

Vineyard upslope shifts – a winning strategy for mountain viticulture?

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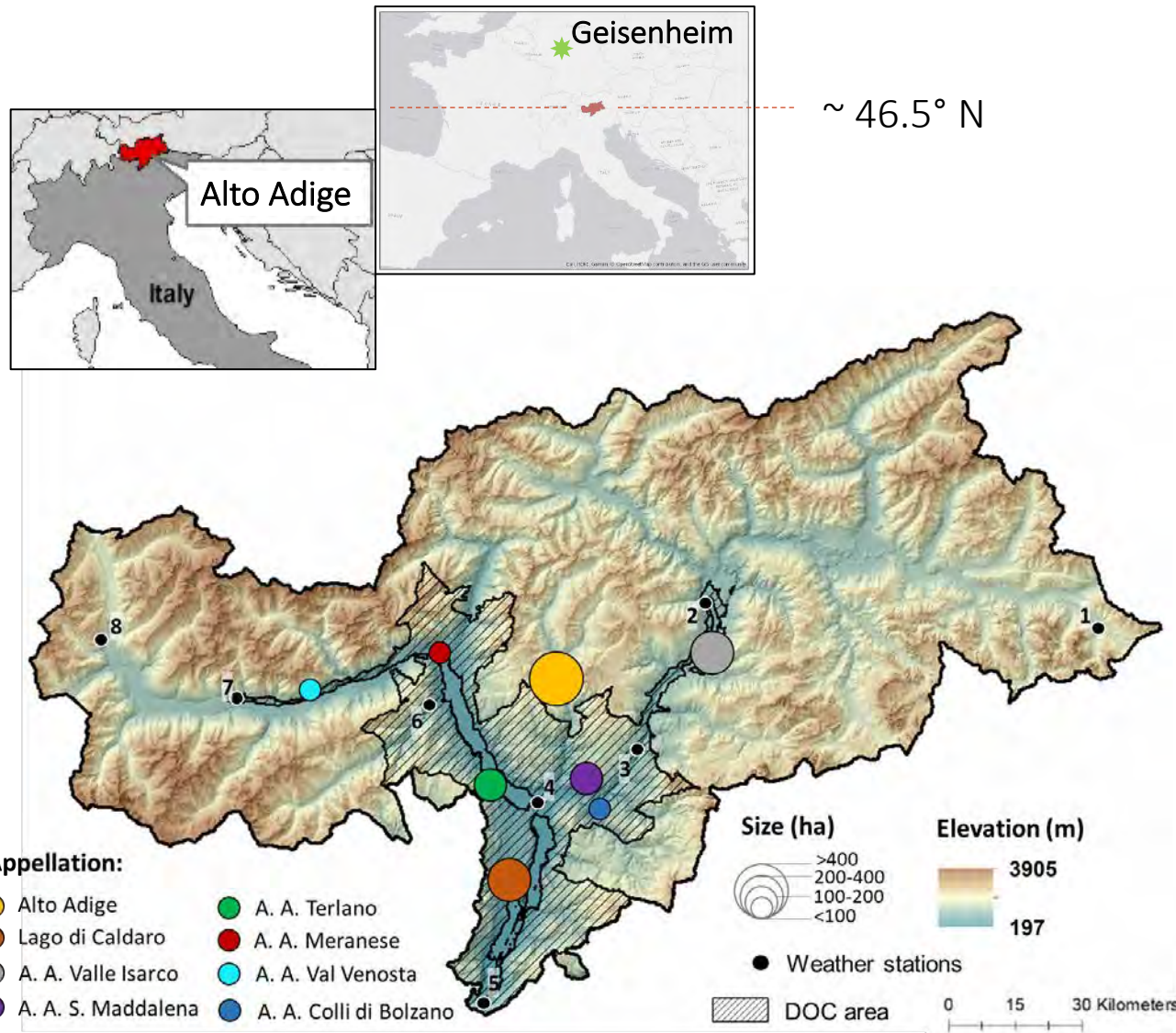
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Alto Adige wine growing region



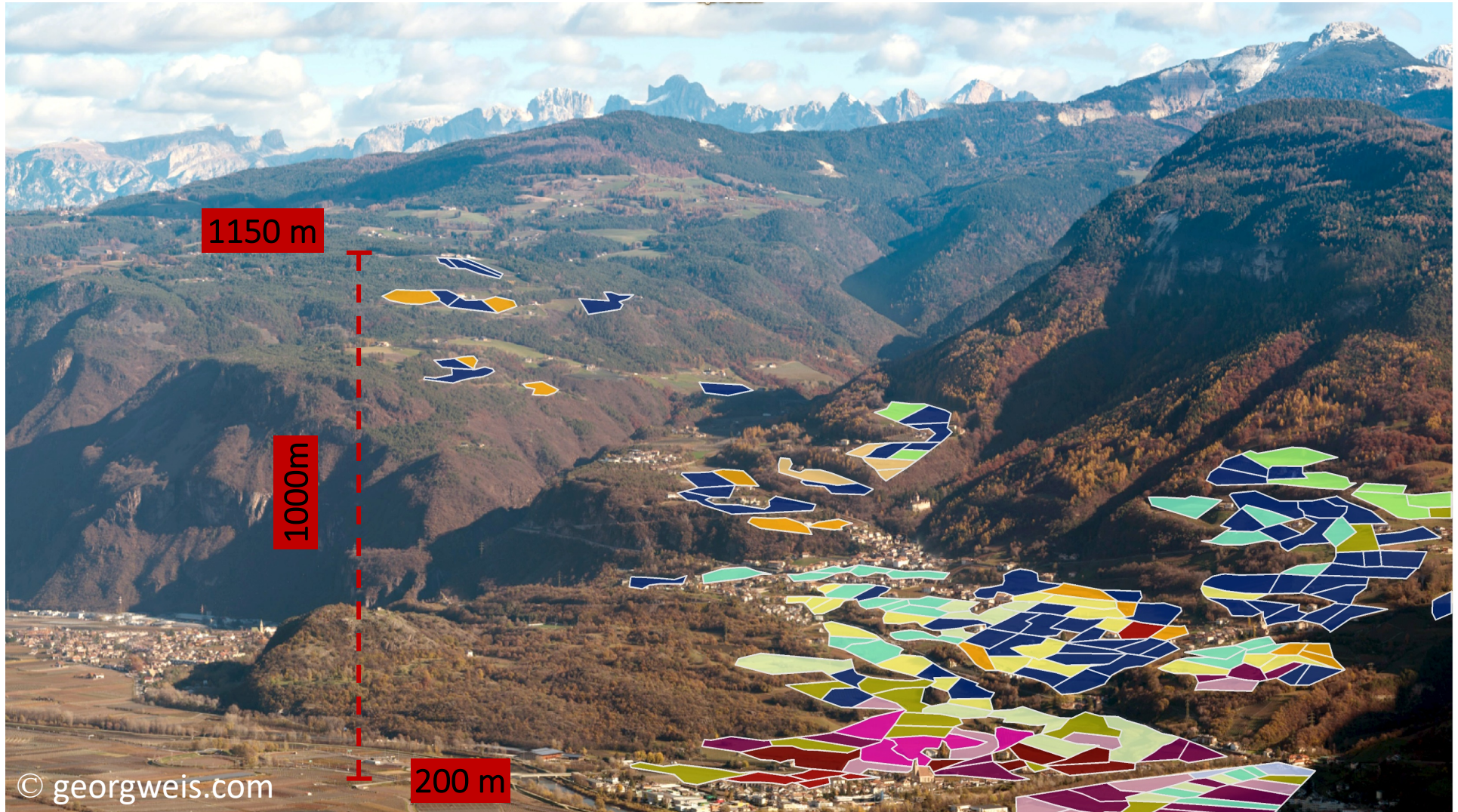
Key numbers:

- Producing area : ~5500 ha
- 98% D.O.C./D.O.P.
- Varieties: > 20
(60% white - 40% red)
- 3 autochthonous varieties
(Vernatsch, Lagrein, Gewürztraminer)
- 160 wineries – 12 cooperative wineries
- 330.000 hl/year = 0.7% of Italy's overall production
- Elevation range: 200 – 1150 m
- GST: 18.3 – 13.4 °C
- Extent: 70 x 70 km

Small winegrowing region - big diversity

Varieties

- Lagrein
- Cabernet Sauvignon
- Merlot
- Cabernet Franc
- Vernatsch
- Pinot Noir
- Chardonnay
- Pinot Gris
- Gewürztraminer
- Petit Manseng
- Müller-Thurgau
- Riesling
- Pinot Blanc
- Sauvignon

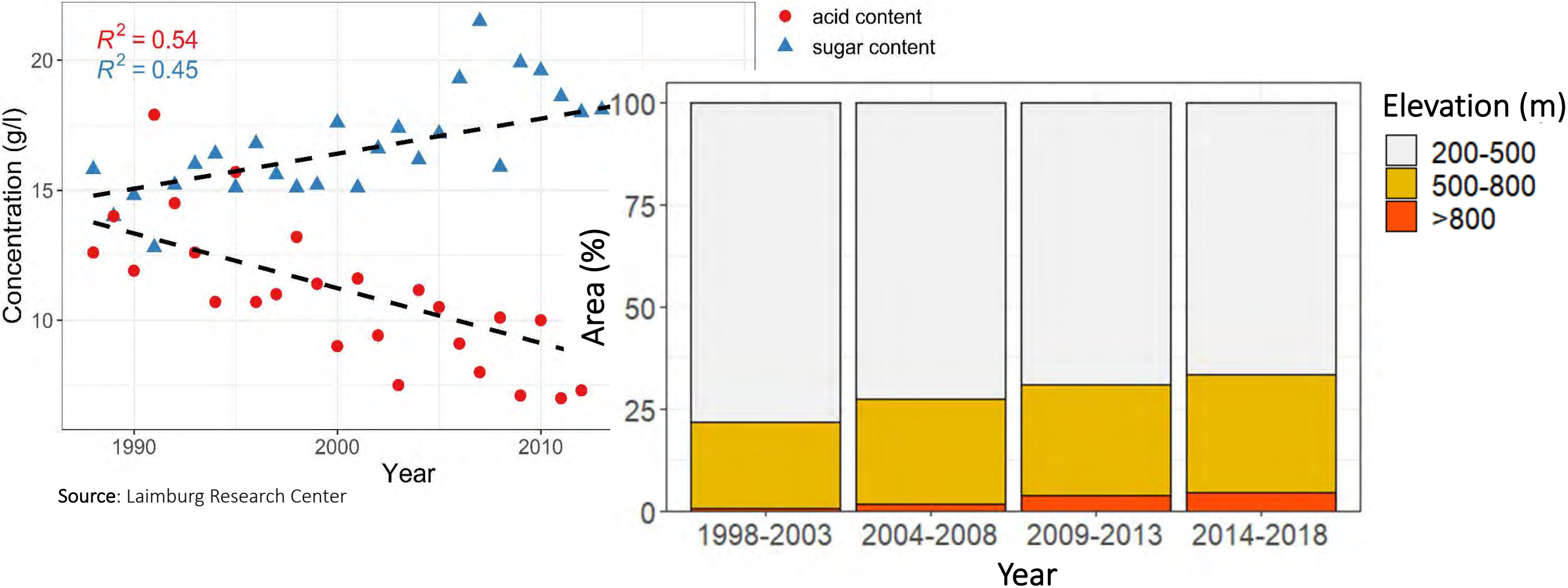


Expectations on Alto Adige wines

- wines with fresh acidity
- fruity wines with fine aromatics
- average alcohol levels
- trends towards more white varieties
- fruity, lively red wines
- rose wines



Observed effects of Climate Change



Source: Land- und forstwirtschaftliches Informationssystem (LAFIS), Provinz Bozen

Observed effects of Climate Change

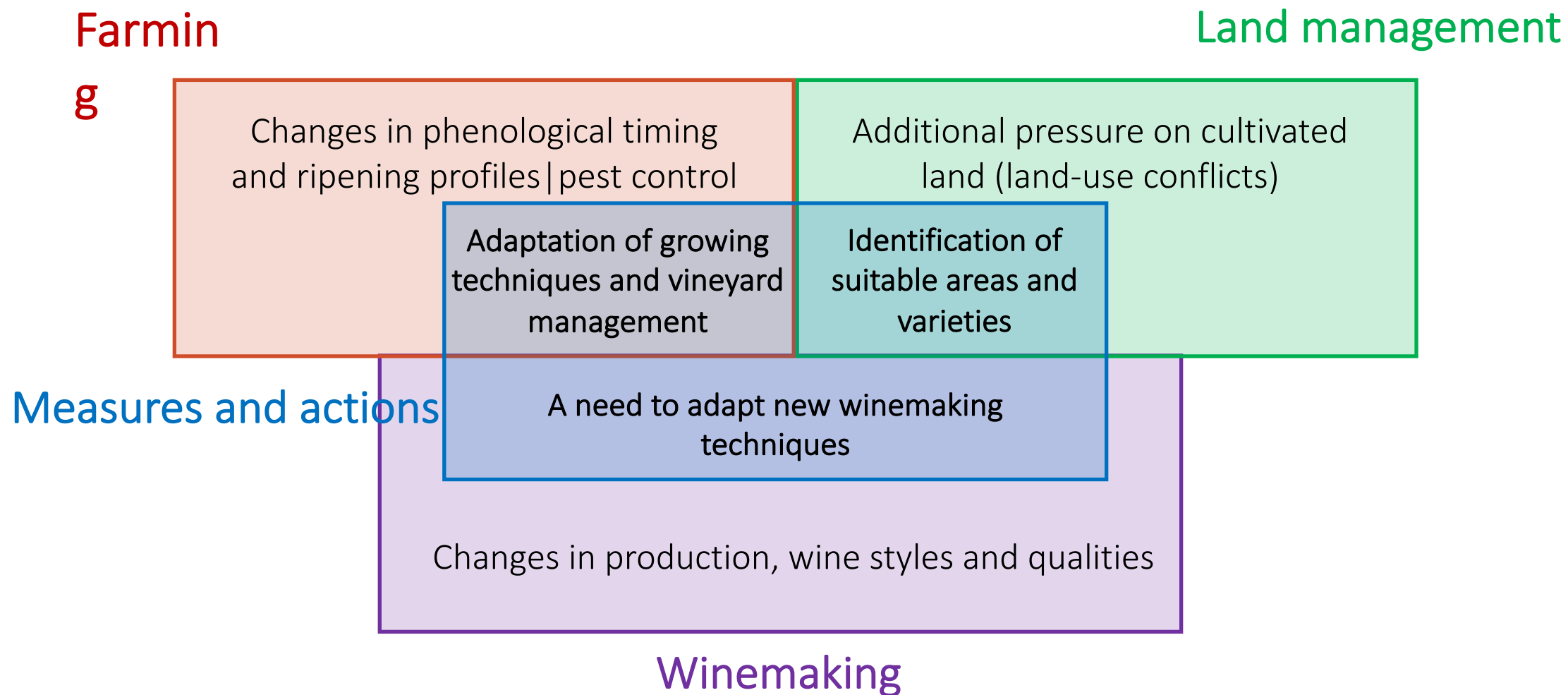


Source: Laimburg Research Center

- Advancements in plant phenology stages 7-14 days
- Longer growing season available (~20 days)
- Warmer dormant periods
- Reduced frost damage (in some areas)
- Altered ripening profiles
- Altered/new disease/pest timing and severity

Source: Report on Climate Change in South Tyrol - 2018

What does all this mean for mountain viticulture?

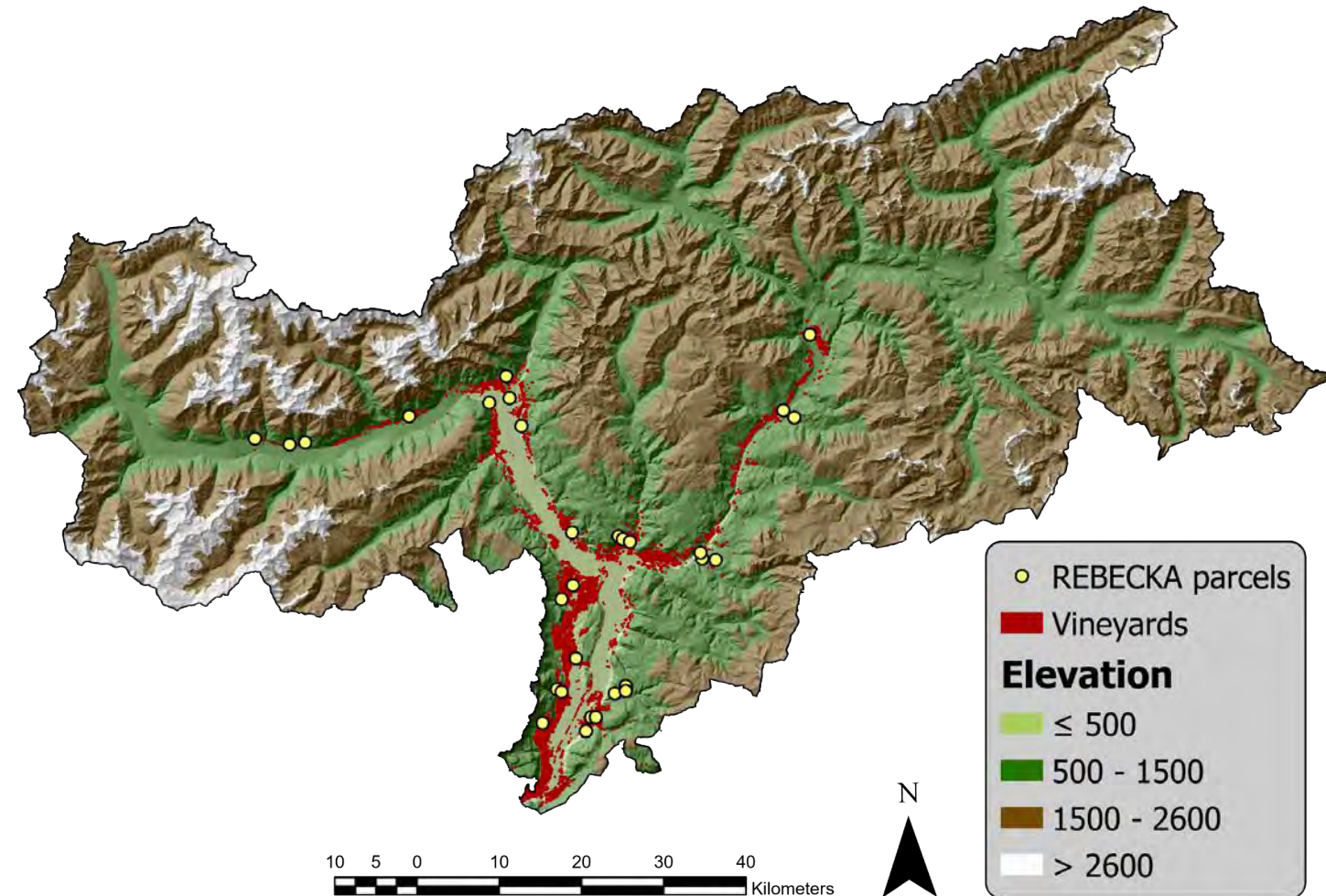
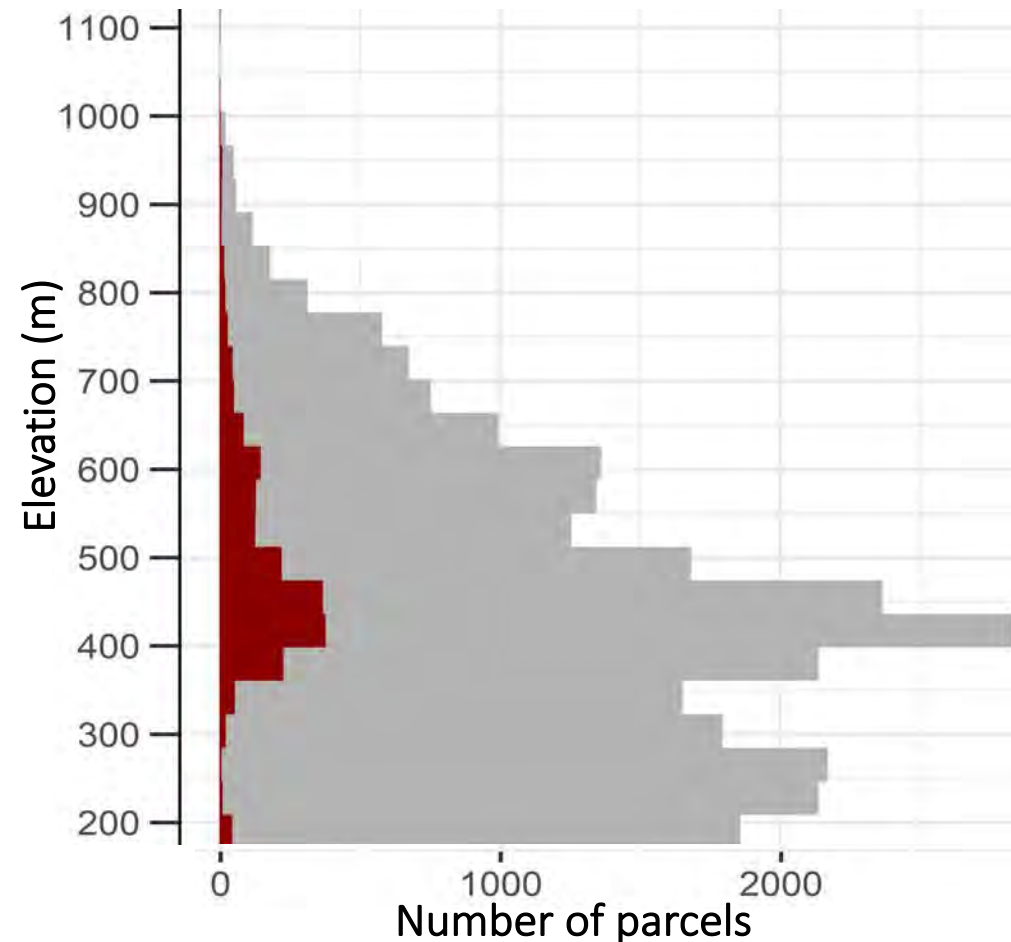


“Rebecka” Study design

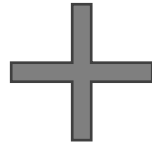
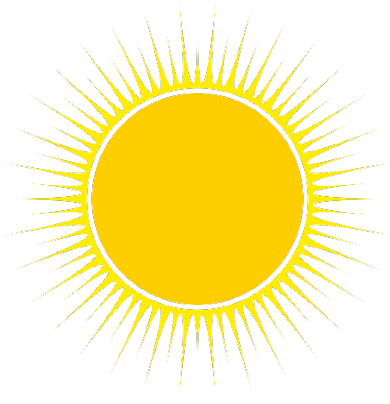
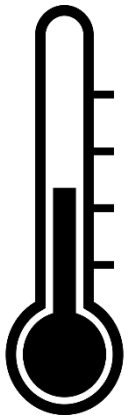
REBECKA-Project:

- 30 sites
- Micro-climatic observations
- Phenological observations
- Grape composition analyses

Distribution of Pinot noir



Characteristics of South Tyrolean viticulture



Temperature Gradients

mainly caused by elevation and complex topography

Solar Radiation

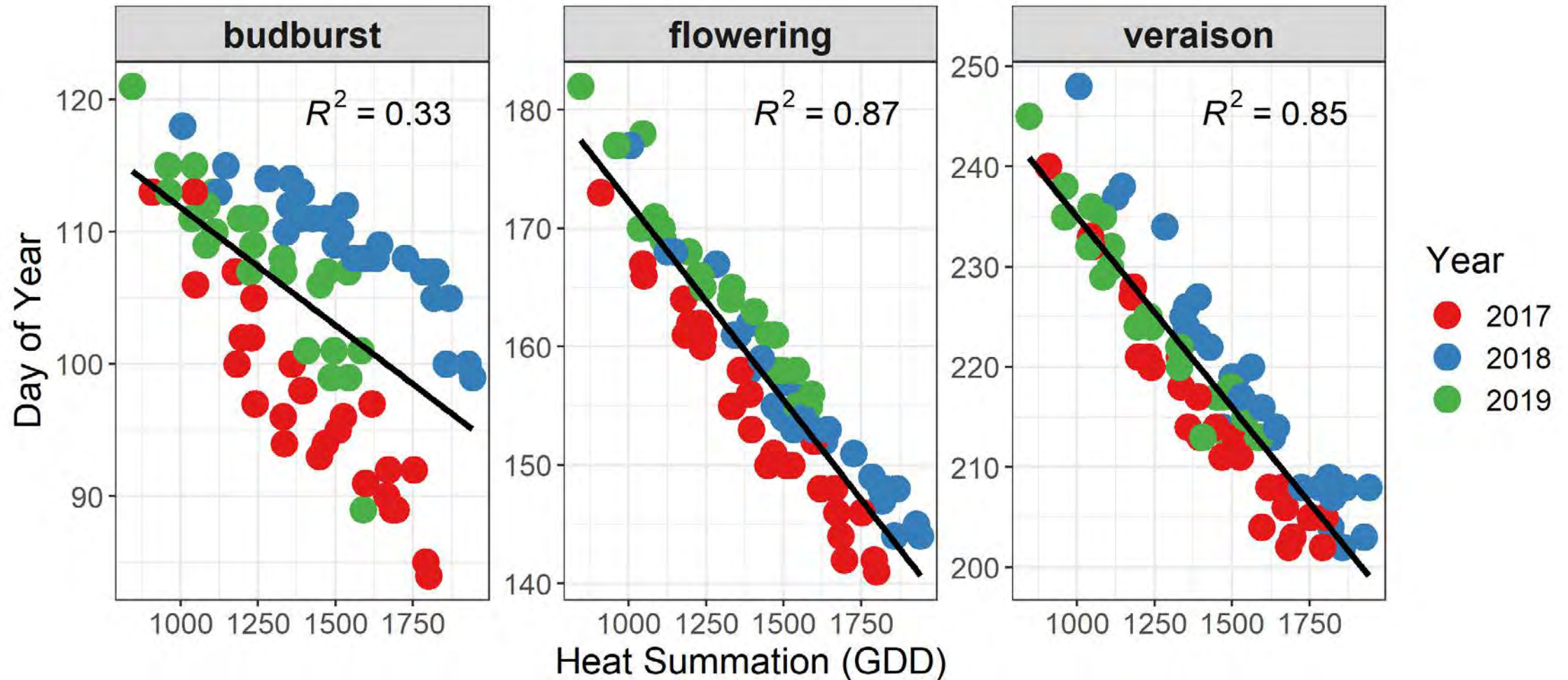
determined by cloud cover, slope, aspect and topographic shading

Small scale

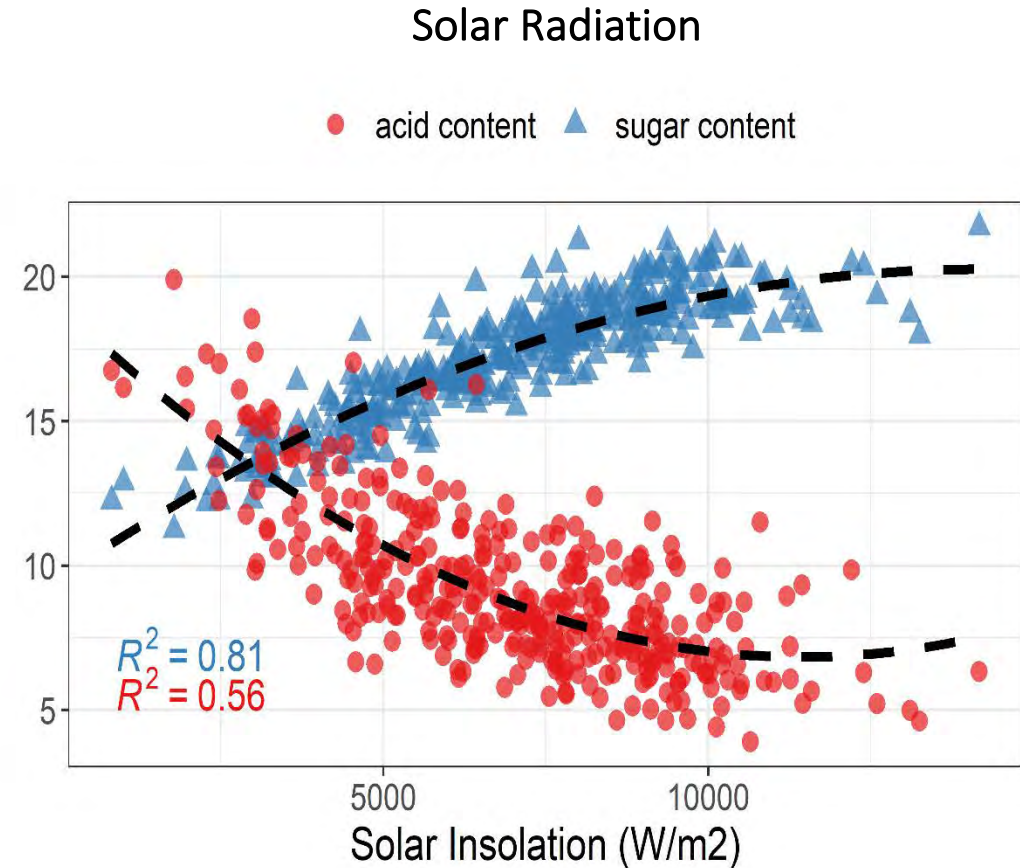
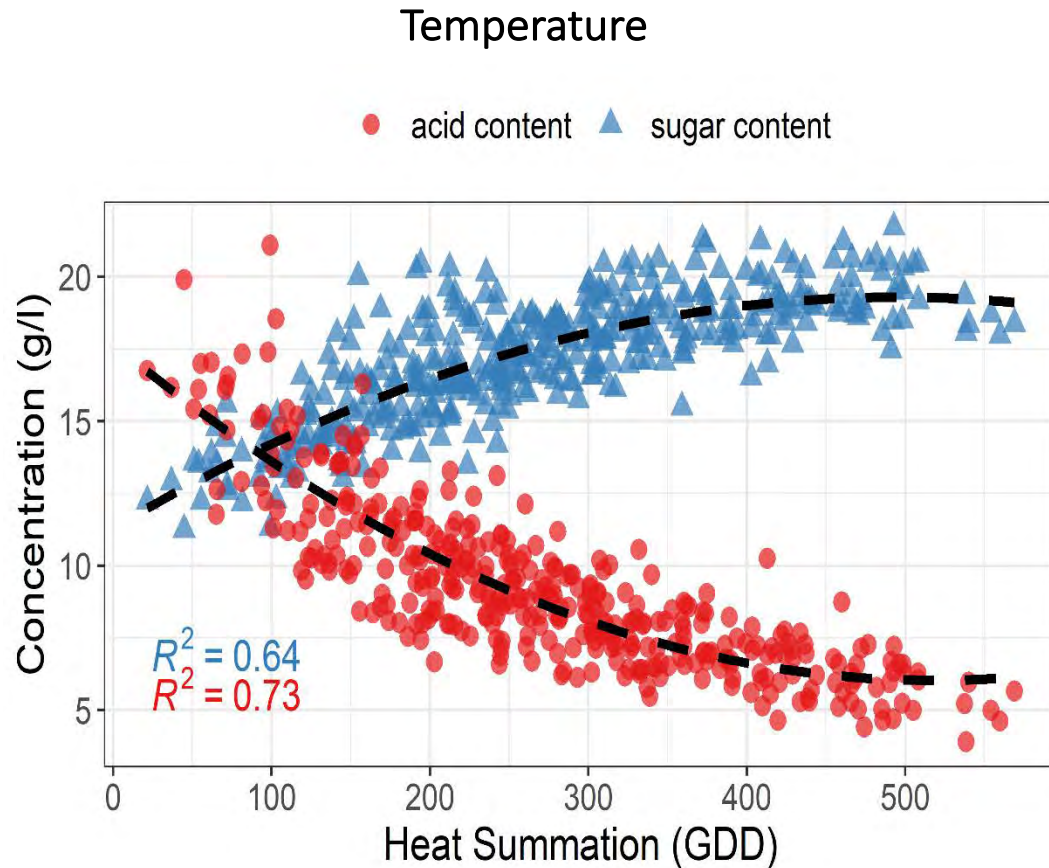
topographic gradients and limited vineyard extension

Broad range of different varieties and wine characteristics

Phenology vs Temperature



Climate vs Grape Maturation

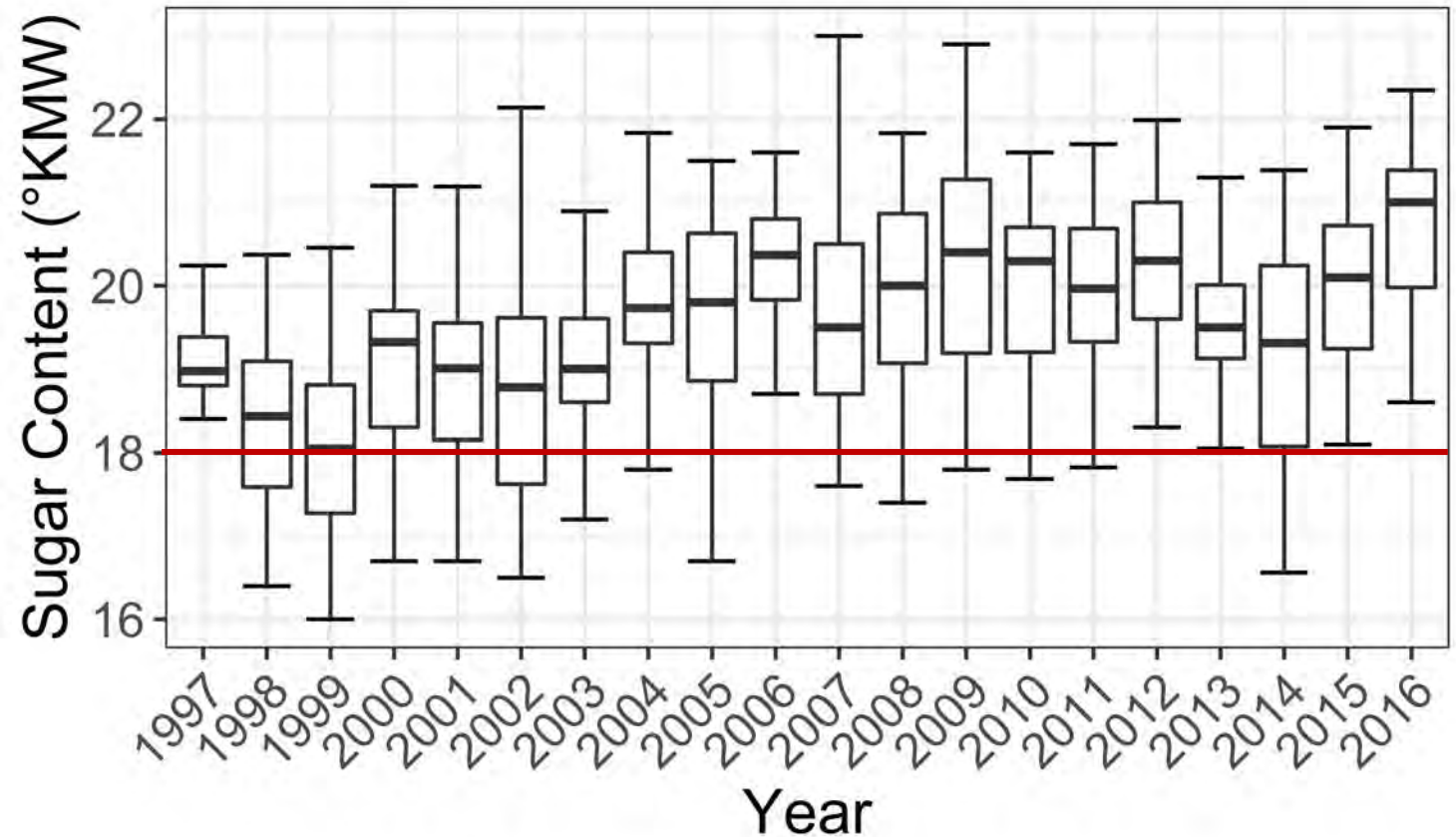


Phenology and grape maturation can be explained by temperature and radiation

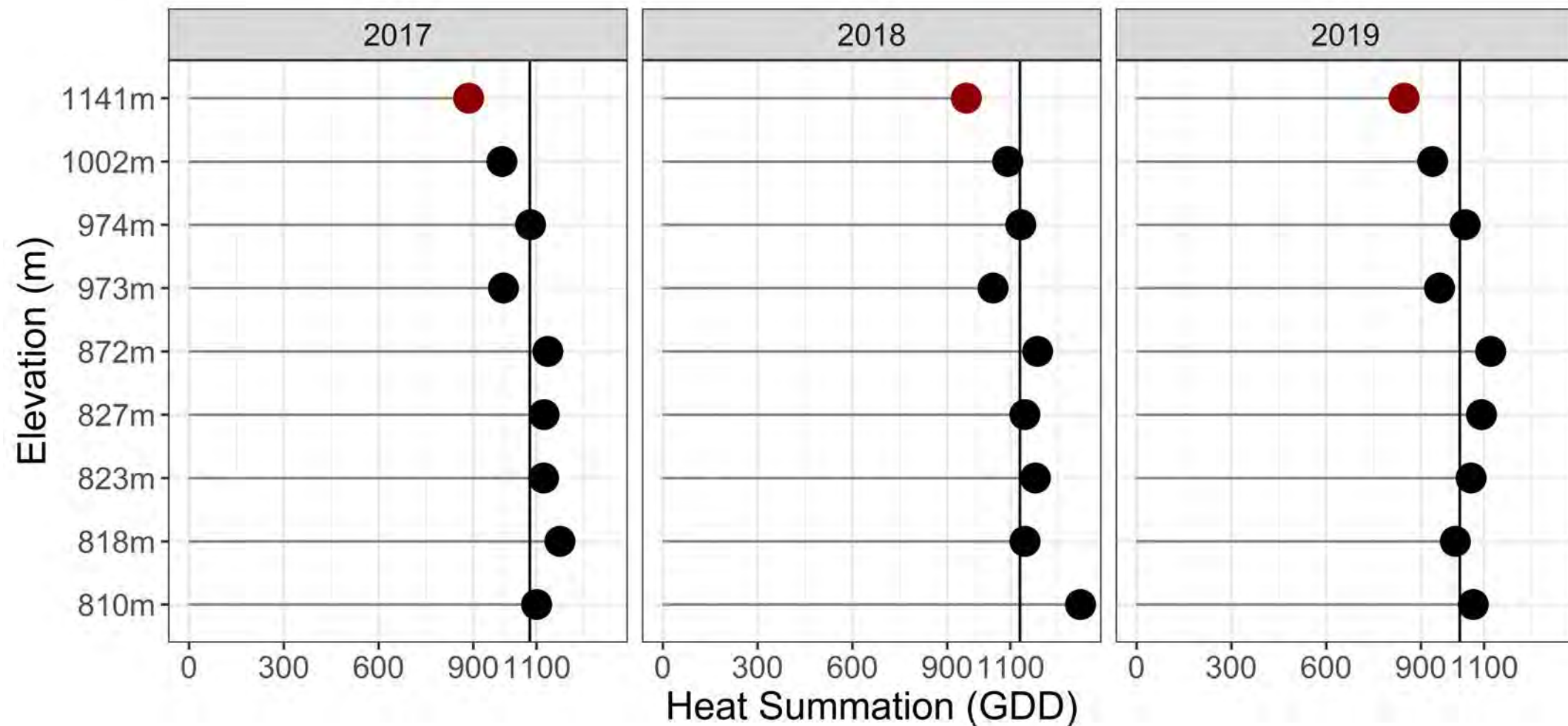
How to define full maturation?

Literature review + Historical observations

Wineries: Eppan, Tramin, Nals,
Kurtatsch, Eisacktal
Period: 1997 – 2016
Deliveries: > 30/year
Elevation range: 200 – 850m a.s.l.

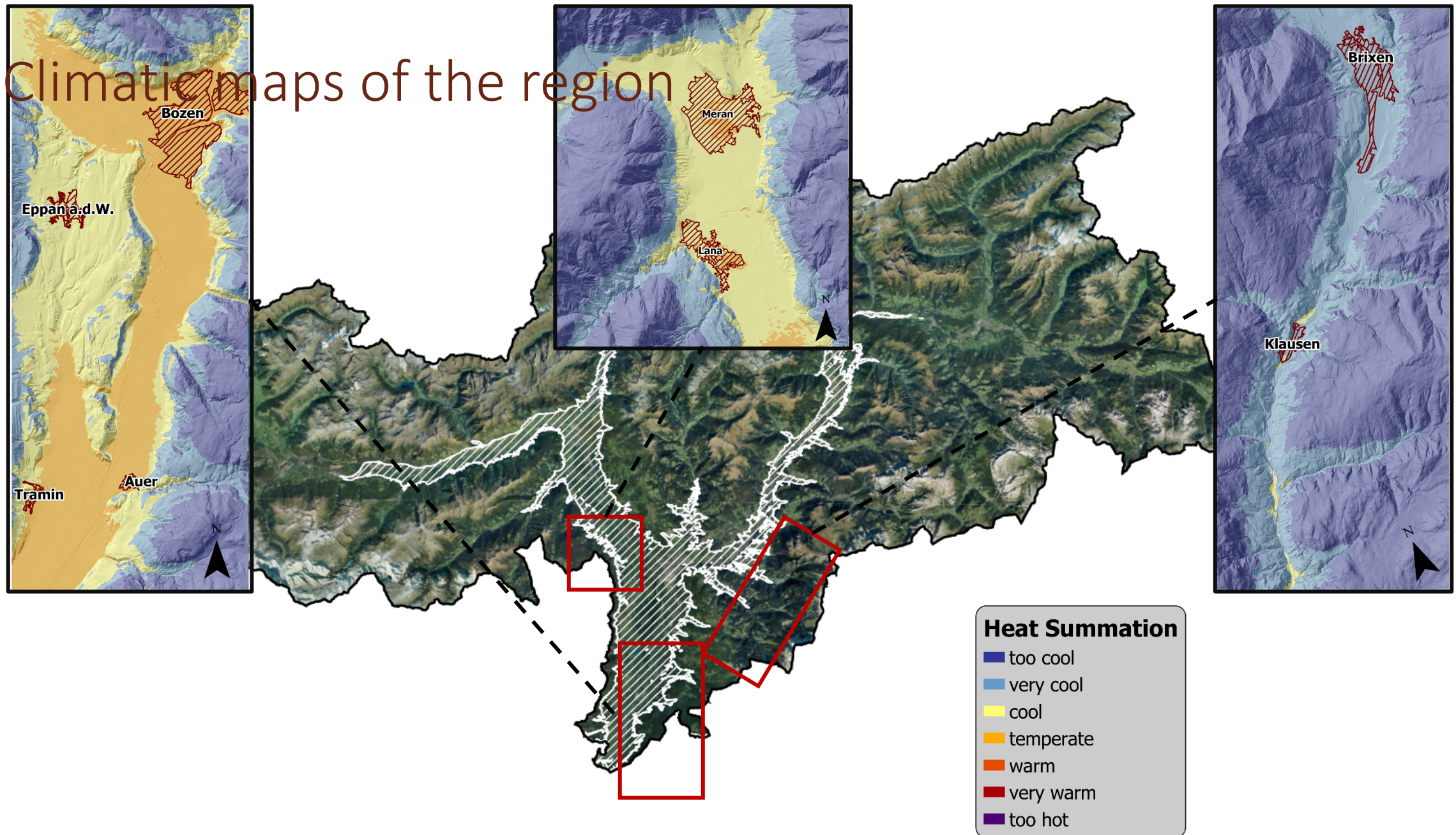


Full maturation is reached at a sugar content of **18°KMW** (90°Oe | 21.5°Bx)



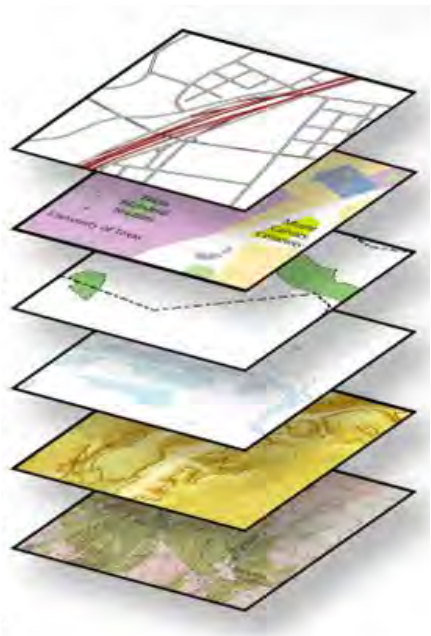
At least **1100GDD** are necessary to reach full maturation on high elevations

Climatic maps of the region



Vineyard expansion analysis

Overlay Analysis



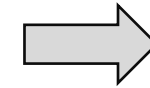
Climate: ≥ 1100 GDD (2001 – 2018)

Land-Use: Grasland, Orchards, Crops

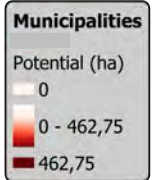
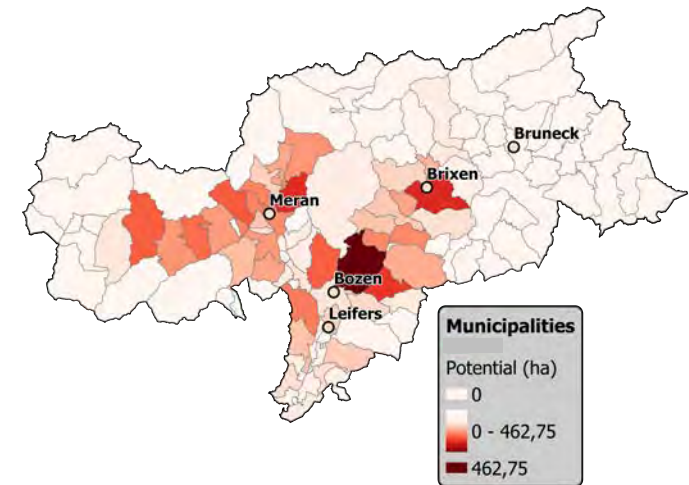
Exposition: West – South – East

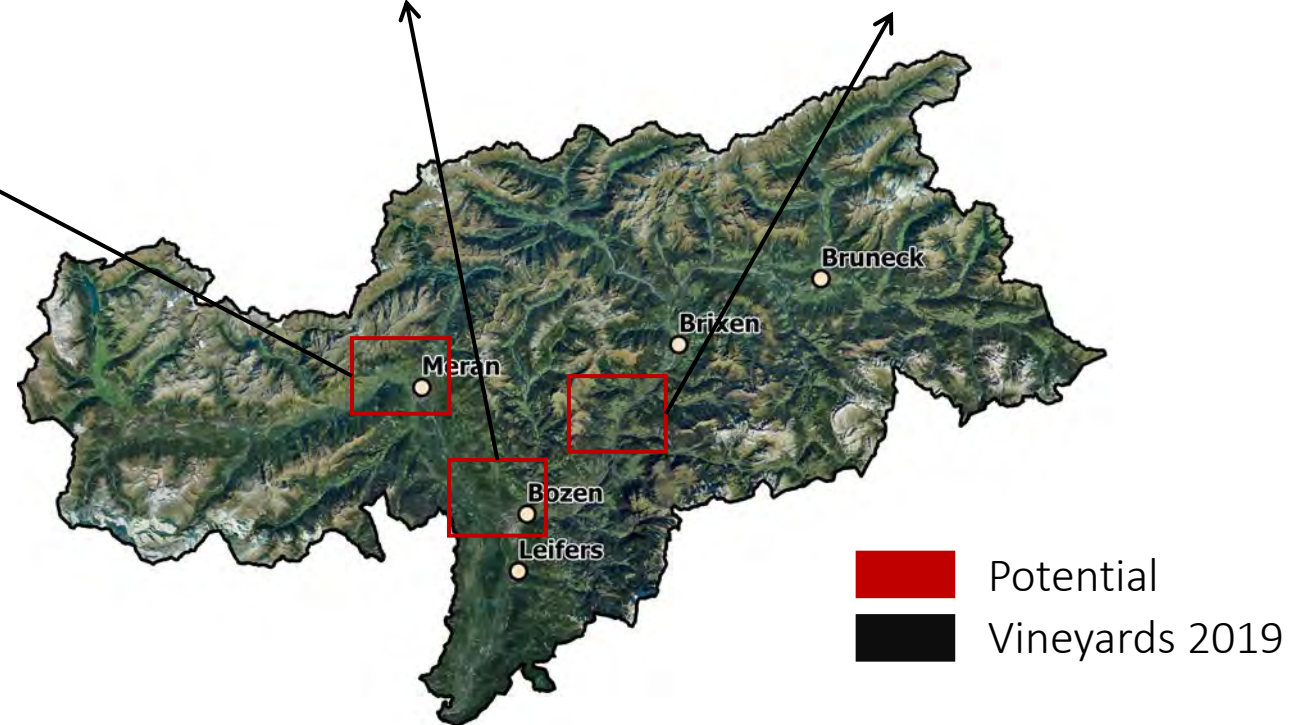
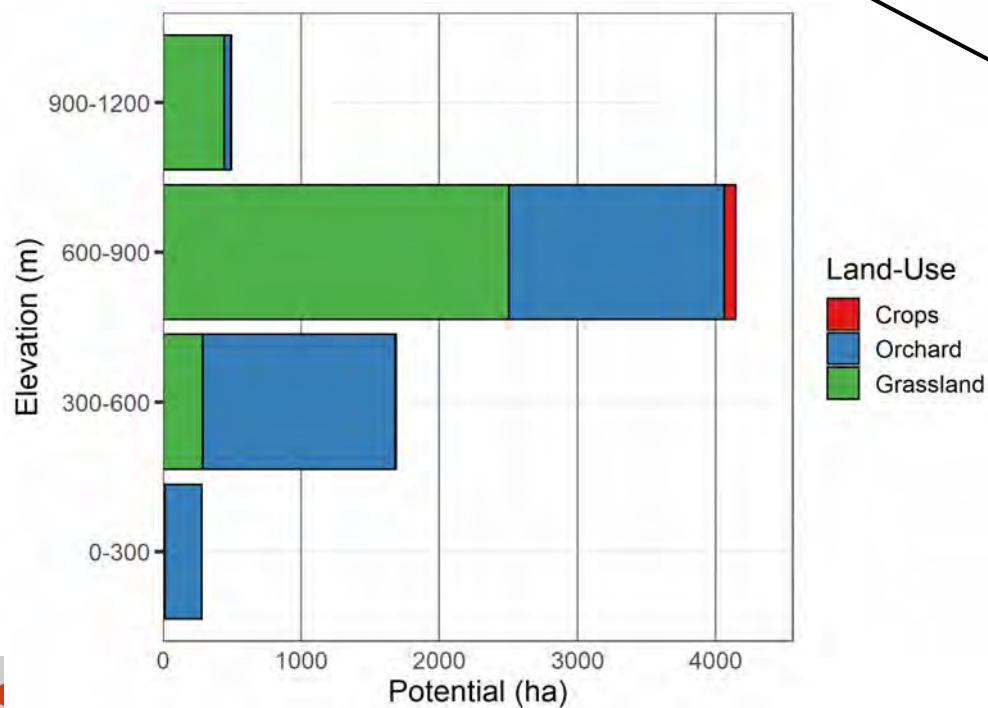
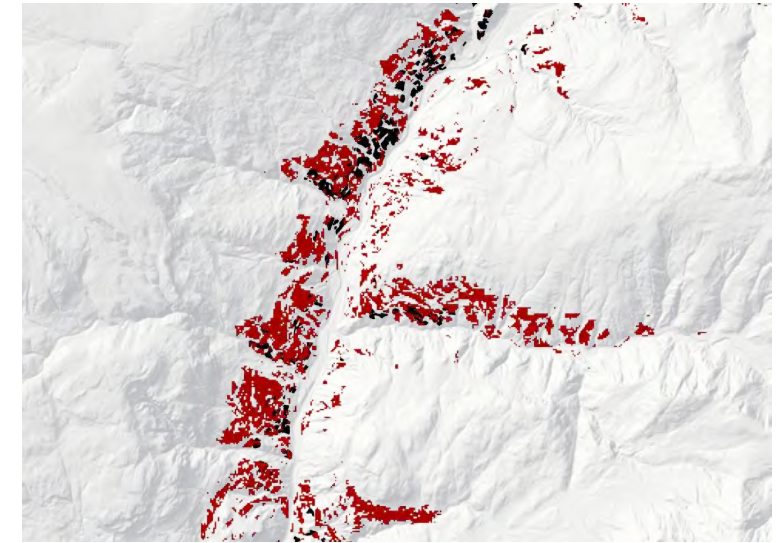
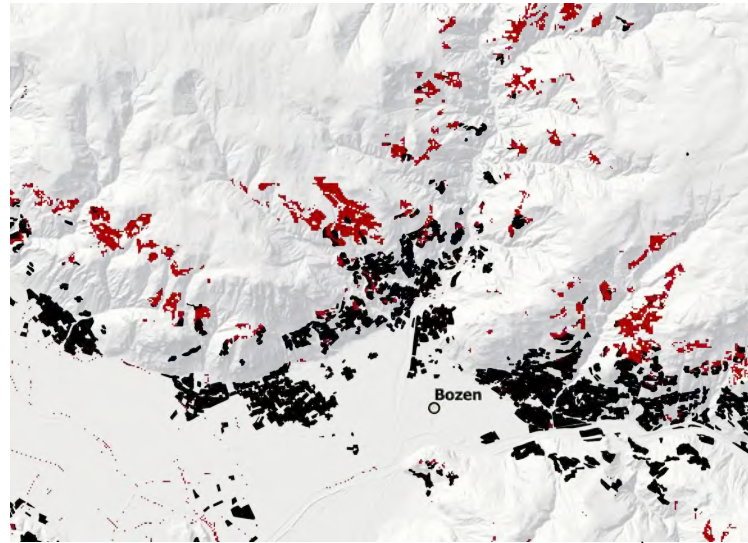
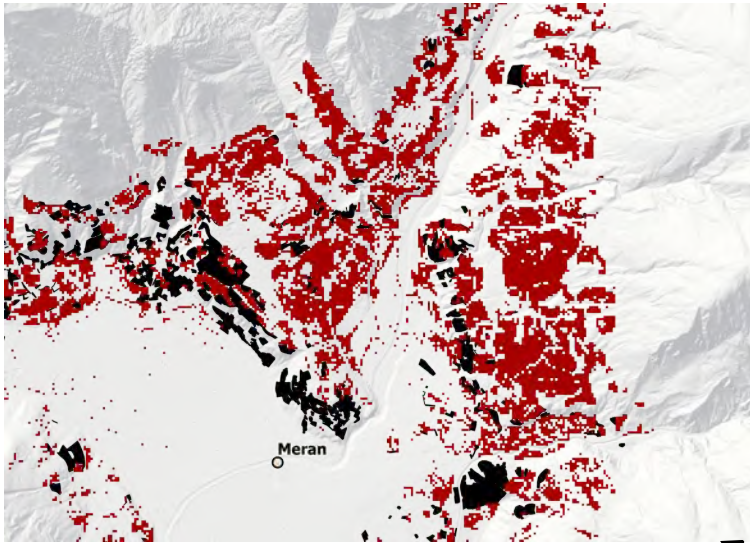
Slope: ≥ 5 degree

Overlay
Analysis



Potential areas for viticulture





Conclusions

- Climate change is **increasingly a challenge also for mountain viticulture**, especially where autochthonous varieties have historically been grown (adaptation)
- On the long run, areas at the **cooler limits** will benefit from a warmer climate (regional development) → lower yields have to be expected
- However, shifts to higher elevation lead also to **land-conflicts** (i.e. traditional landscapes are transformed) → balance innovation with tradition
- High elevated vineyards are more exposed to **extreme events** (i.e. hail and winter frost) → likely to increase due to CC



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