Are Phenology models developed with European and USA data useful in Australia?

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Phenology models describe the relationship between the environment (temperature) and timing of budburst, flowering, véraison and maturity. We tested seven winegrape phenology models developed using European and USA data in nine locations (Cessnock NSW, Launceston Tas, Ararat Vic, Mildura NSW, Renmark SA, Victor Harbor SA, Coonawarra SA, Nuriootpa SA and Margaret River WA).

Understanding phenology has value in the vineyard and winery

A more accurate prediction of fruit maturity would help avoid fungicides being applied during the withholding period prior to harvest and ensure that the winery is ready to receive fruit (especially grapes for sparkling wine) in an earlier than normal vintage. Understanding phenology is also essential when matching varieties to regions in both the current and future climates as it allows the impact of changes in climate in coming decades to be examined by accounting for changes in plant development stage.

How do the International models perform in Australia

We lack extensive data sets for testing, especially of budburst, flowering and vérasion. Nevertheless, there were models that matched the experience of local viticulturists. The notable exceptions were cooler years in Launceston where some models failed to ripen Chardonnay, and cooler years in cooler mainland locations where some models failed to ripen Cabernet sauvignon. In warmer regions, the models provided strong indications of the quick 2016 and slower 2017 vintages as early as November which would be useful for planning.

How Phenology models work

The heat accumulated over a vintage is the main driver of phenology and many viticulturists monitor growing degree days (GDD). Published models of varying complexity have been developed using extensive data sets of grape development stages in Europe and USA. These are all driven by accumulated heat but differ in starting date and have variety specific base temperatures and thresholds of GDD for reaching key stages such as budburst, flowering, véraison, and maturity.

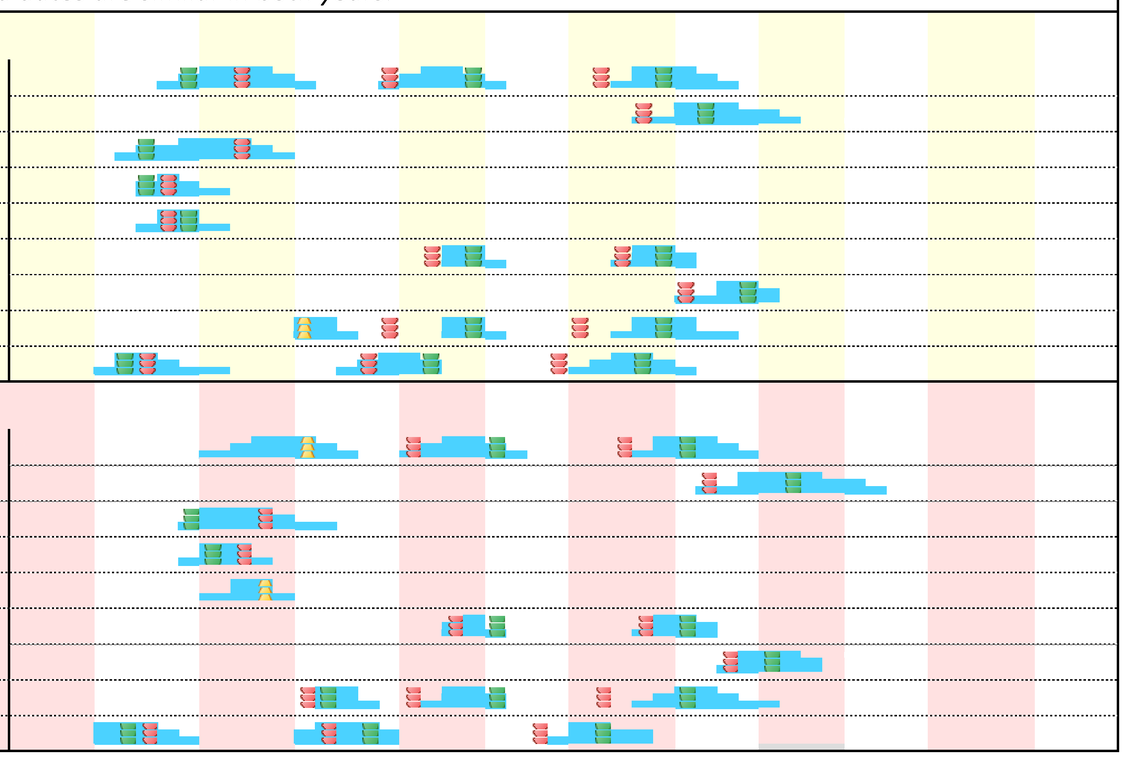
	Heat accumulation commences	GDD threshold (°C)	Budburst	Flowering	Veraison	Maturity
Van Leeuwin	1st July	10	✓	✓	✓	✓Harvest date
Garcia de Cortazar-Atauri	1st July	10	✓	×	×	×
	1st July	5	✓	×	×	×
	After dormancy	5	✓	×	×	×
Parker	29th Aug	0	×	✓	✓	✓20 °Bx
Zapota	1st Oct	10	✓	✓	✓	×
	1st July	Variable	✓	✓	✓	×

Temperature and Predicted dates from Phenology models at Nuriootpa

	Growing Season	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Mean growing season (October to April) and monthly temperature (°C) *Colours of the monthly values denote the corresponding decile (coolest shown in blue, warmest in red, warmer than Historic period in Purple)*													
1986-2005	GST = 18.3	9.1	9.6	11.9	14.3	17.3	19.5	21.2	21.5	18.8	15.5	12.4	10.0
2015/16	GST = 20.3	8.3	9.5	11.2	18.7	18.7	22.9	23.0	21.3	20.8	16.4	13.8	9.9
2016/17	GST = 18.6	9.3	10.0	10.4	13.2	16.3	20.1	22.6	21.1	21.2	15.8	11.7	8.5
Mean growing degree days base of 10°C (GDD10) (°C days), and accumulation from October to end of each month. Monthly totals shown for July to September. *Colours of the monthly values denote the corresponding decile (coolest shown in blue, warmest in red, warmer than Historic period in Purple).*													
1986-2005	GDD10 = 1759	*12*	*21*	*67*	134	354	647	996	1320	1594	1759	1839	1866
2015/16	GDD10 = 2191	*7*	*16*	*48*	271	532	933	1335	1664	1999	2191	2308	2333
2016/17	GDD10 = 1828	*17*	*33*	*27*	103	293	605	997	1308	1654	1828	1888	1891

Grapevine development predicted by phenology models

Blue shows the historic spread of predicted dates; Red shows predicted date of the warmer 2016 vintage, Green the predicted date of the cooler 2017 vintage and Yellow when predicted dates are similar in both years.



Conclusions

All models show a wide range in predicted dates of the development stages from cooler to warmer years.

The Barossa valley, like most Australian wine regions is showing strong warming trends. Even the 2016 vintage, which was considered a cooler than usual vintage, was actually a decile 8 vintage (using the 20 year base period from 1986 to 2005).

Since 2000, only 2002 and 2011 have been decile 5 or cooler.

Your assistance in providing records of dates of phenological stages would allow these models to be more thoroughly evaluated and calibrated for local Australian conditions.

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