NSW GOVERNMENT Department of Primary Industries

Weather for Flowering

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Chat

- This season
  - You
  - Me
- Some new(ish) interpretation
  - Australia: Cripps Pink
  - Global: Golden Delicious
- What I think
- Where to next

2016 – Your Observations?

(R. Fox, Cobram)

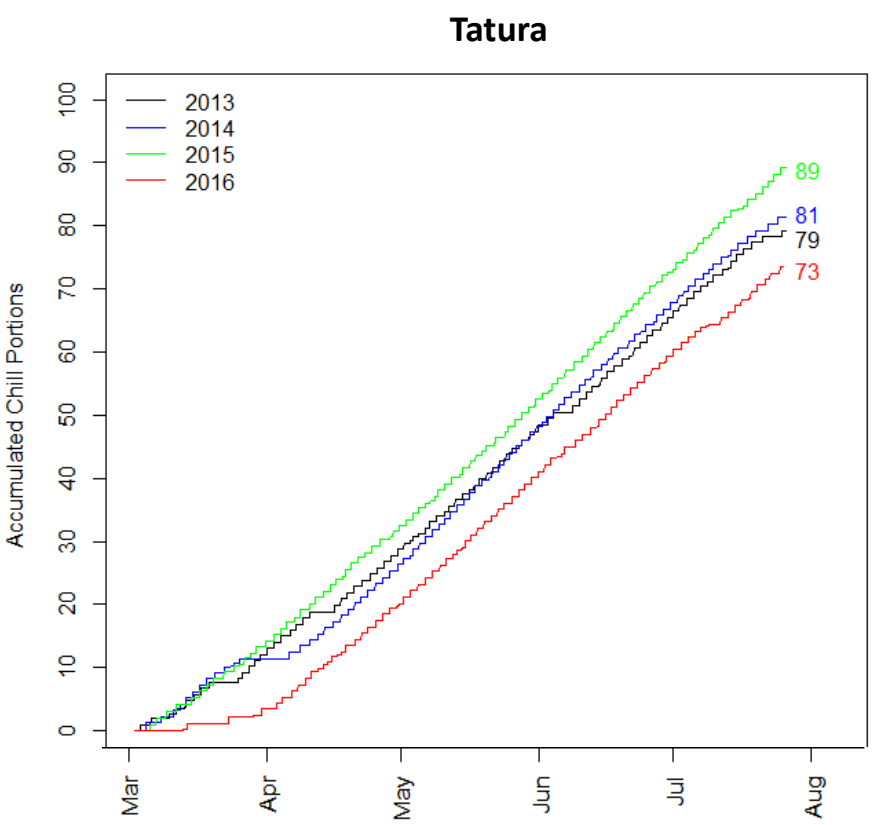
"Nijisseiki pollinisers appeared to flower 3 to 4 weeks earlier than Williams' bon Chrétien" I. Goodwin

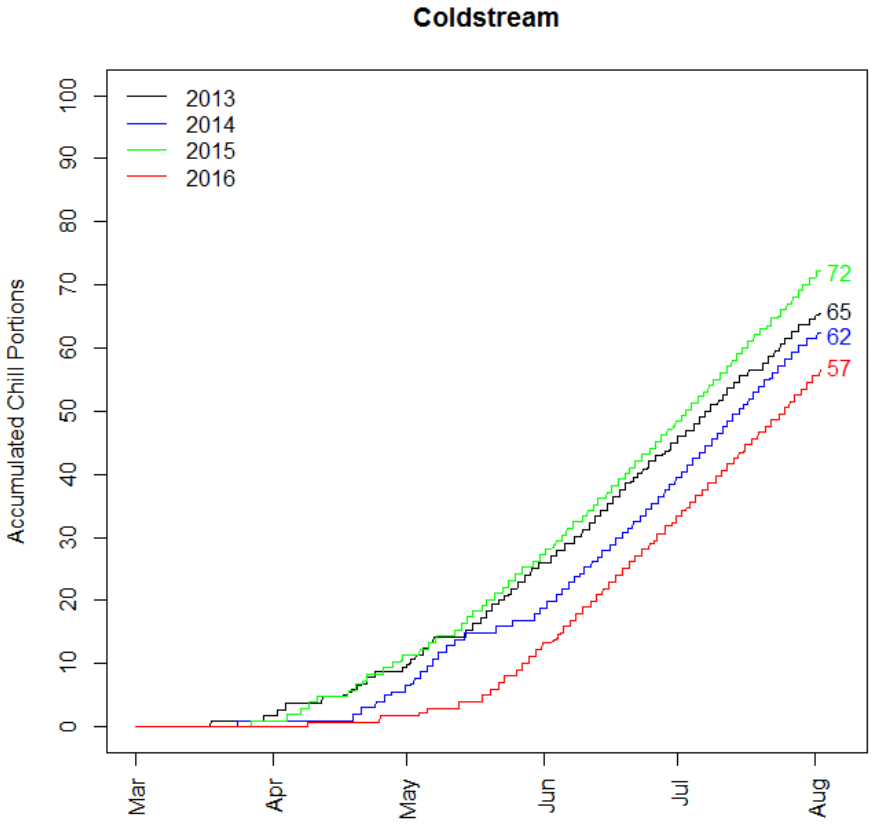
(I. Goodwin, Tatura)

LowER chill year

LOW chill year

Winter Chill





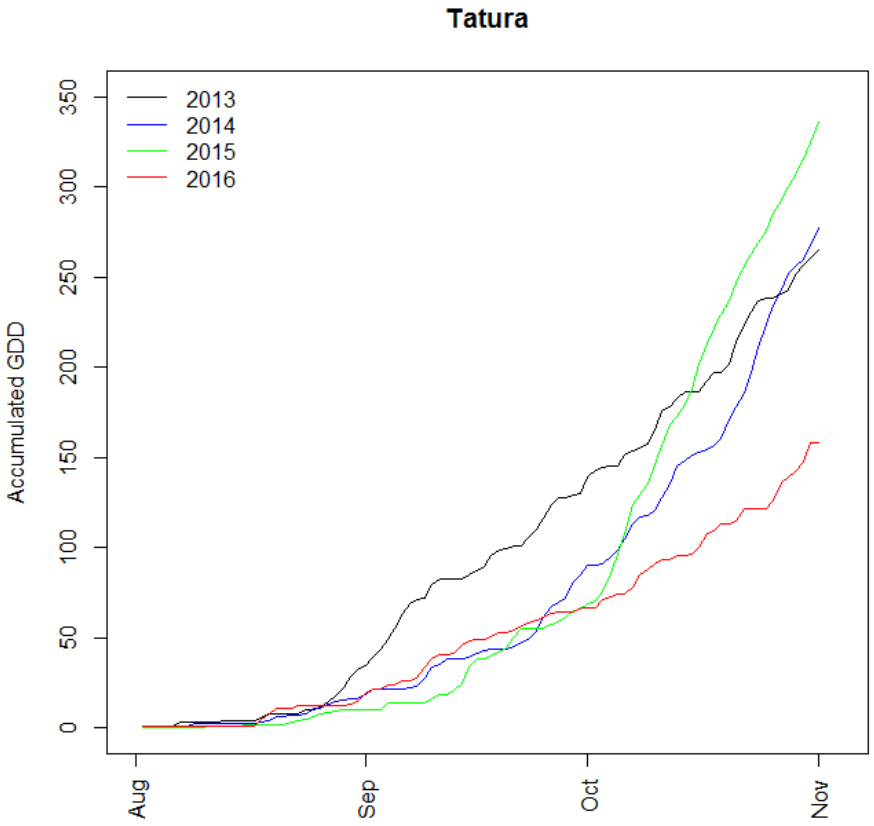
Tatura historical range = 81-94 CP

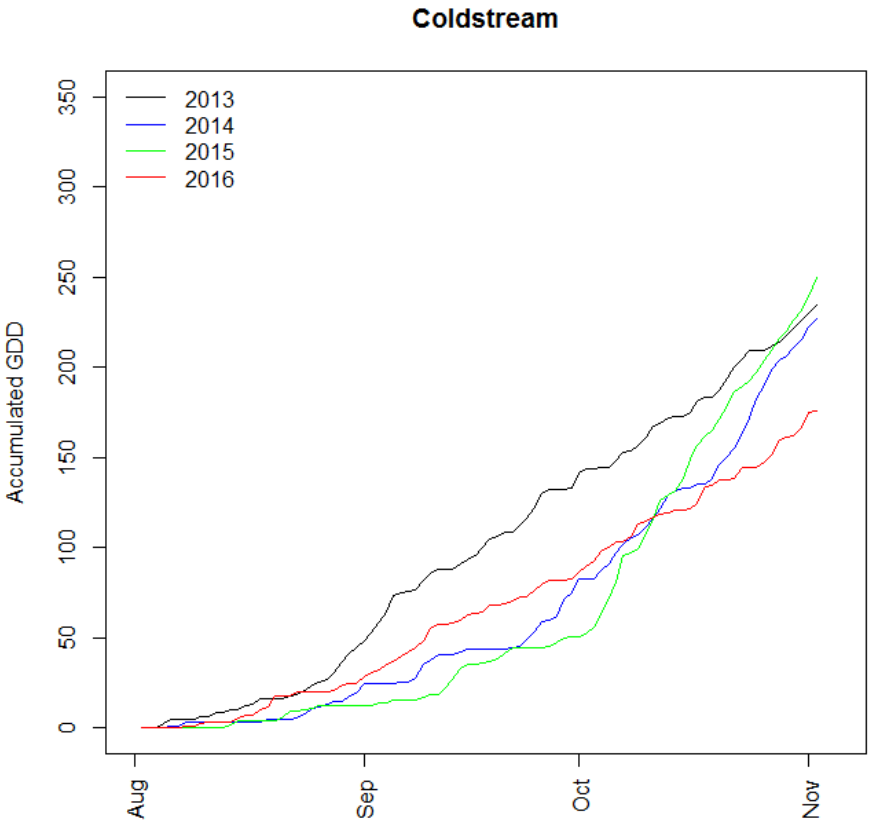
Yarra Valley* historical range = 94-109 CP

Was a **REALLY** cold spring

Was a **PRETTY** cold spring

Degree Days





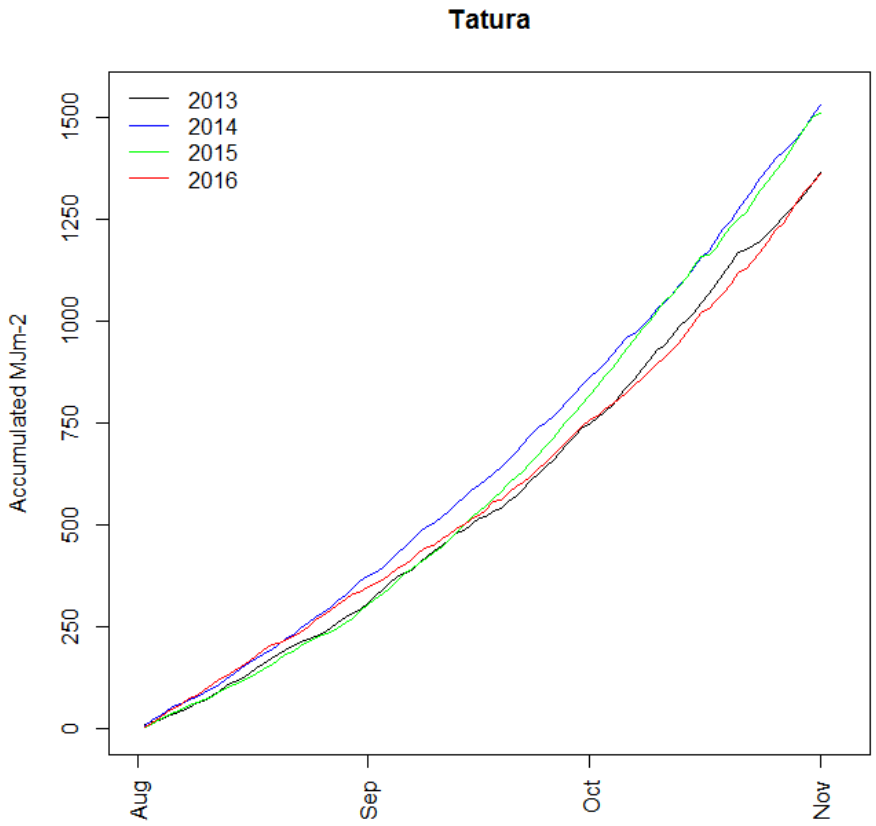
% heat in 2016 compared with:
2013 = 60%
2014 = 57%
2015 = 47%

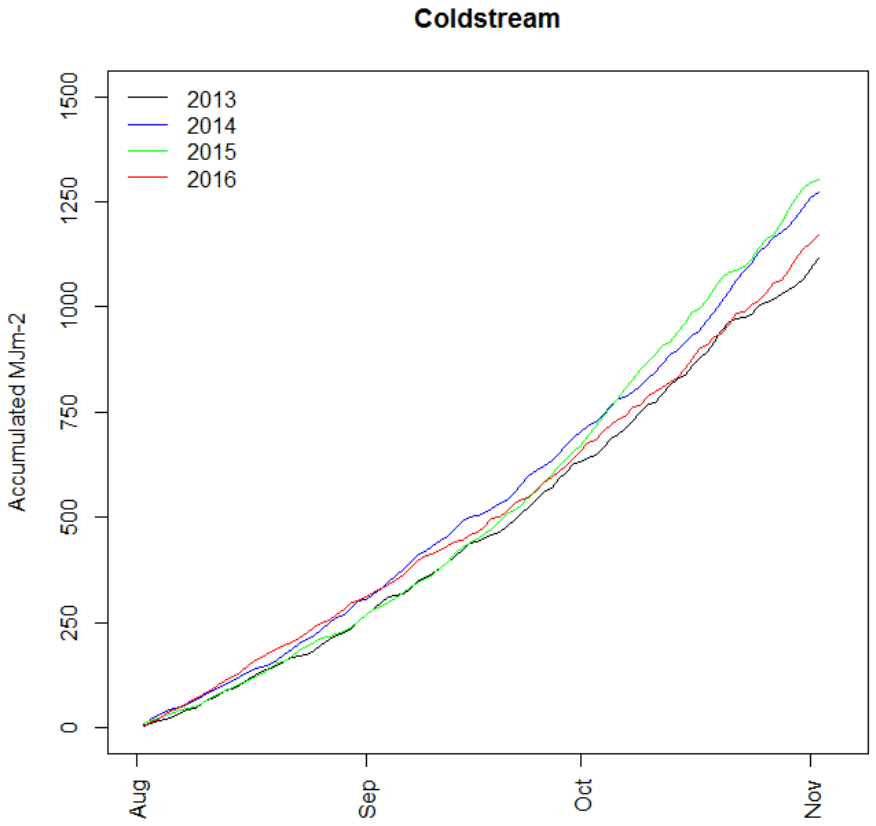
% heat in 2016 compared with:
2013 = 75%
2014 = 77%
2015 = 70%

Total solar radiation was down a bit

Total solar radiation was down a bit

Radiation





From September tracked similar to 2013

Second half Oct picked up from 2013

Culprit?

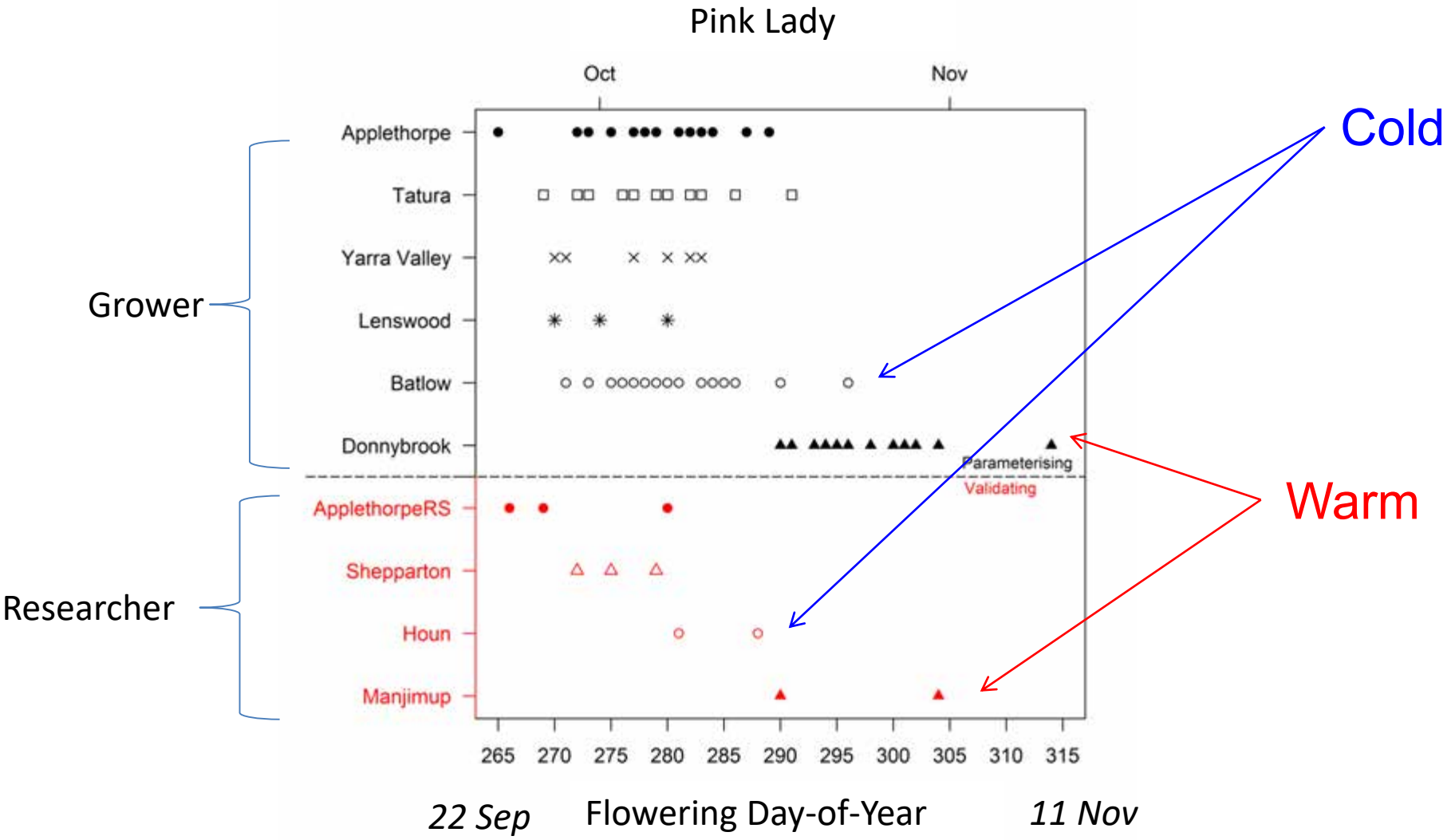
New(ish) Interpretation ➡

Understanding Flowering is Important!

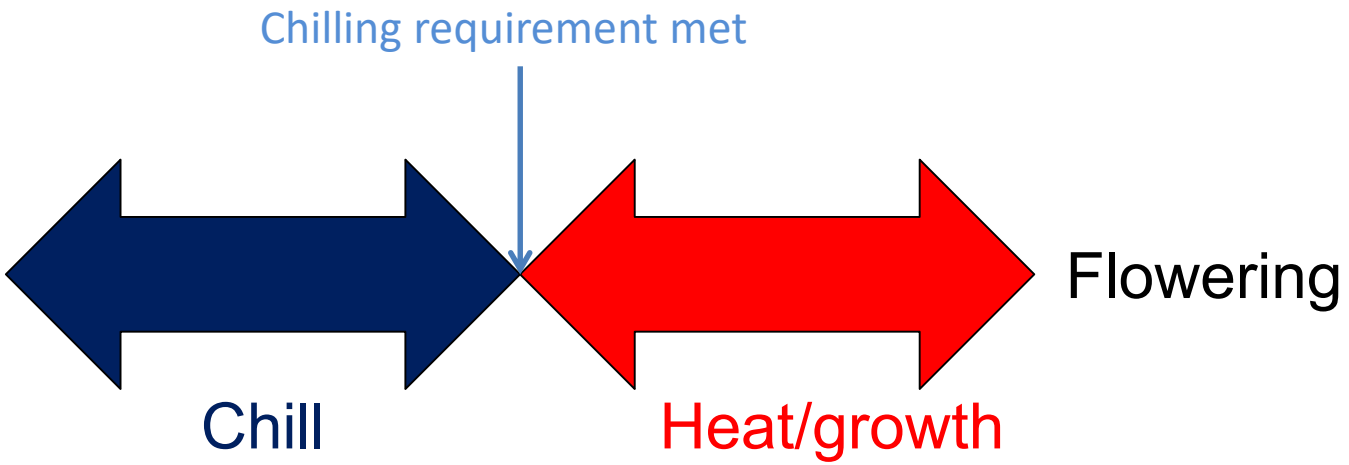
- Flowers are precursors for fruit
- Cross-pollination success
- Match new varieties to growing conditions
- Develop new management strategies
- Manage short and long-term climate risk
- Models help us understand processes
  - They are a tool to help interpretation, not the result

(Darbyshire et al., 2016)

Aussie Data



‘Old’ Model



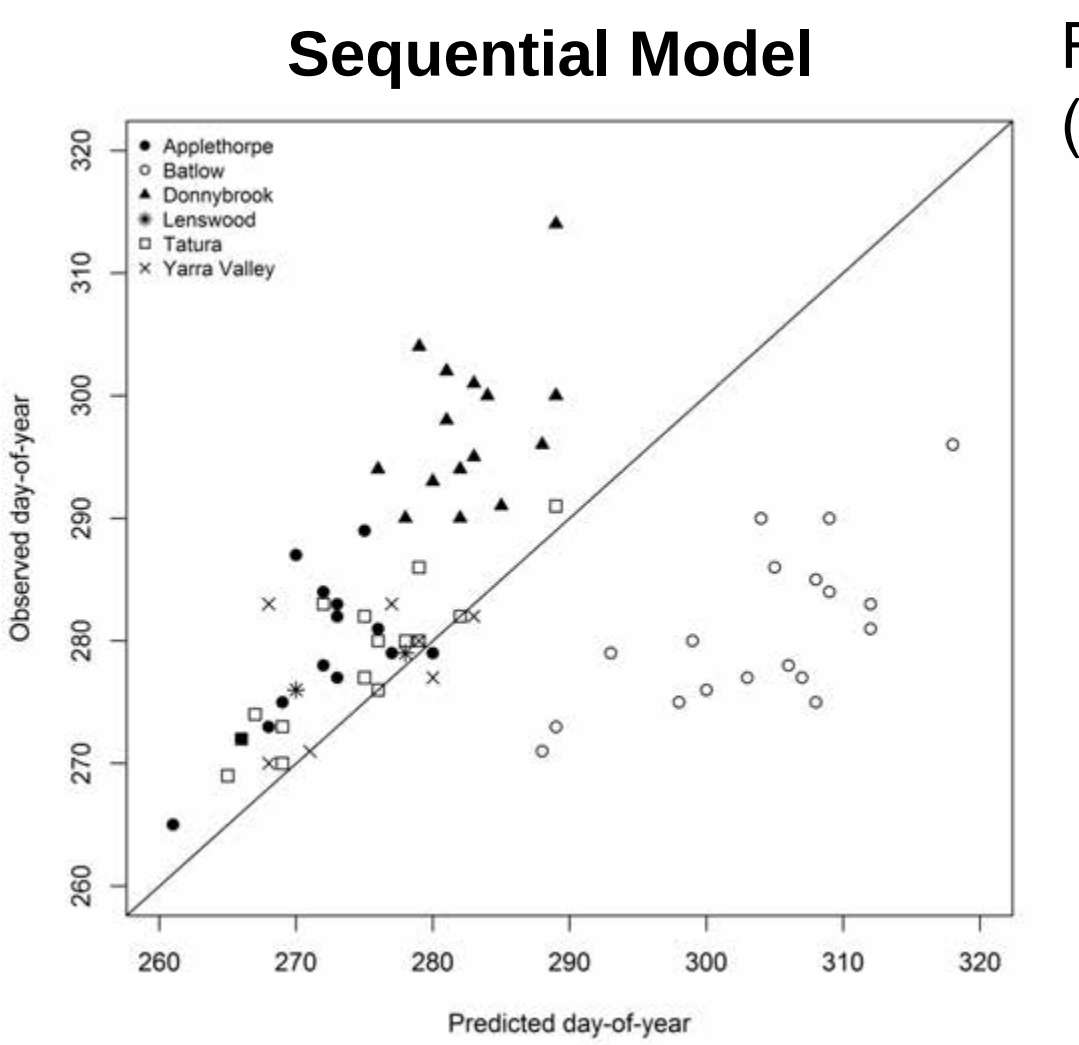
Sequential and independent phases

Amount of chill and heat required are FIXED

Temperature has opposite influence on each phase

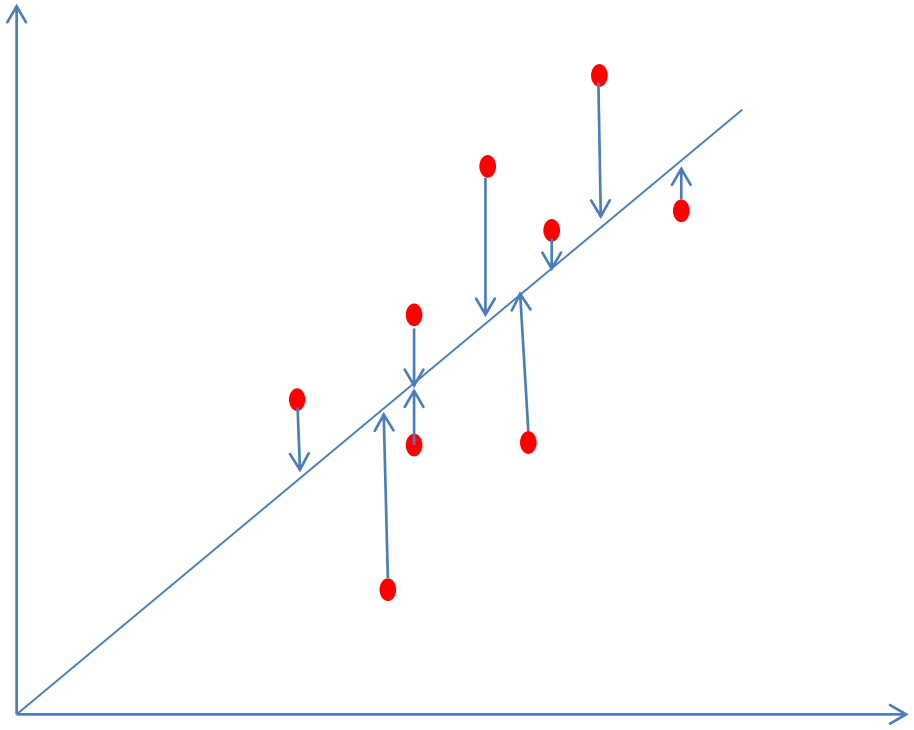
Model Evaluation

Sequential Model



RMSE=14.7days
($RMSE_{ave}$=9.6days)

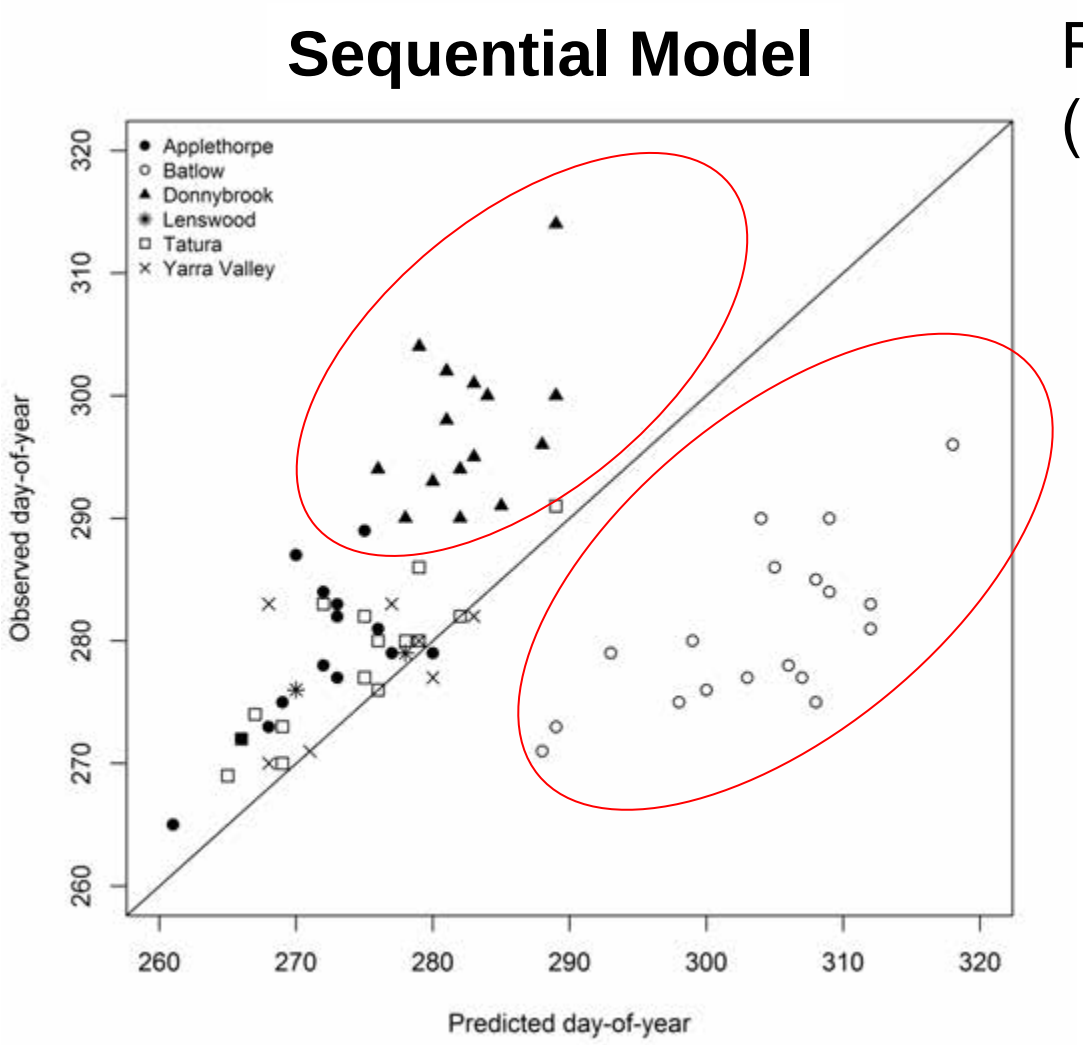
…Root Mean Square Error



Average ‘distance’ from perfect model

Model Evaluation

Sequential Model

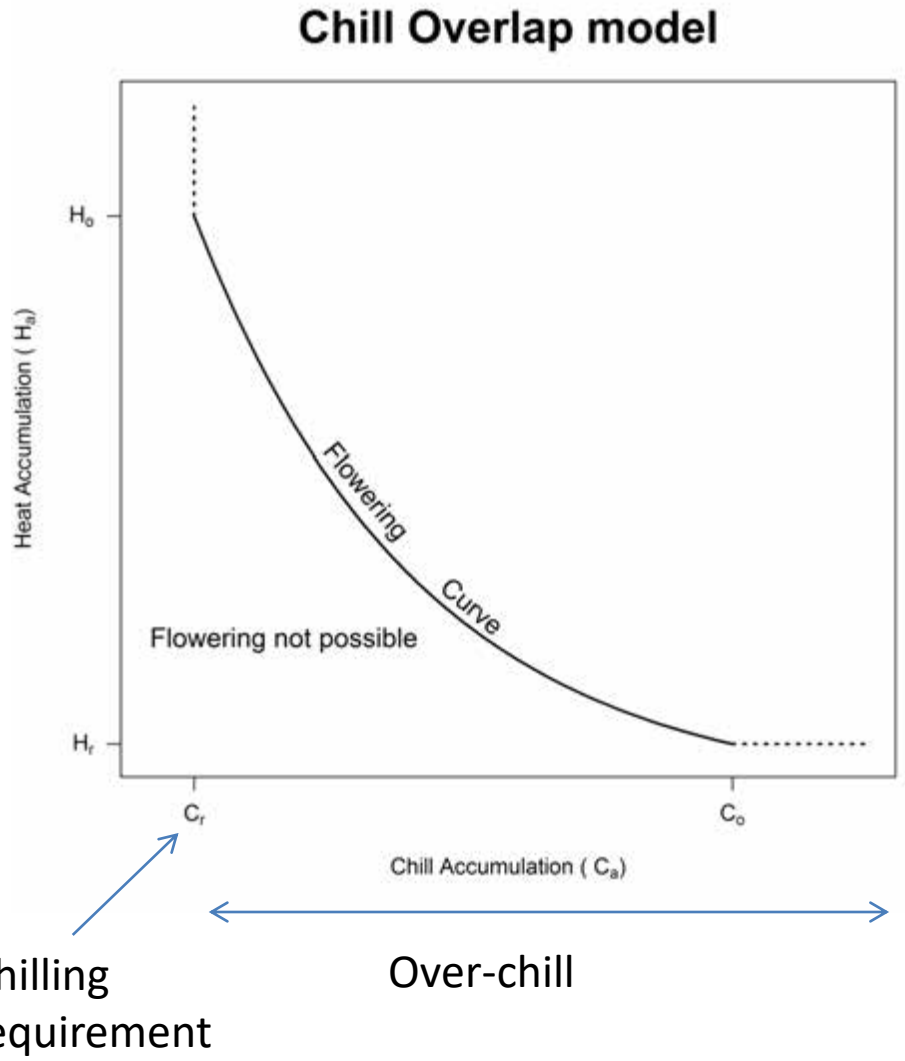


RMSE=14.7days
($RMSE_{ave}$=9.6days)

Predicating:

1. cold site later than observed
2. warm site earlier than observed

‘New’ Model



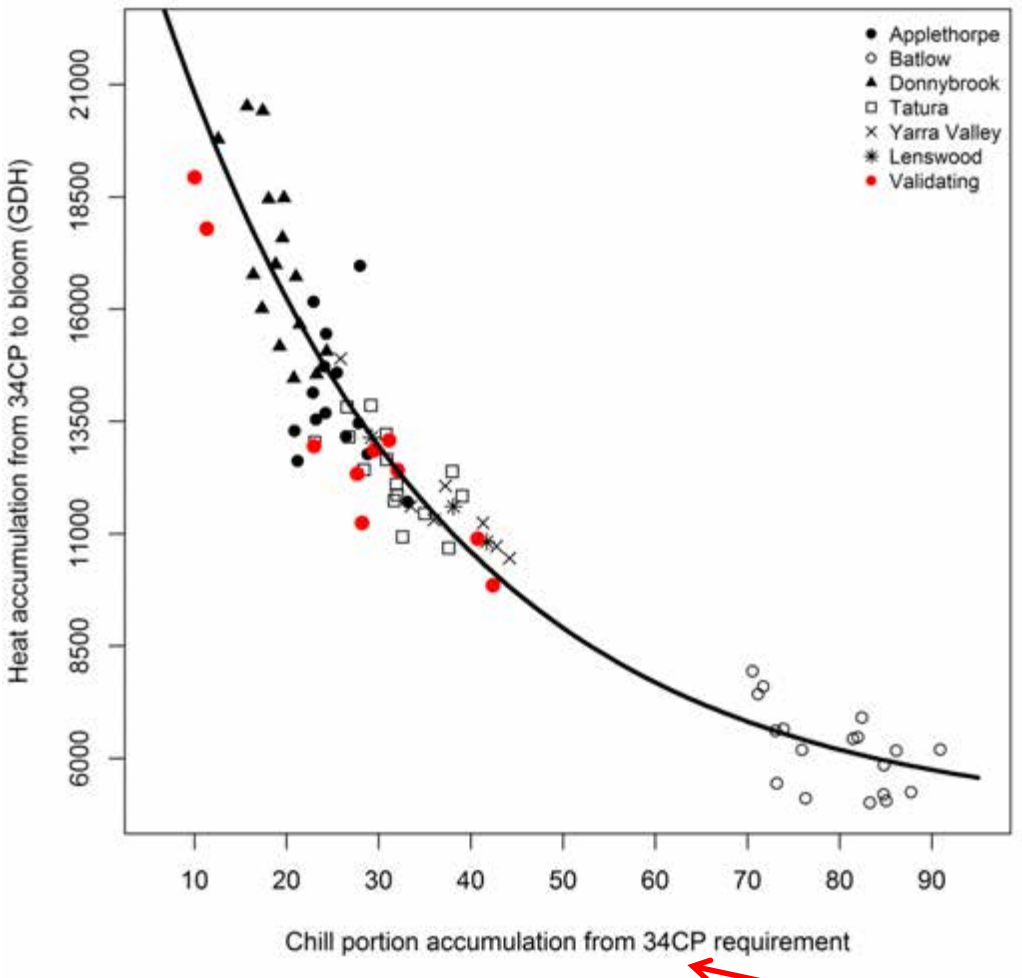
Minimum chill requirement (Cr)

‘over-chill’ reduces heat requirement
i.e. variable heat requirement

(Pope et al., 2014; Darbyshire et al., 2016)

Model Evaluation

Cripps Pink



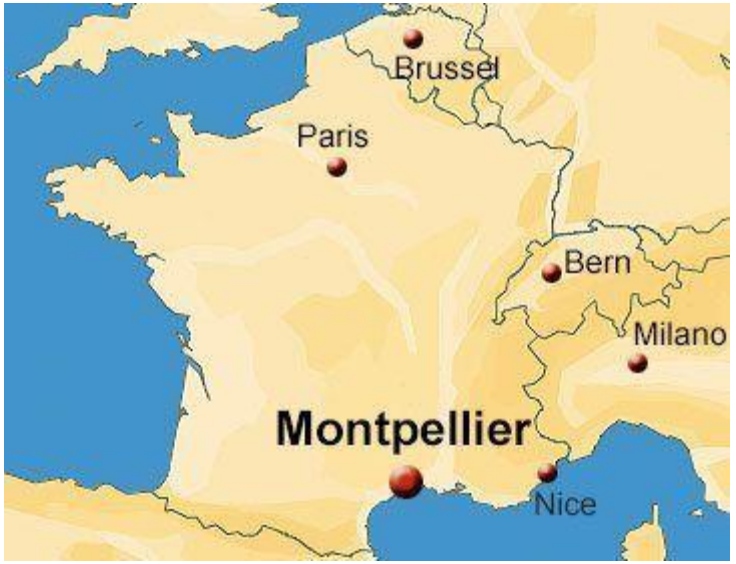
RMSE=6-7days

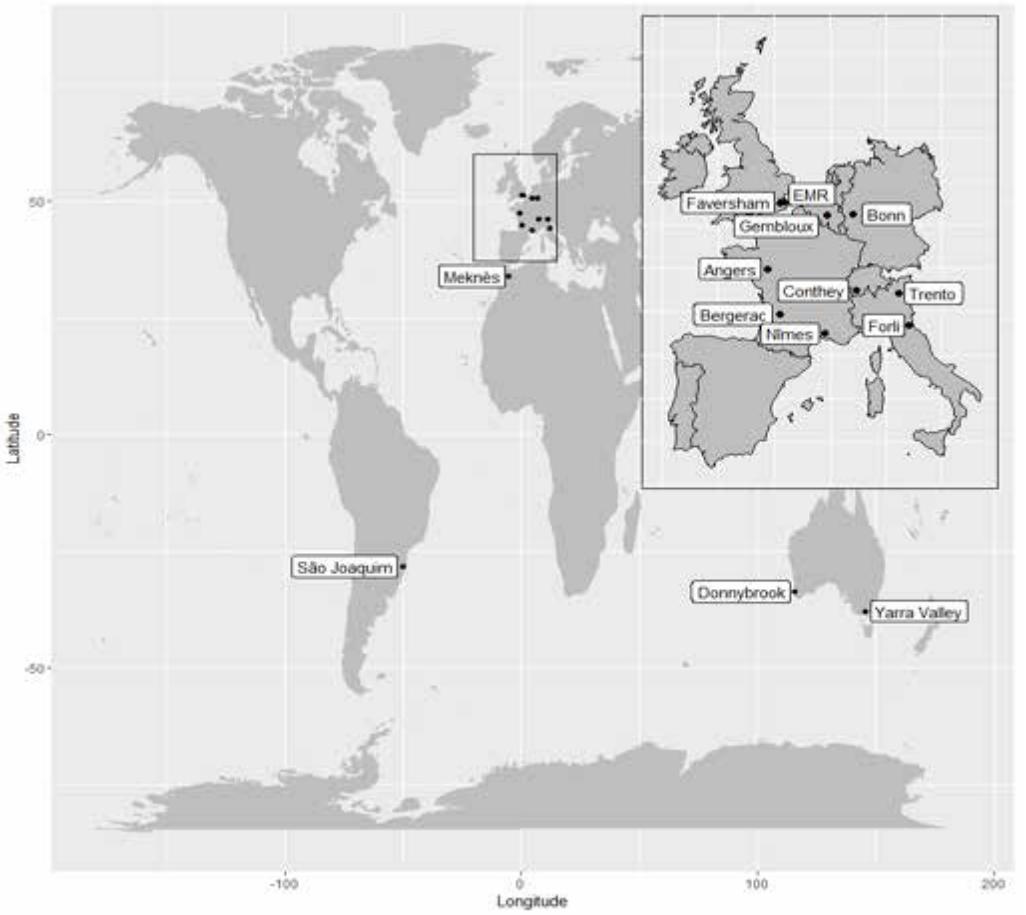
Build a predictive model for dormancy breaker application?

Your thoughts?

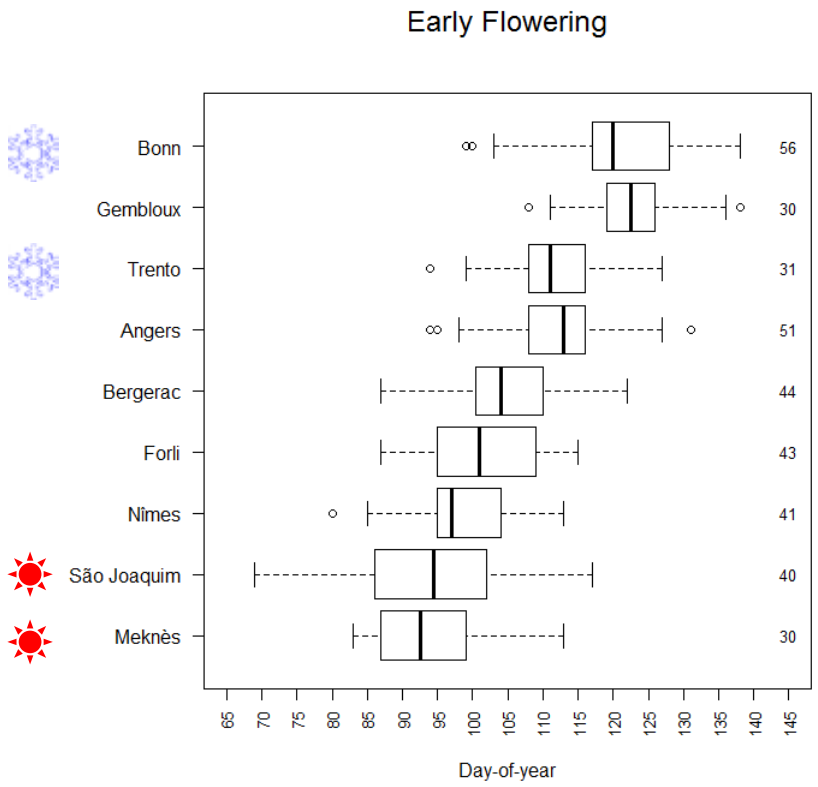
Statistical

Let's Go Global

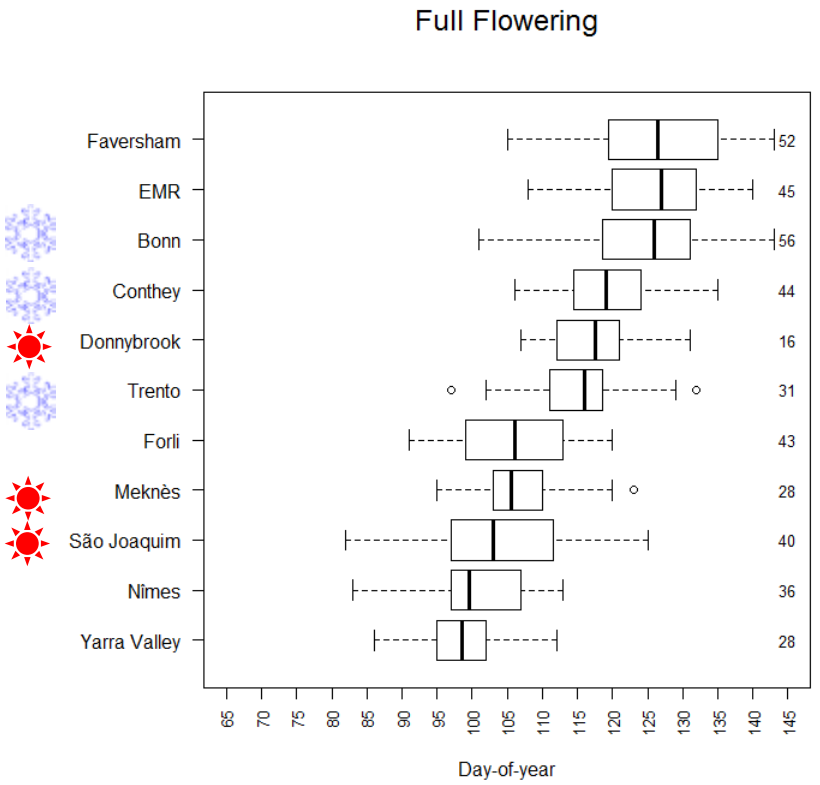




Golden Delicious



n=366



n=419

(Darbyshire et al., 2017)

(Darbyshire et al., 2017)

Model Evaluation

Combined Error = 6.6 days

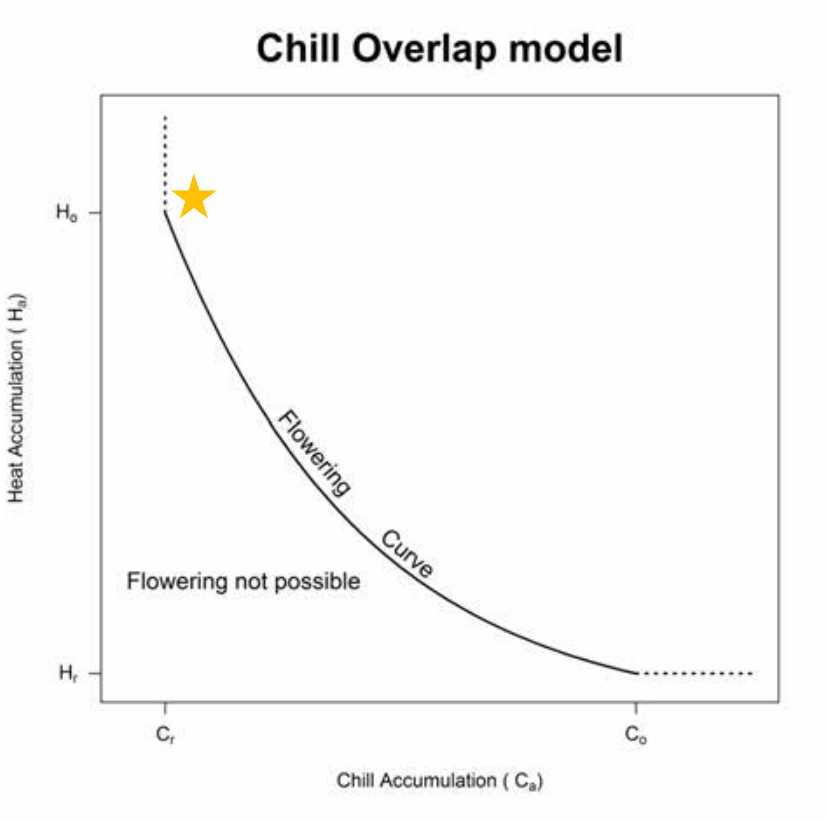
Worse than combined

Combined Error = 5.4 days

Model Evaluation

- Chill Overlap model:
  - Performed well statistically
  - Held biological assumptions across flowering stages (same CR, higher HR for full flowering)
- Mild sites were not modelled well
  - Data? Long and variable flowering period
  - Edge of production? i.e. model assumption fall over
  - Why???

Mild sites - why?



Micro climate + canopy design

Individual buds accumulating chill, others heat at same time

Higher heat requirement

Mild sites - why?

INRA – Bordeaux

Heat ‘efficiency’ better with more over-chill.

Simplify the mathematics in the model?

V

Still do not know enough

- Linkage to roots & rootstock (timing, strength)
- What are dormancy breakers doing? (heat?)
- What management options can modify temperature conditions? How do we apply them?
- Can we influence metabolics?
- How do we work out *yield limiting* Cr?

Grower Scientists

Let’s see what happens with cherries?!

France = large European dataset, asked for Aus. data

Thanks to scientists: Mark Chapman, Simon Rouget & Alex Turnbull

Can you help?

Questions?

(For some winter chill maps and more info:
http://www.hin.com.au/projects/winter-chill-and-fruit-trees)

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