

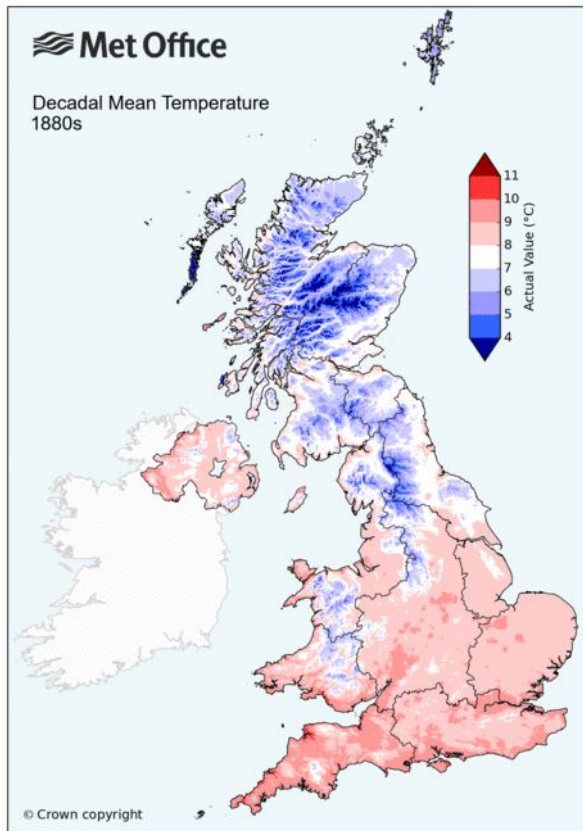
Role of bud dormancy in flowering time control in winter oilseed rape, and its association with yield stability

UK-BRC

Samuel Warner

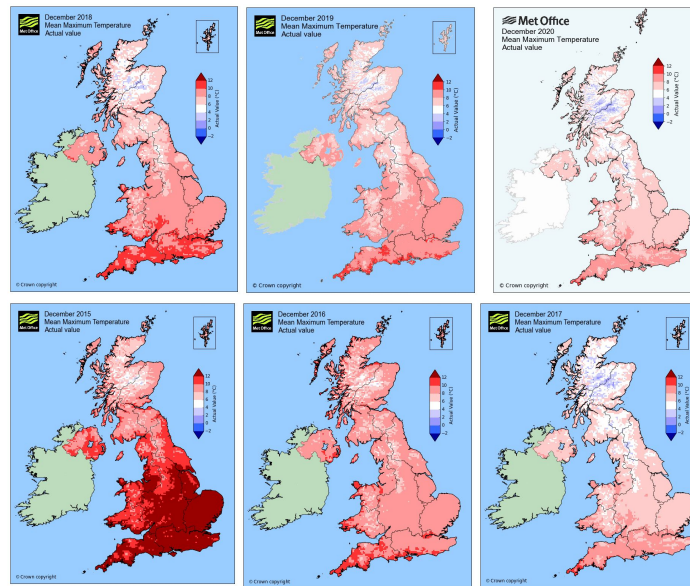
Steve Penfield Group, John Innes Centre

Climate change is causing warmer winters



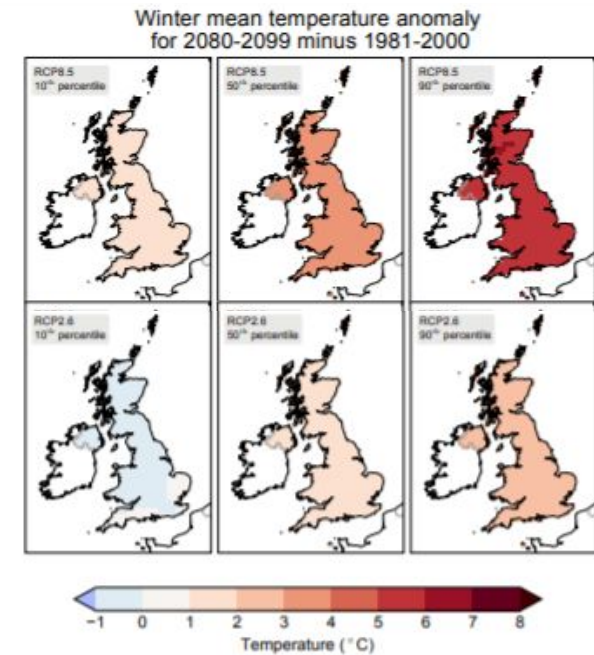
Historic UK climate warming

UK winters face disproportionate warming



Met Office

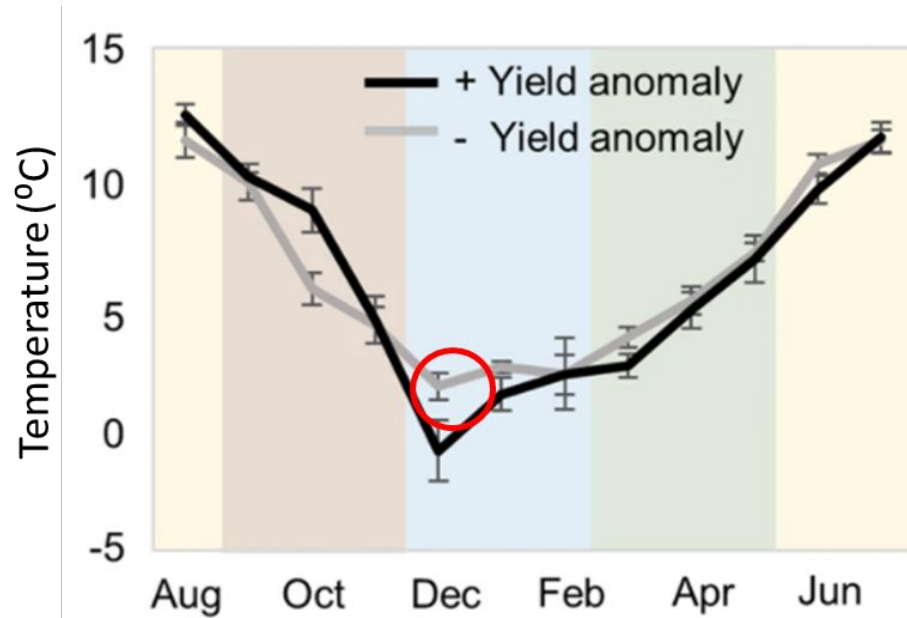
Winters from the past six years



Future winter temperatures

After the inflorescence transition warm temperatures = reduced yield

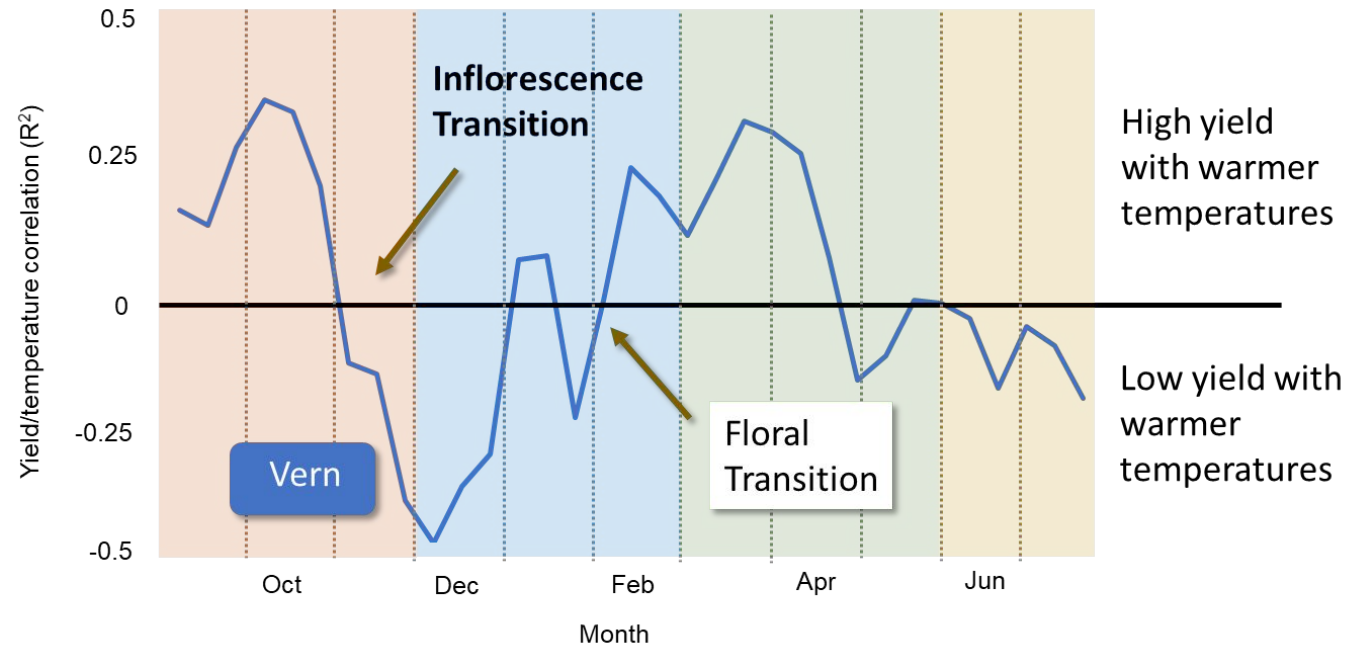
Brassica napus yields correlate with winter temperature



£22m

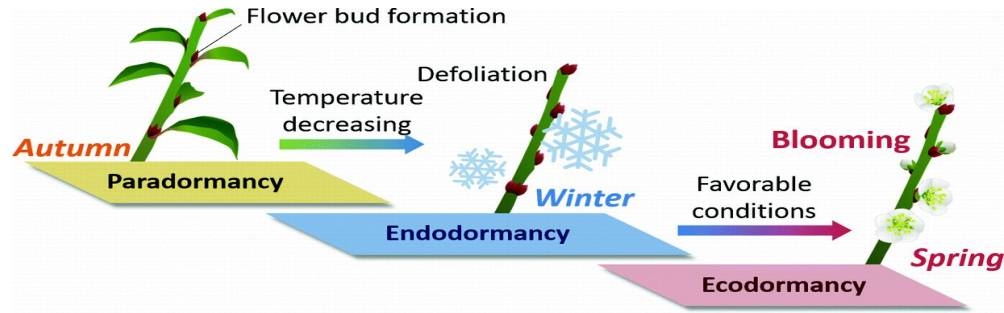
Brown et al., 2019

Warm winter temperatures are negatively associated with yield after the inflorescence transition

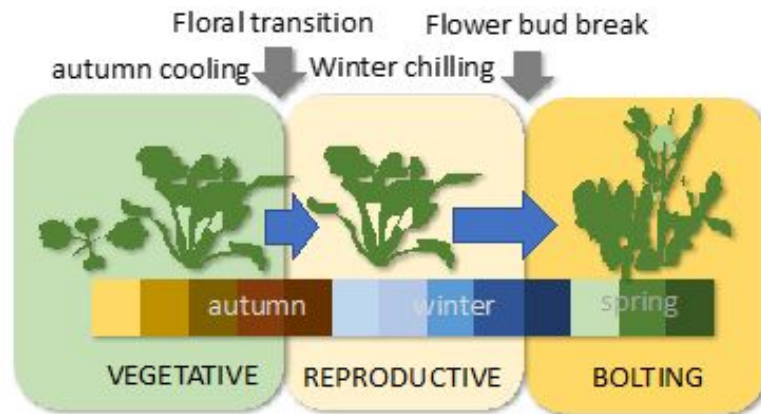


Winter bud dormancy occurs after the floral transition

This is similar to perennial dormancy model

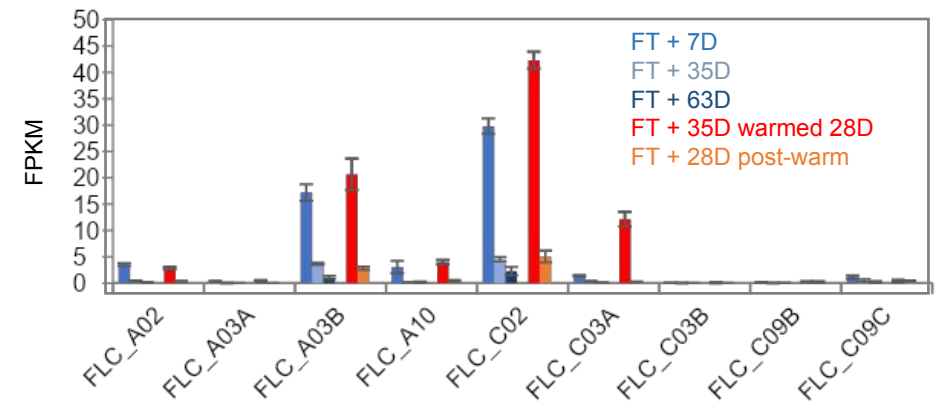


Brassica napus model: bud dormancy stage



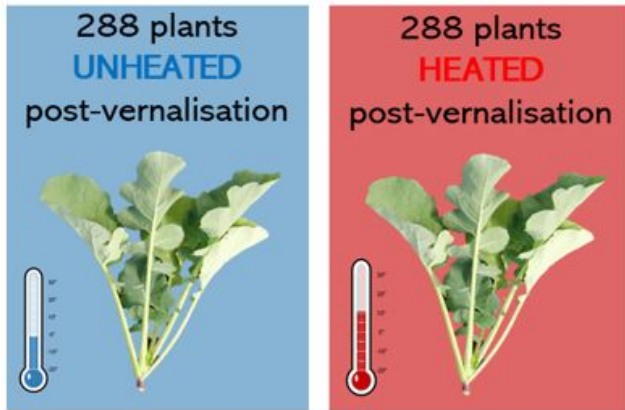
B. napus winter annual phenology hypothesis

We see that warming during this bud dormancy phase alters expression of key genes

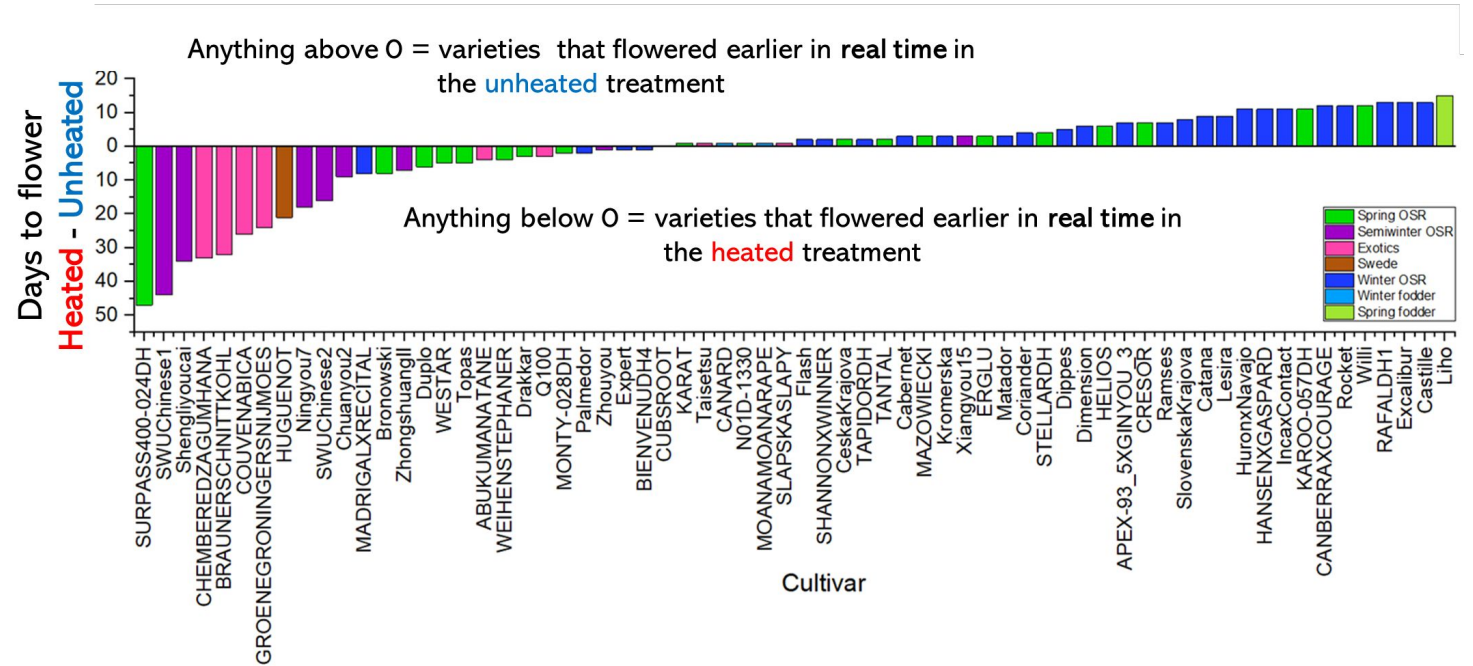


Xiang Lu and Carmel O'Neill

Warming during bud dormancy delays flowering for many crop varieties



There is a large range of responses to temperature

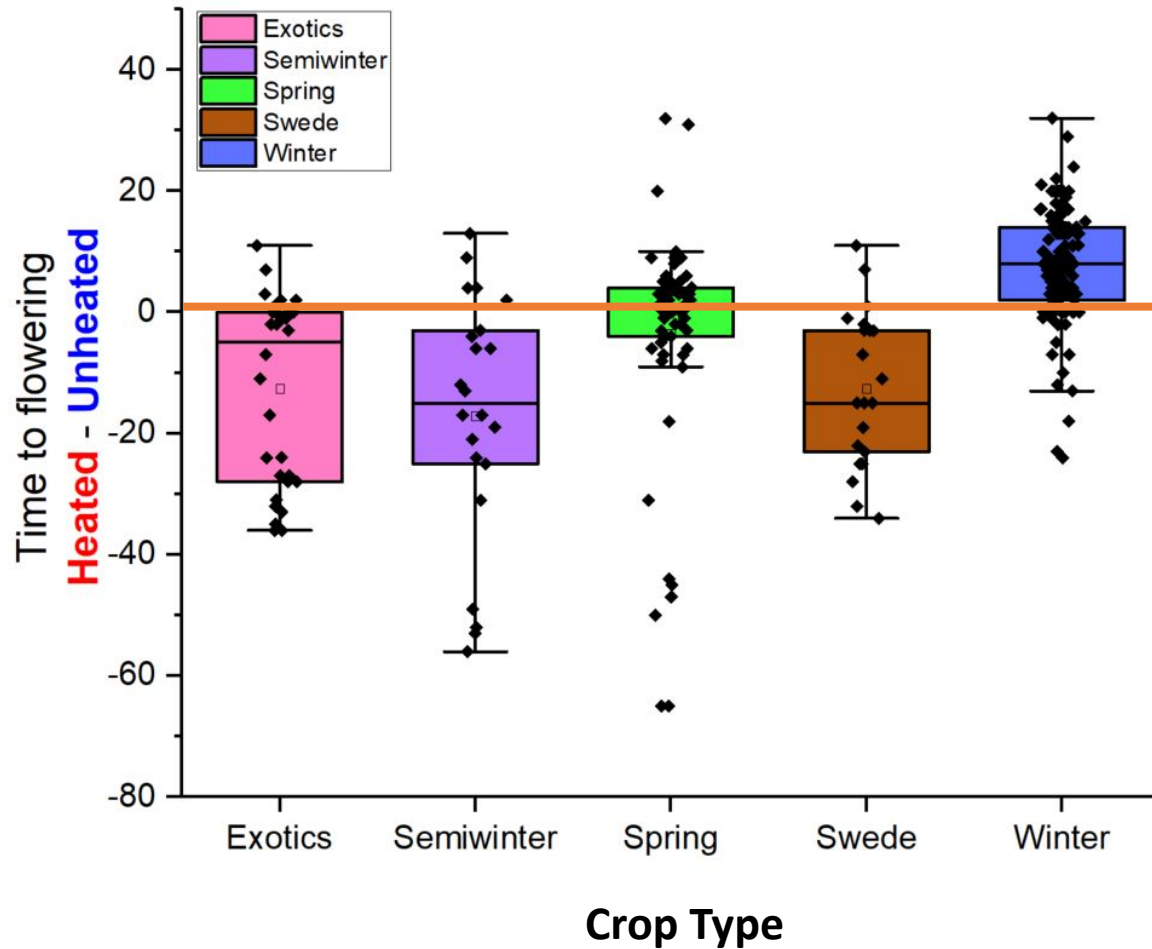


Diversity Fixed Foundation Set including:

Winters, Springs, Swedes, Exotics and Semi-winters.

Winter OSR demonstrates delayed flowering in response to warming during bud dormancy

Flowering response to warming during bud dormancy



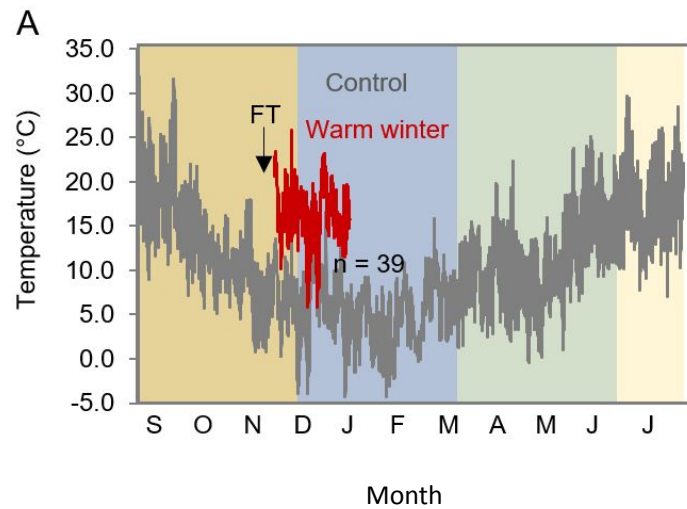
Delay to flowering caused by winter warming

Winter warming **speeds** up flowering

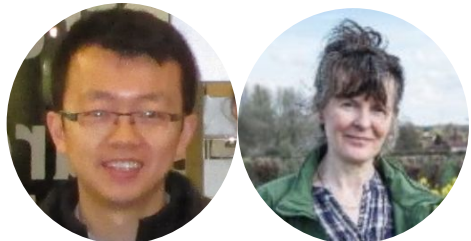
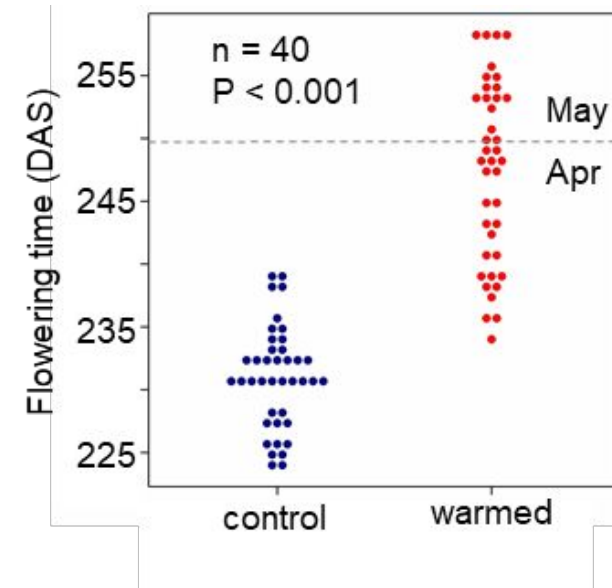


Warming during bud dormancy delays flowering for Cabriolet

Simulated a rise in winter temperatures in controlled environment rooms



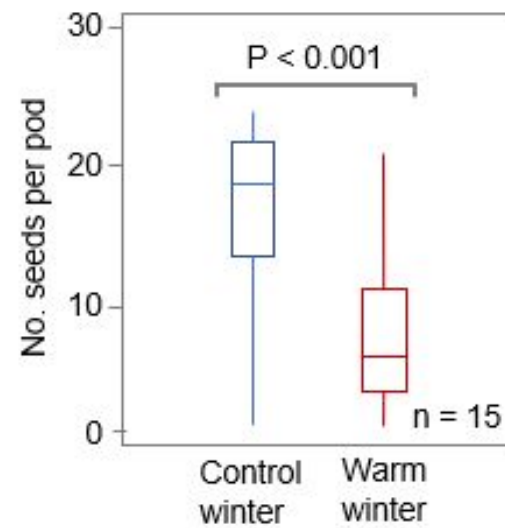
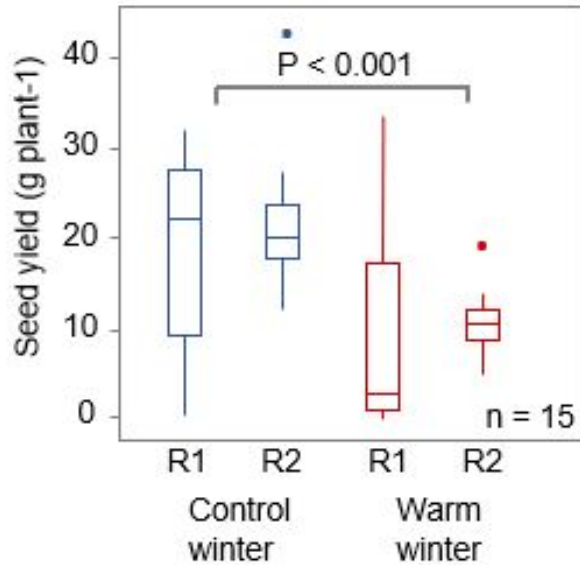
Flowering time delayed by ~14-15 days



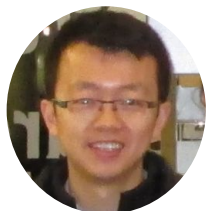
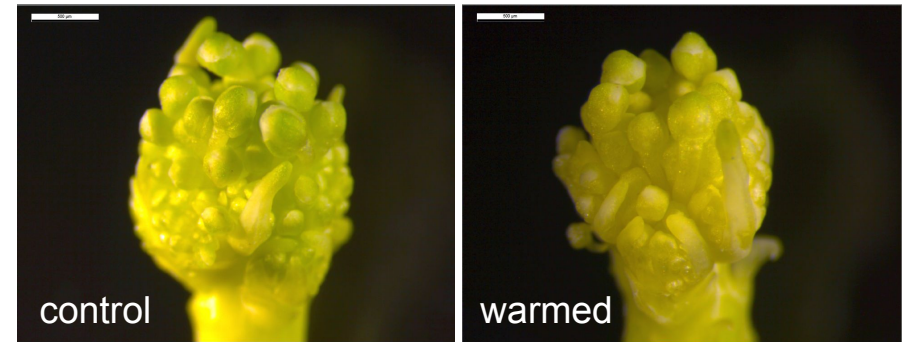
Xiang Lu and Carmel O'Neill

Delayed heating in Cabriolet is associated with low yield

This is also associated with low yield



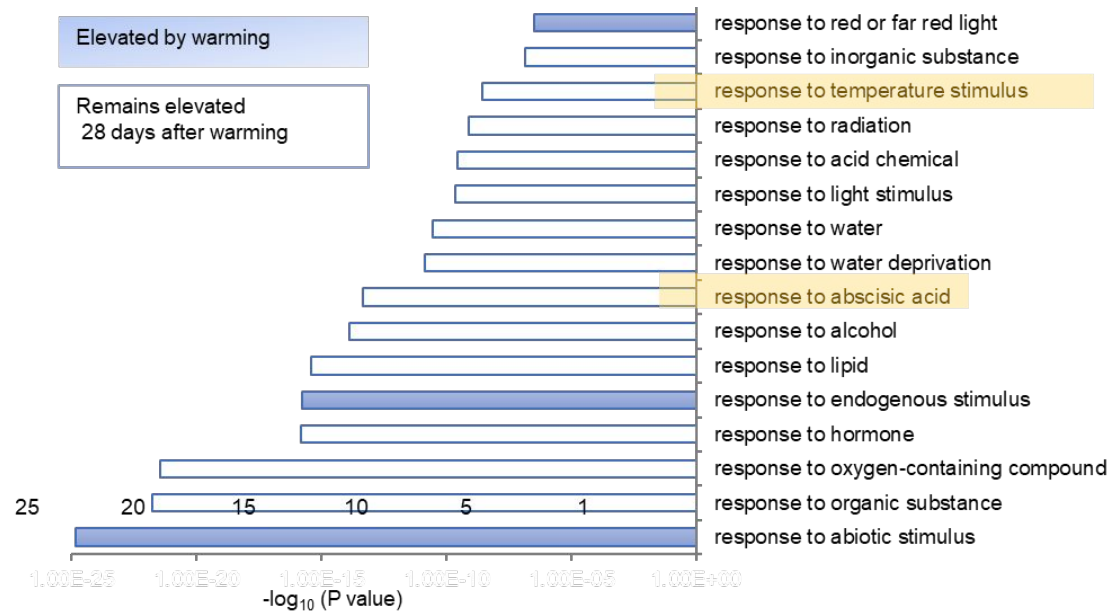
Warmed buds also appear less developed



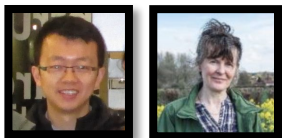
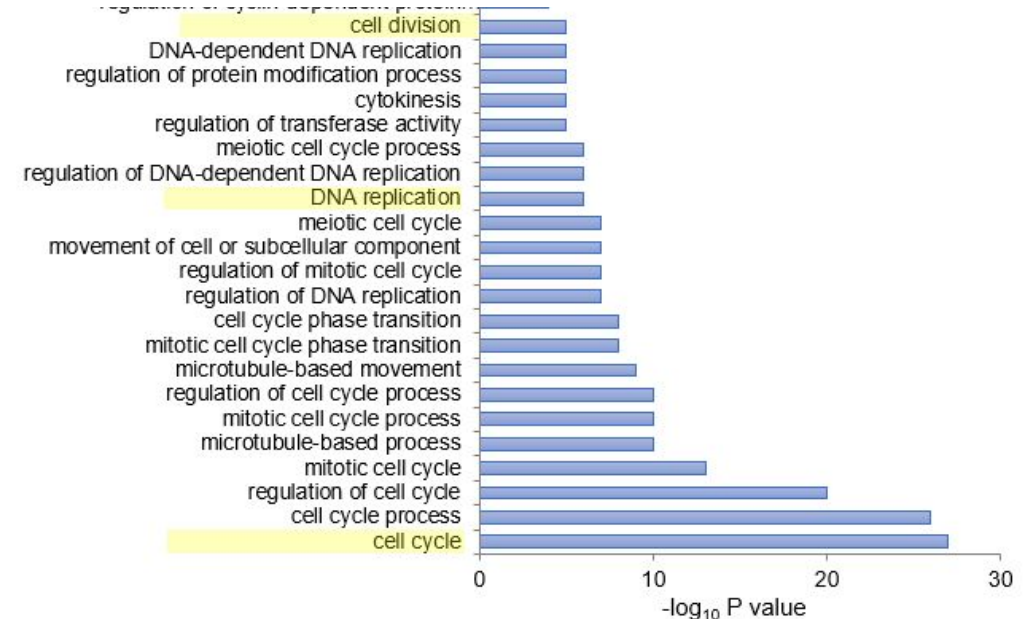
Xiang Lu and Carmel O'Neill

Warming prevents cell division during bud dormancy

GO Terms in warmed plants show response to ABA and temperature stimulus



GO Terms in control plants show cell division and DNA replication



Conclusions

- Warming during bud dormancy:
 - Is associated with low yield
 - Alters gene expression
 - Delays flowering across a wide range of winter OSR
 - Leads to lower yields in Cabriolet
 - Is associated with less cell division



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Biotechnology and
Biological Sciences
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