    - 2011 ↓
  - Phenolics
    - 2010 ↑
    - 2012 ↓

2010	2011	2012
Warm and dry	Cool and wet	Warm and dry


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PINOT NOIR BASE WINES

- In each of the 3 seasons
- Low and high separate
  - Medium crop load varies with season
- Hydroxycinnamates are a principal driver
- Increasing with increasing crop load
  - Quality not quantity

PINOT NOIR CROP LOAD SUMMARY

- Delayed rate of maturation as a result of increased crop load from winter pruning (TSS)
- Juice and base wine phenolic profiles are linked with crop load
- As winter pruning occurs before we know the seasonal weather, most likely that crop thinning may need to be utilised as well to achieve the desired phenolic profile in the base wines

PRESS FRACTION ANALYSIS

- Pinot noir
- Chardonnay
- First press, collect juice, vinify separately
- Second press, collect juice, vinify separately

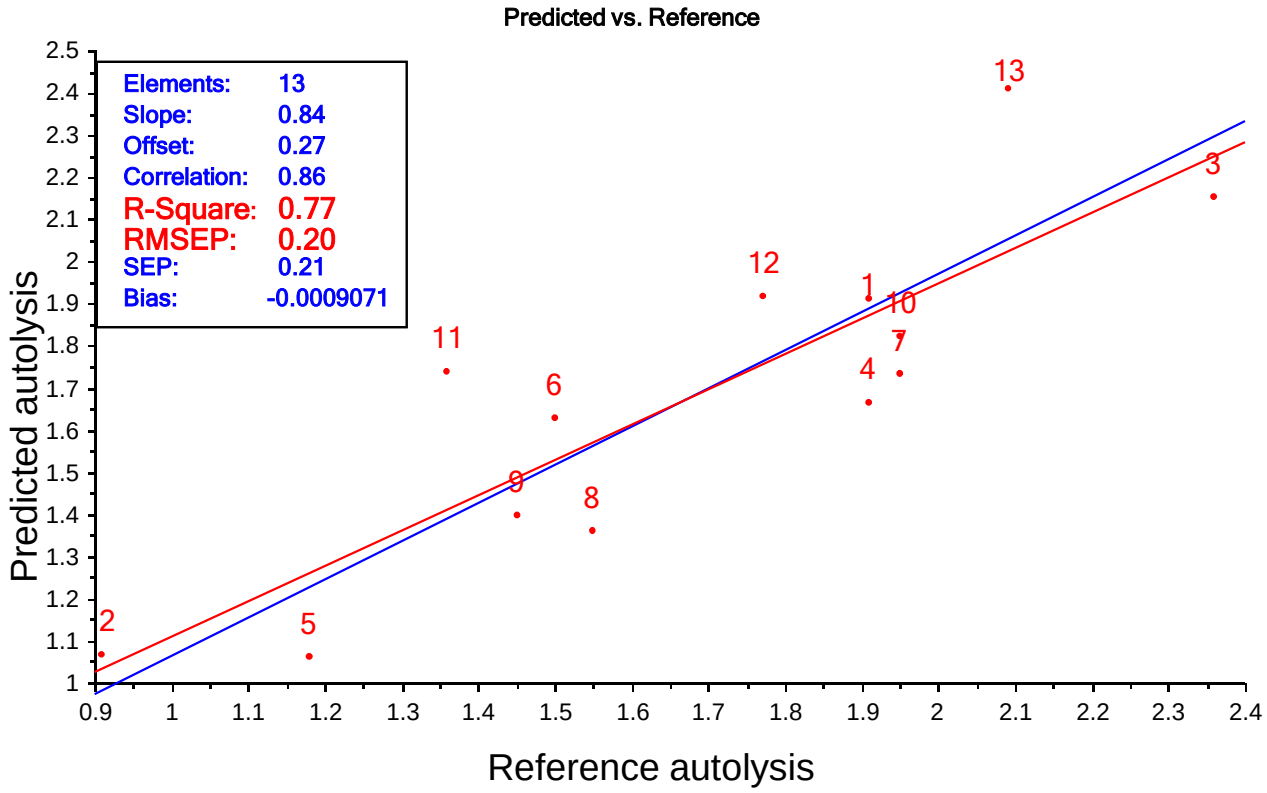
TAKE HOME MESSAGES

- Juice and wine phenolic profiles are influenced by exposure and crop load
- Timing of exposure effects is both site and season dependant
- Traditional methods for measuring total phenolics are of little use with the low extraction rates used to prepare sparkling juice
- We may be able to develop a new simple assay for readily extractable phenolics

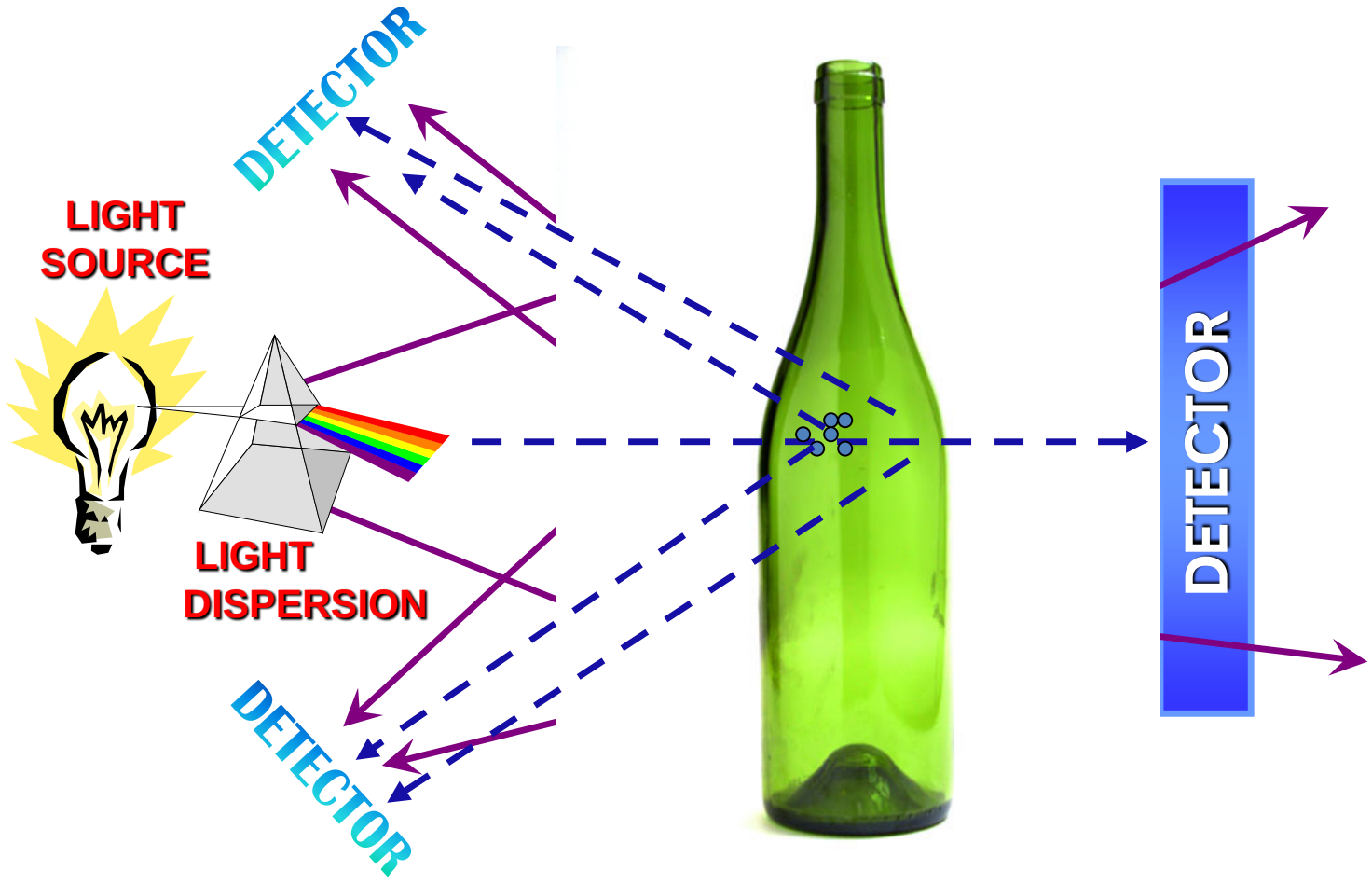
MORE FROM AWRI COLLABORATION

The Australian Wine Research Institute

PREDICTING AUTOLYSIS RATINGS WITH UV-VIS



IN-BOTTLE SCANNING



MEET BEVSCAN

SPARKLING WINE SPECTRA 450-1050 nm

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THE USABLE REGION 480-900 nm

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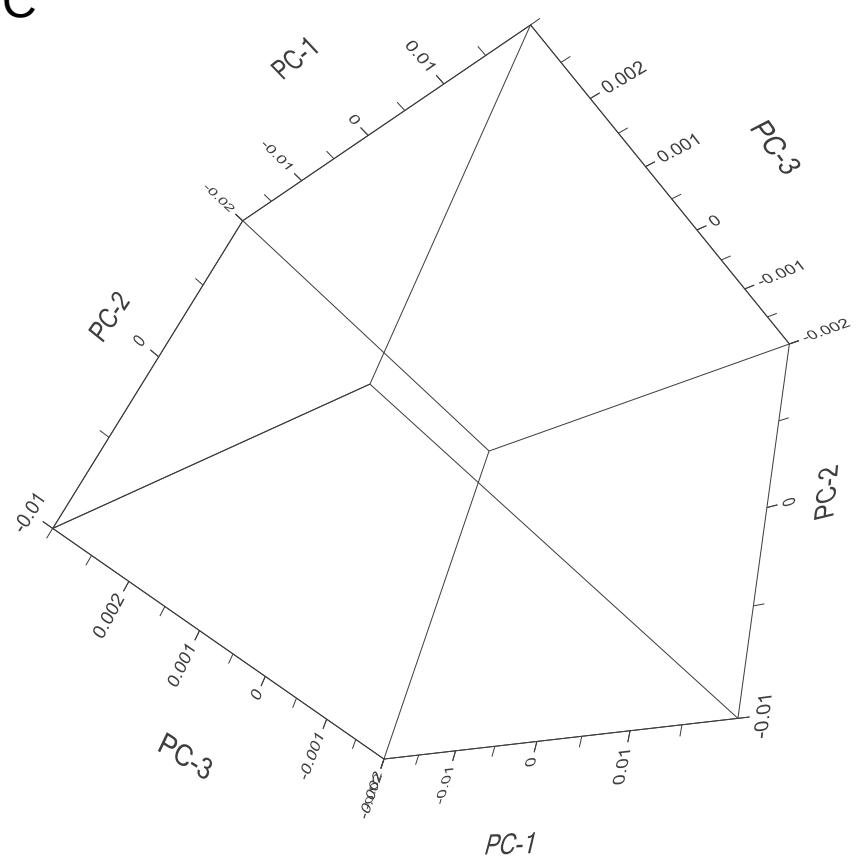
Tirage ferment monitoring

- Commercially tiraged ferments, incubated at 20° C

- PCA Scores of Bevscan spectra, marked by day of ferment



Classifying day of ferment with PCA scores of spectra

	0	1	2	3	4
0	5	0	0	0	0
1	0	5	0	0	0
2	0	0	5	0	0
3	0	0	0	5	0
4	0	0	0	0	5

Using linear discriminant analysis (LDA)
Actual day (red row)
Predicted day (blue column)
Correct responsed shown in green

i.e. 100% correct classification!!

In Conclusion

- Spectroscopy methods have the capability to monitor sparkling tirage and maturation
- Hardware and software is evolving quickly to enable fast, simple and cheap analysis
- There is potential to perform these measurements with non-destructive methods

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THANK YOU

– CCOVI

– The Dr Don Martin Sustainable Viticulture Fellowship

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