Hardiness update

Faith Jones, April 28th

What I will cover

- Added site alpha effect
- Split data spring and autumn
- Added a curve (if we get time)

My model

My current model:

Linear (no quadratic)

Site and variety intercept effect

Variety slope effect

Co-varience for variety (un-centred in stand Code)

nonCentre_slopeSiteVarietyCov.stan

$$ltePred_i \sim Normal(\mu_i, \sigma)$$

$$\mu_i = \alpha_{var,i} + \alpha_{site,i} + \beta_{var,i} * x_i$$

$$\begin{bmatrix} \alpha_{var} \\ \beta_{var} \end{bmatrix} \sim MVnorm\left(\begin{bmatrix} \alpha \\ \beta \end{bmatrix}, S\right)$$

$$S = \begin{pmatrix} \sigma_{\alpha Var} & 0 \\ 0 & \sigma_{\beta Var} \end{pmatrix} \rho \begin{pmatrix} \sigma_{\alpha Var} & 0 \\ 0 & \sigma_{\beta Var} \end{pmatrix}$$

$$\alpha_{site} \sim normal(0, \sigma_{\alpha Site})$$

$$\beta \sim lognormal(0, 1)$$

$$\sigma \sim truncNormal(0, 5)$$

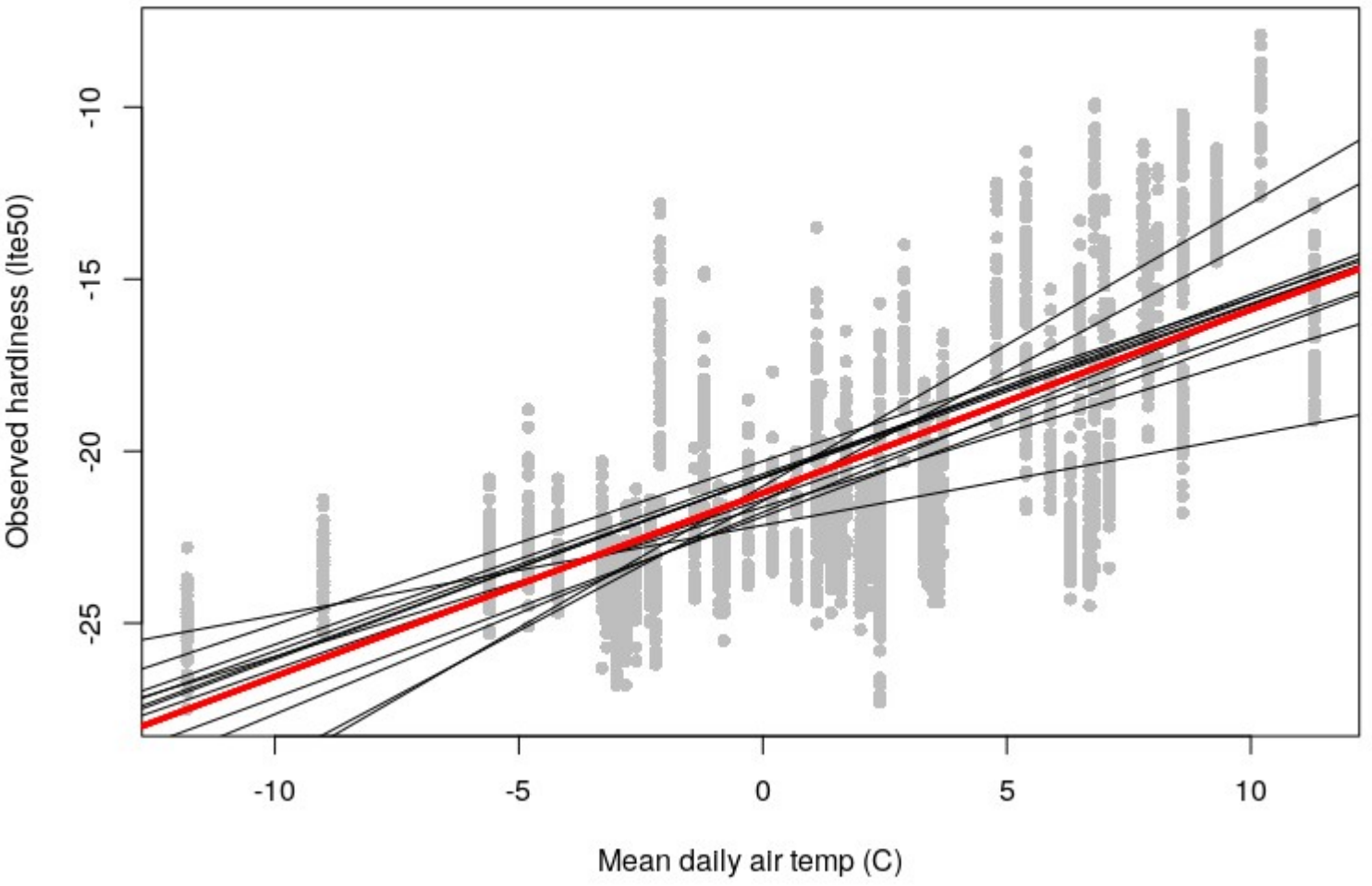
$$\sigma_{\alpha Var} \sim truncNormal(0, 5)$$

$$\sigma_{\alpha Site} \sim truncNormal(0, 5)$$

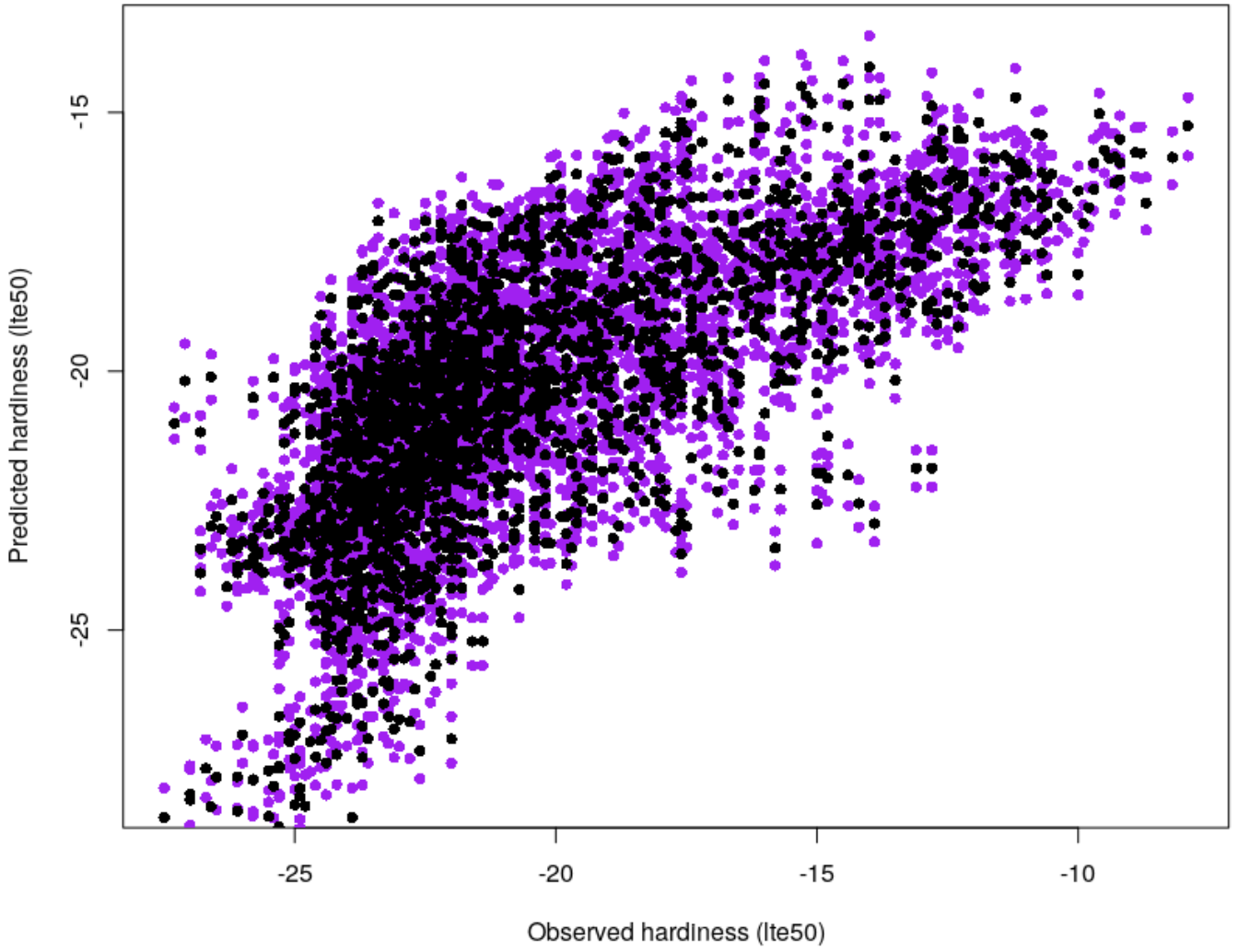
$$\sigma_{\beta Var} \sim truncNormal(0, 1)$$

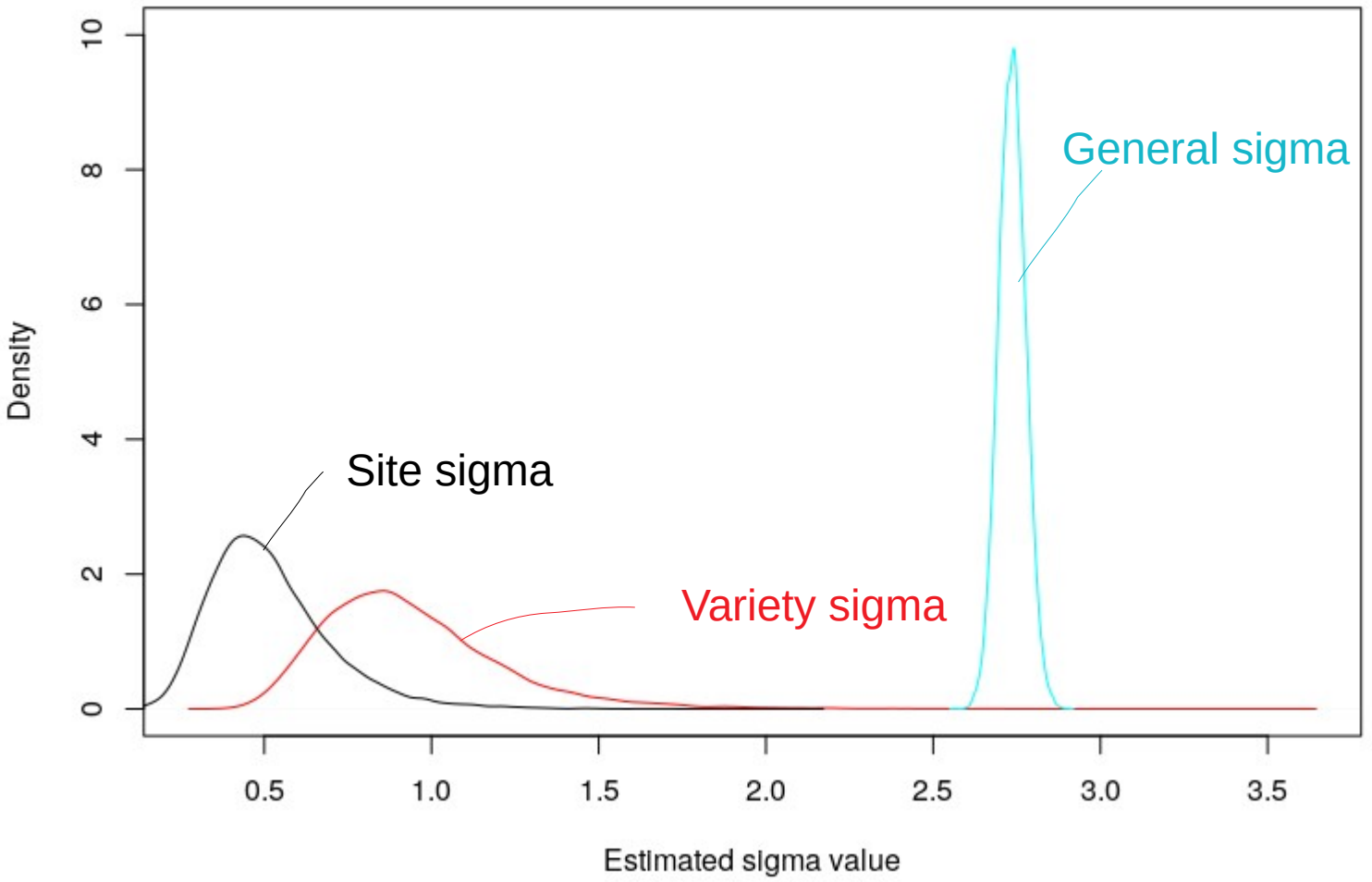
$$\rho \sim LKJcorr(2)$$

Results for whole dataset

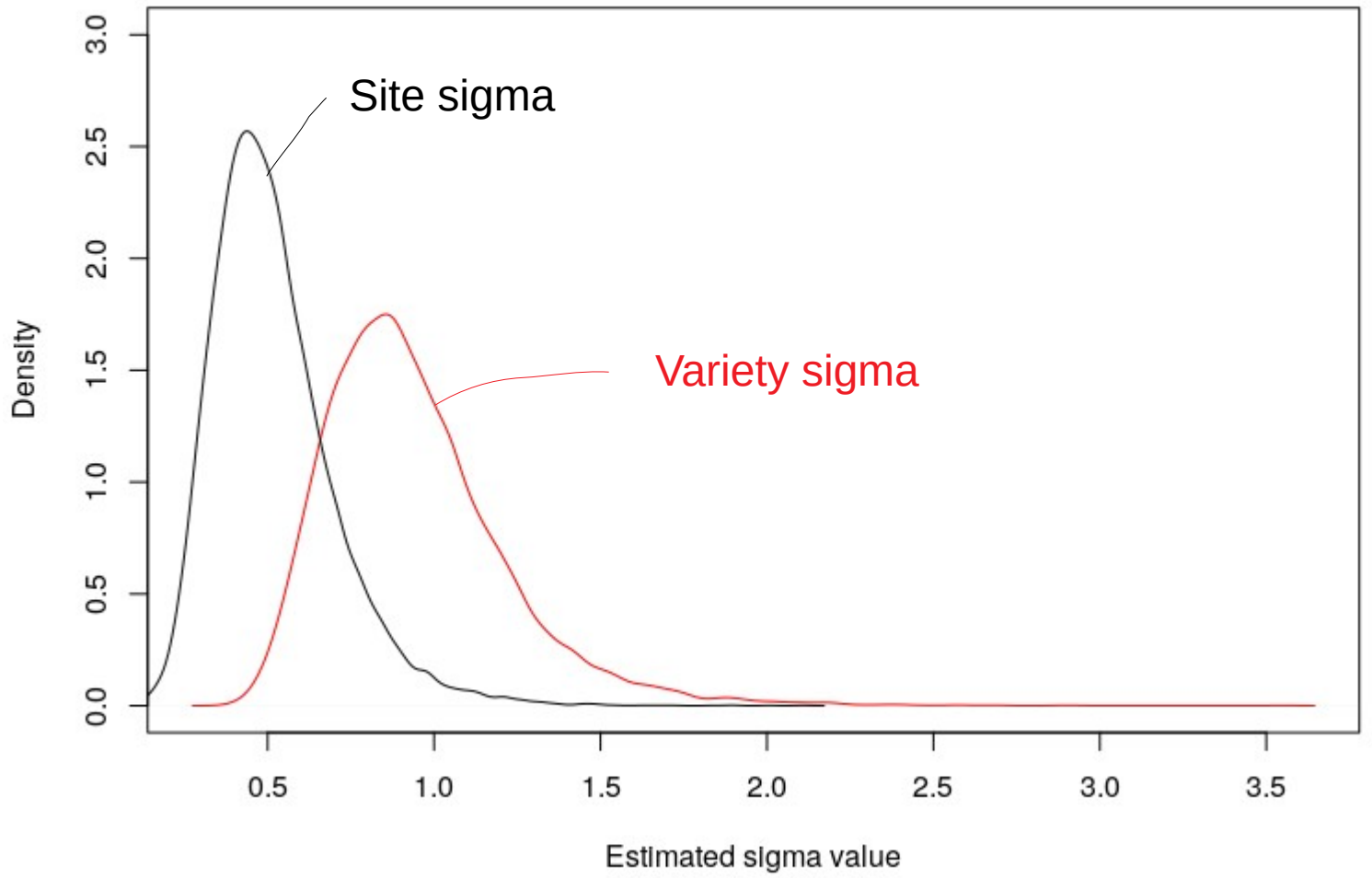

Observed hardiness (lte50)
-10
-15
-20
-25
-10
-5
0
5
10
Mean daily air temp (C)

Underestimatimng hardiness?

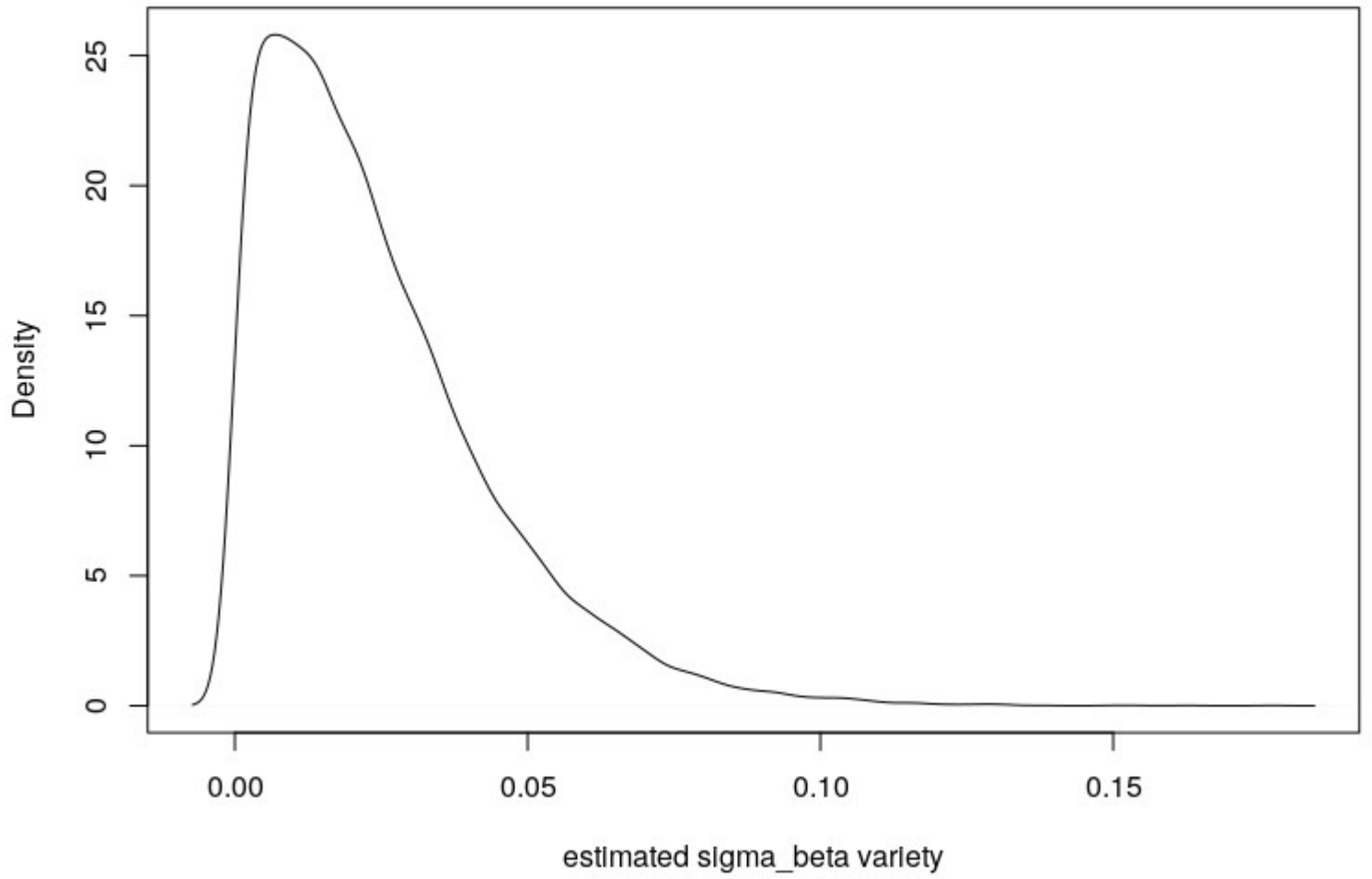



Density
0
2
4
6
8
10
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Estimated sigma value
General sigma
Site sigma
Variety sigma

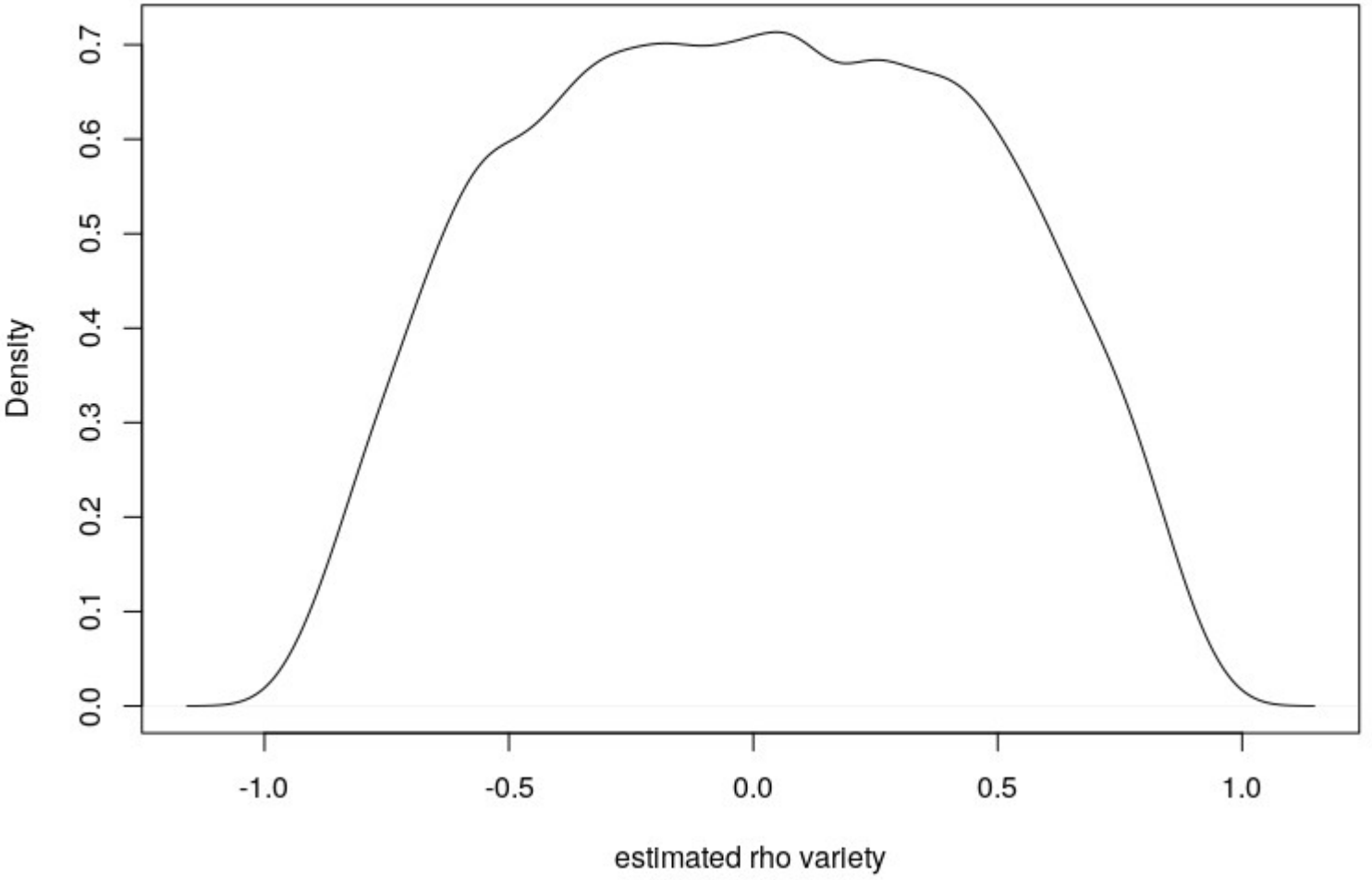
Variety more influencial than site, but less certain?

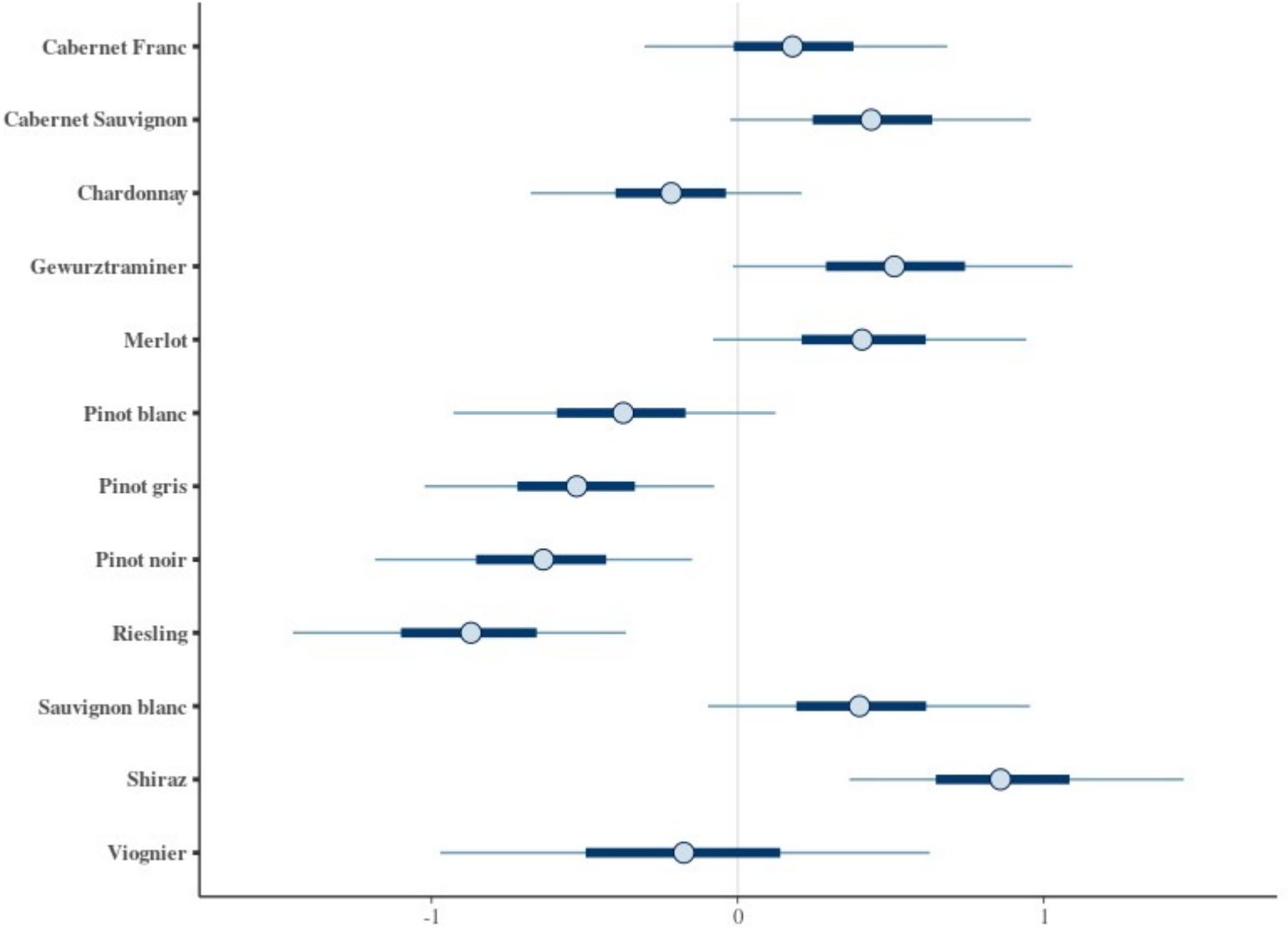


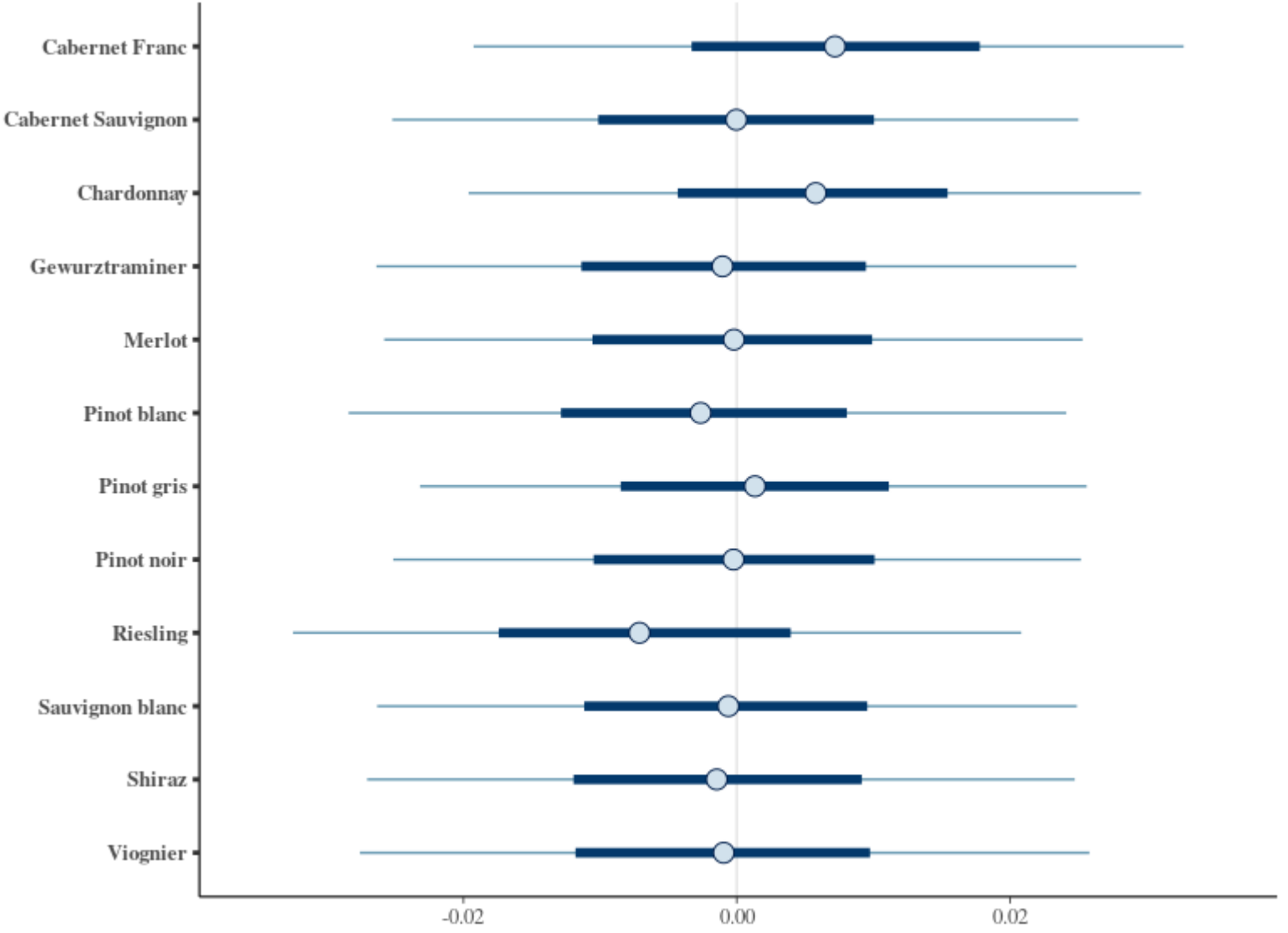
Slopes dont vary much

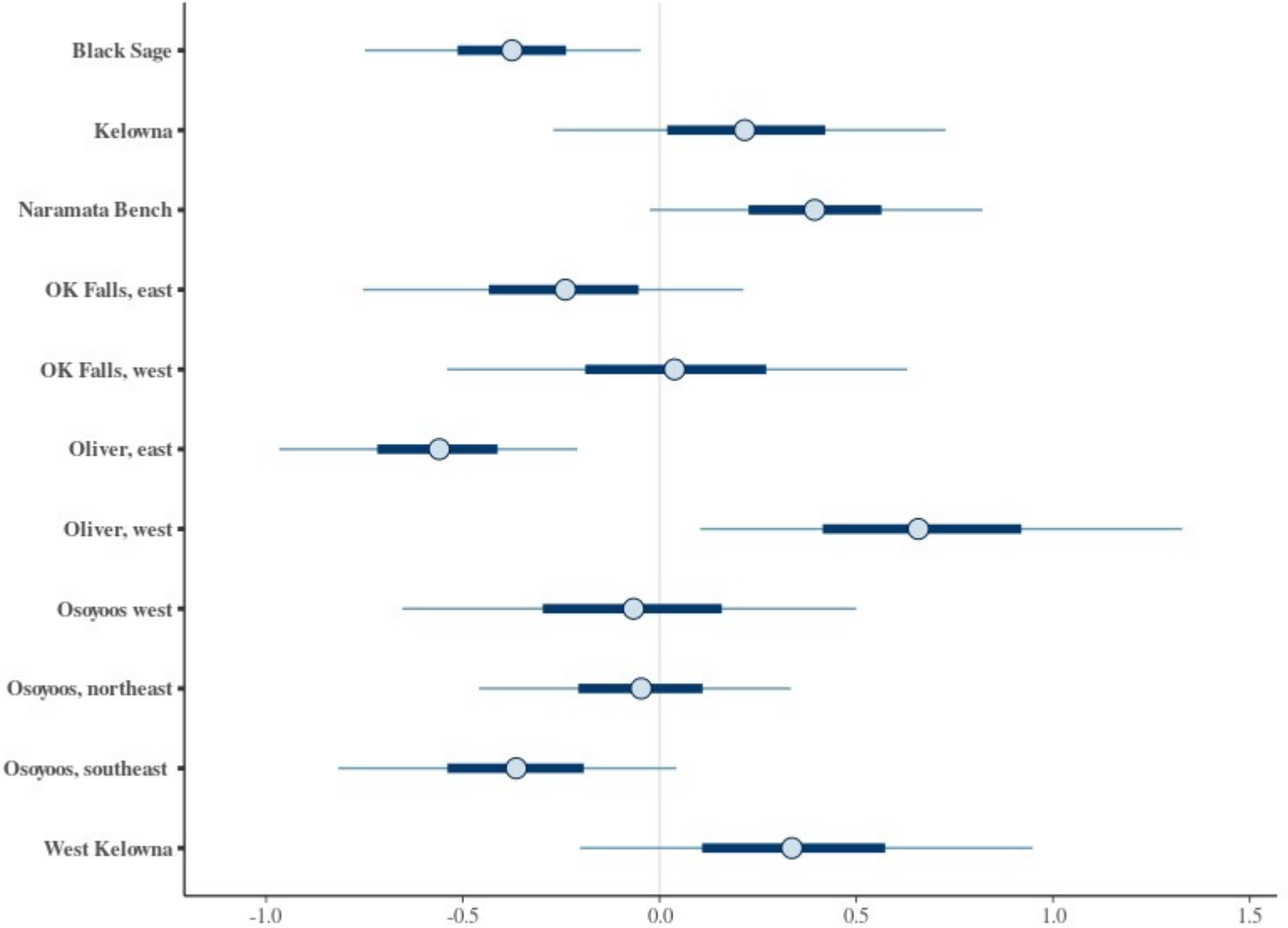


No correlation between effects of variety on intercept and slope




Cabernet Franc
Cabernet Sauvignon
Chardonnay
Gewurztraminer
Merlot
Pinot blanc
Pinot gris
Pinot noir
Riesling
Sauvignon blanc
Shiraz
Viognier
-1
0
1

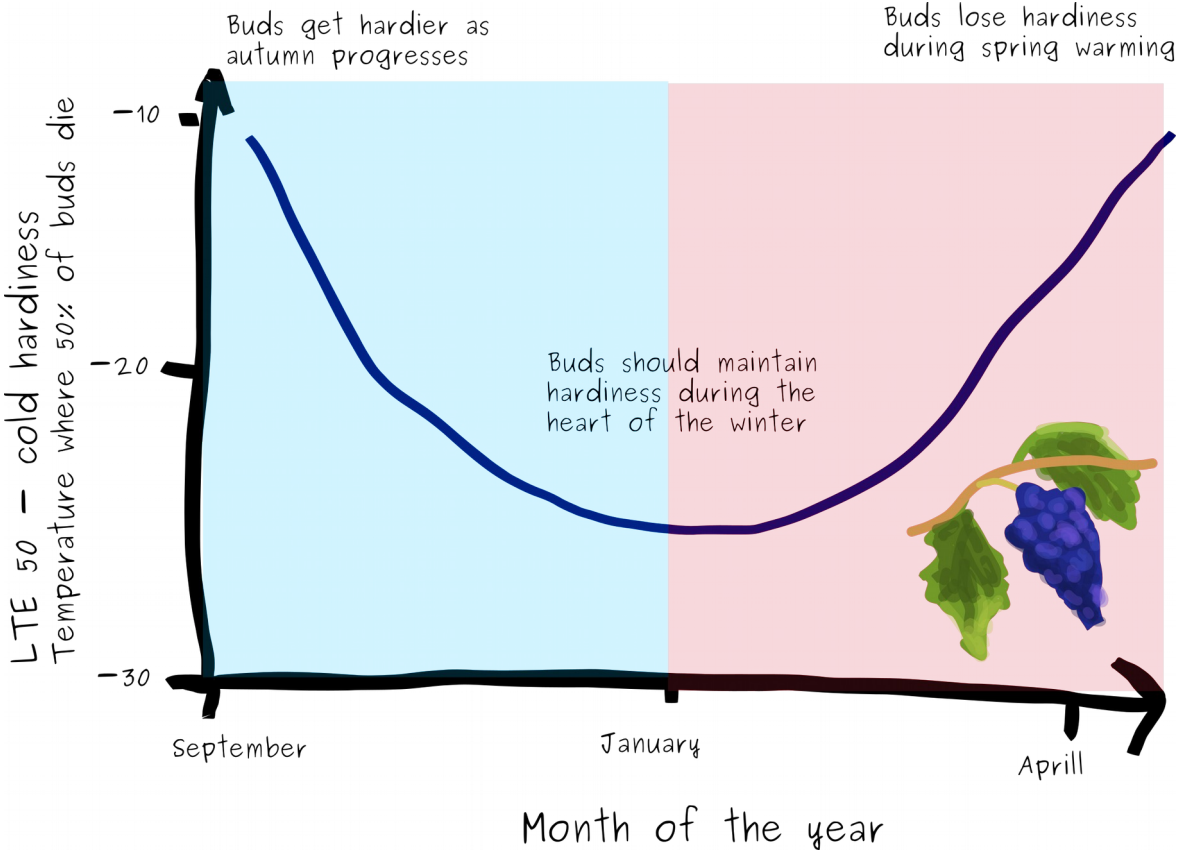

Cabernet Franc
Cabernet Sauvignon
Chardonnay
Gewurztraminer
Merlot
Pinot blanc
Pinot gris
Pinot noir
Riesling
Sauvignon blanc
Shiraz
Viognier
-0.02
0.00
0.02


Black Sage
Kelowna
Naramata Bench
OK Falls, east
OK Falls, west
Oliver, east
Oliver, west
Osoyoos west
Osoyoos, northeast
Osoyoos, southeast
West Kelowna
-1.0
-0.5
0.0
0.5
1.0
1.5

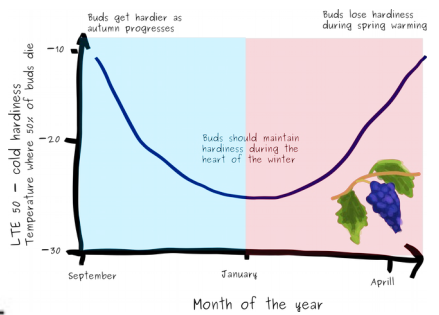
Split Data

Endodormancy (before 1st Jan)
Mostly acclimation

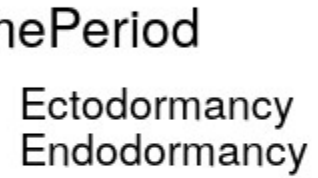
Ectodormance (after 1st Jan)
Mostly deacclimation



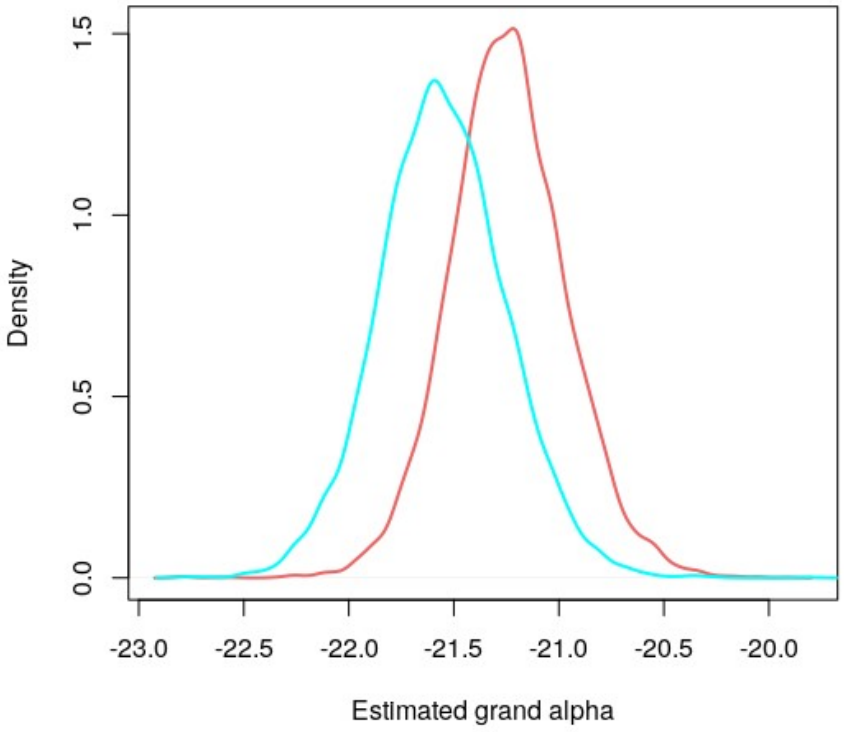
Steeper slope for Ectodormancy (deacclimation in the spring)

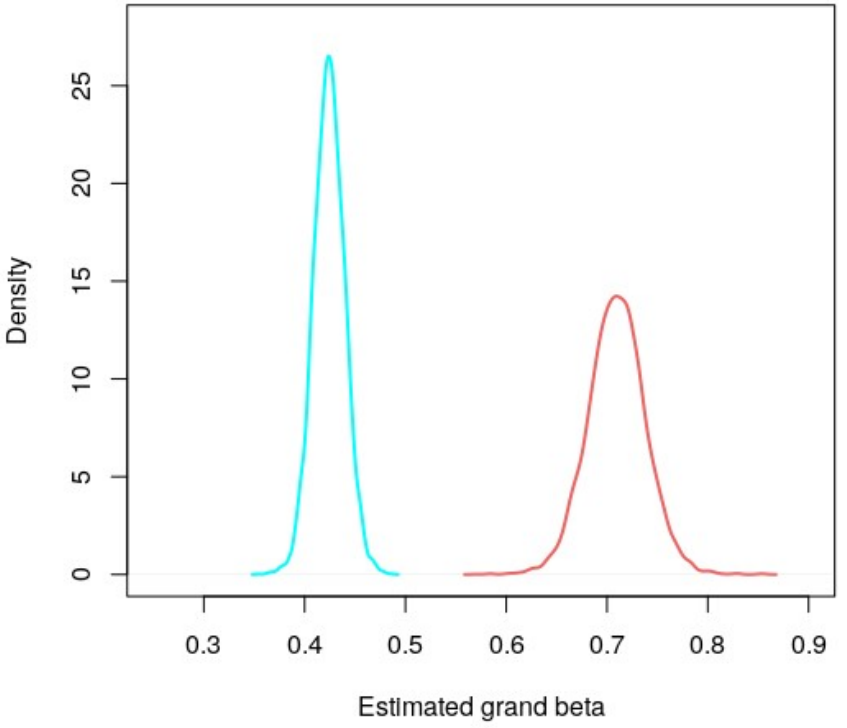


Grand parameters

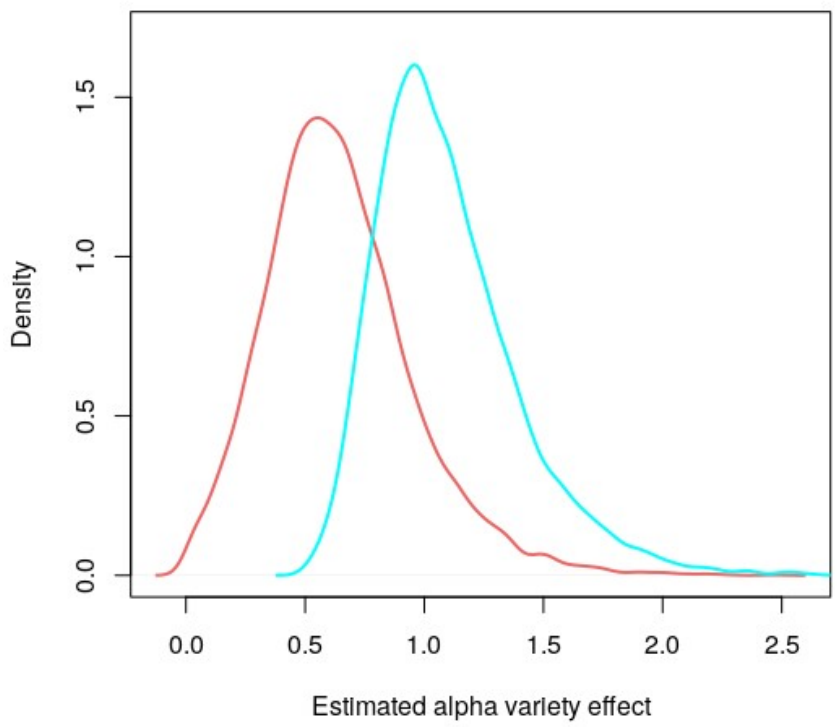


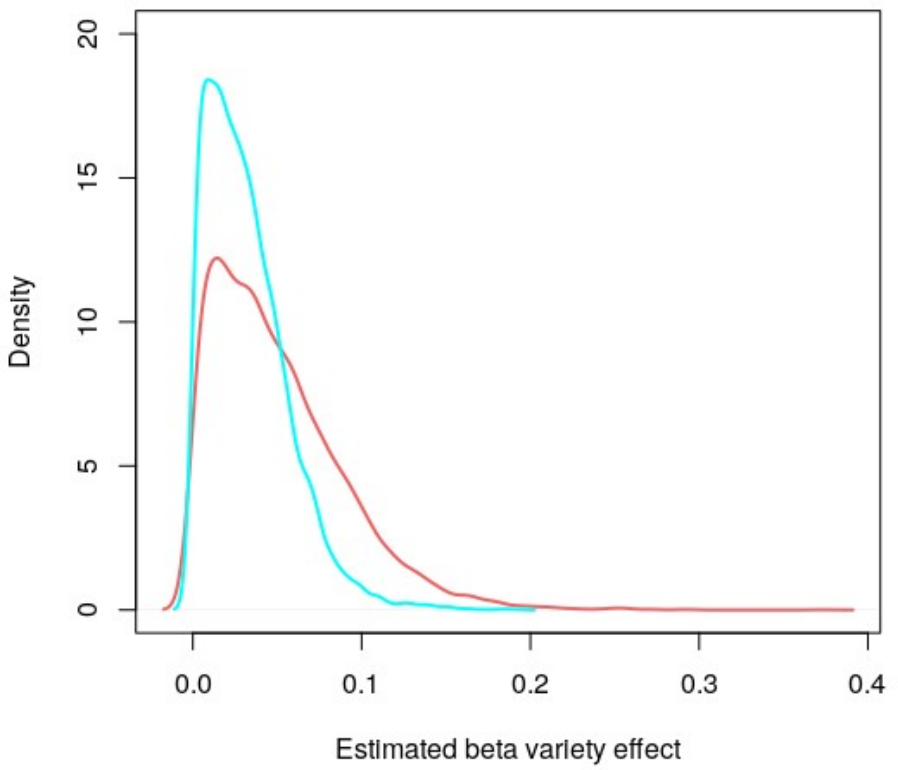
Similar alphas, but steeper slope for ectodormancy (spring deacclimation)

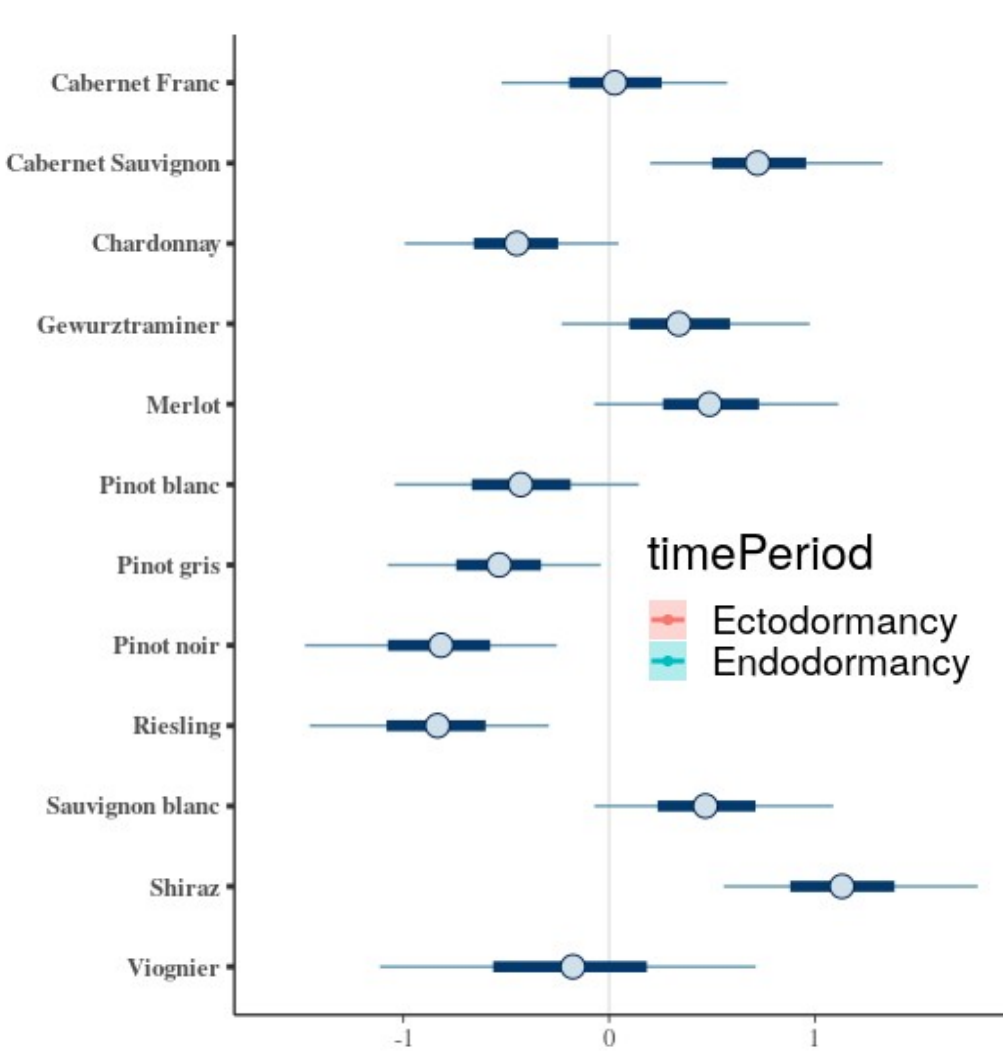


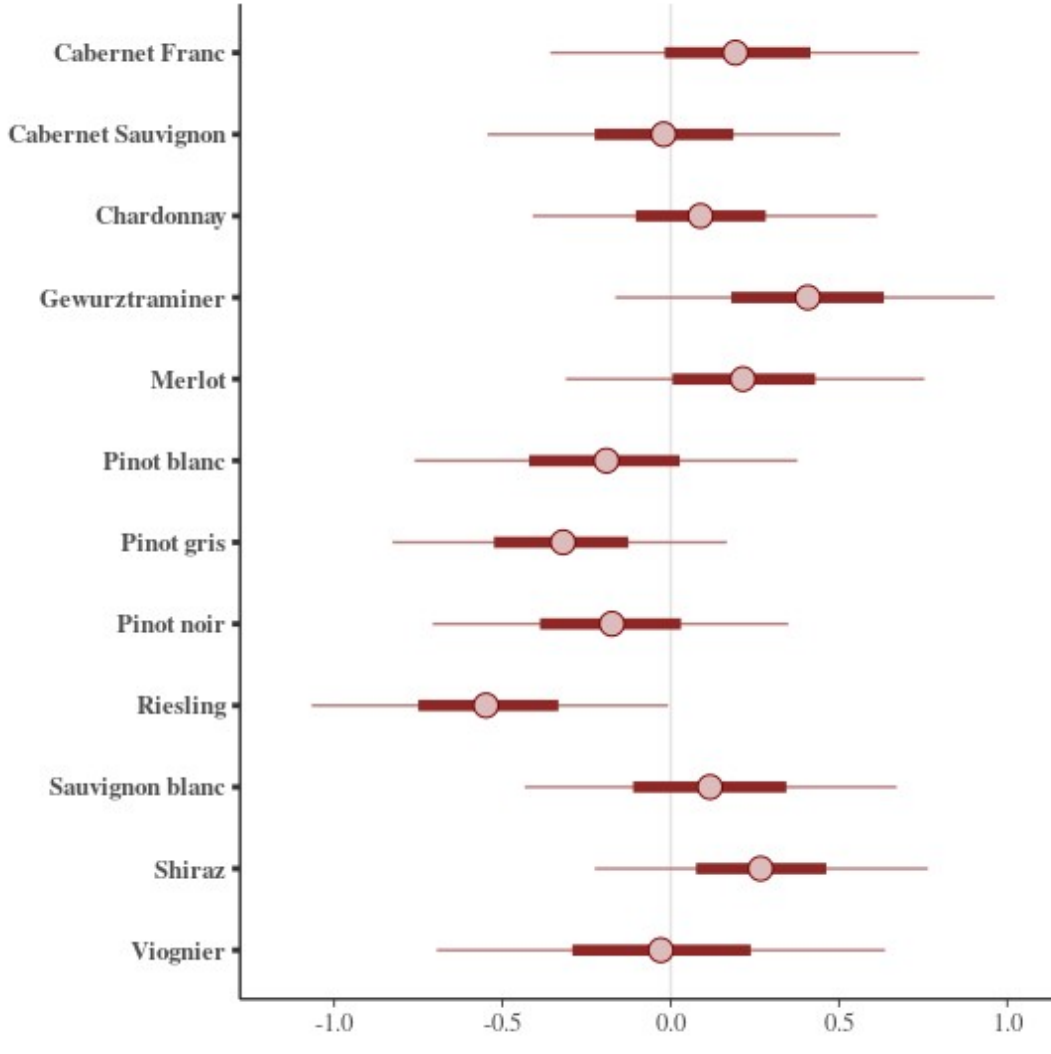


Variety effect

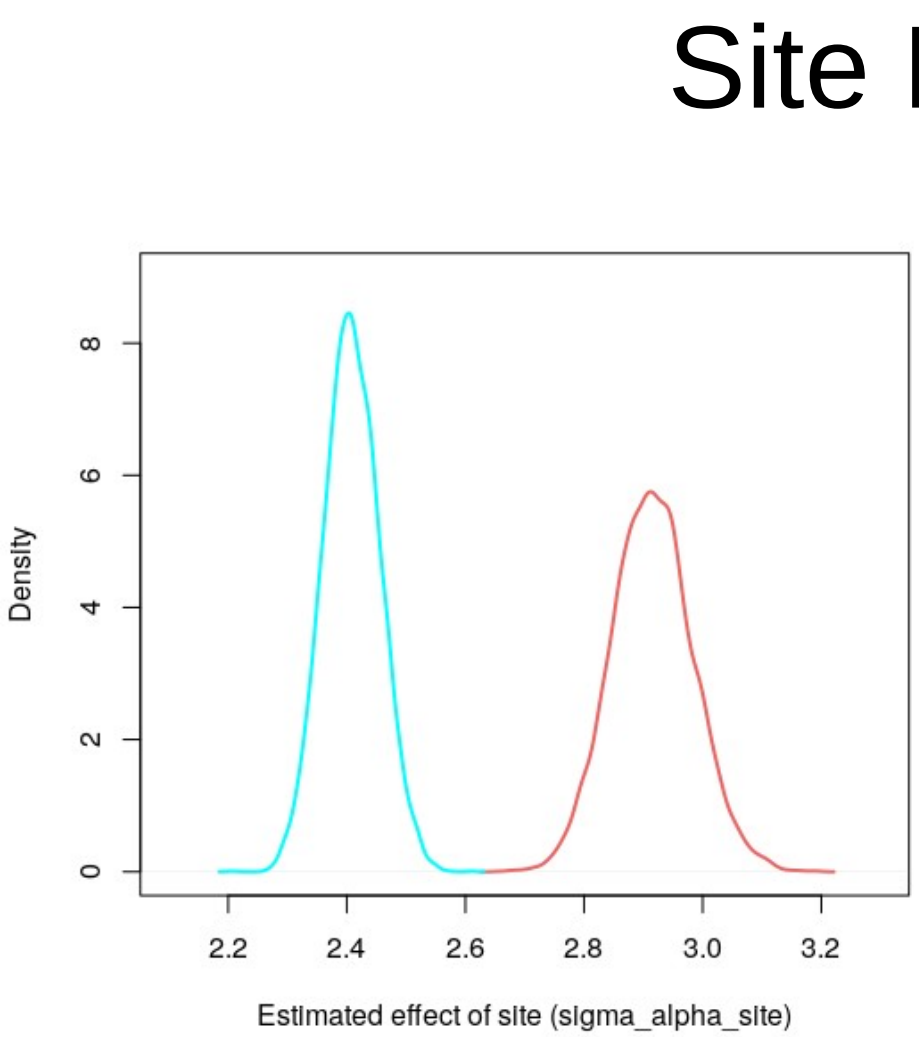





Cabernet Franc
Cabernet Sauvignon
Chardonnay
Gewurztraminer
Merlot
Pinot blanc
Pinot gris
Pinot noir
Riesling
Sauvignon blanc
Shiraz
Viognier
-1
0
1
timePeriod
Ectodormancy
Endodormancy

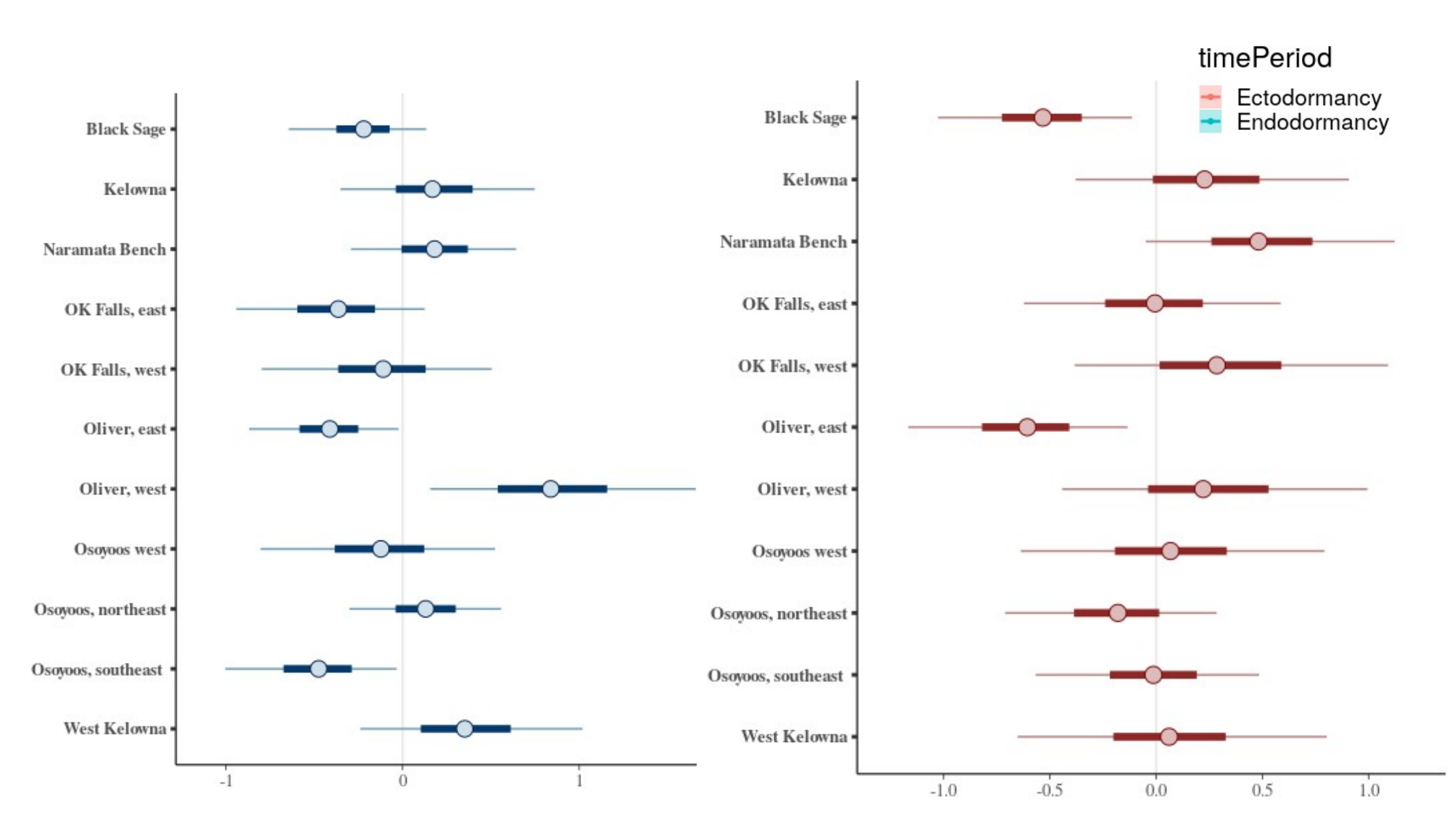

Cabernet Franc
Cabernet Sauvignon
Chardonnay
Gewurztraminer
Merlot
Pinot blanc
Pinot gris
Pinot noir
Riesling
Sauvignon blanc
Shiraz
Viognier
-1.0
-0.5
0.0
0.5
1.0

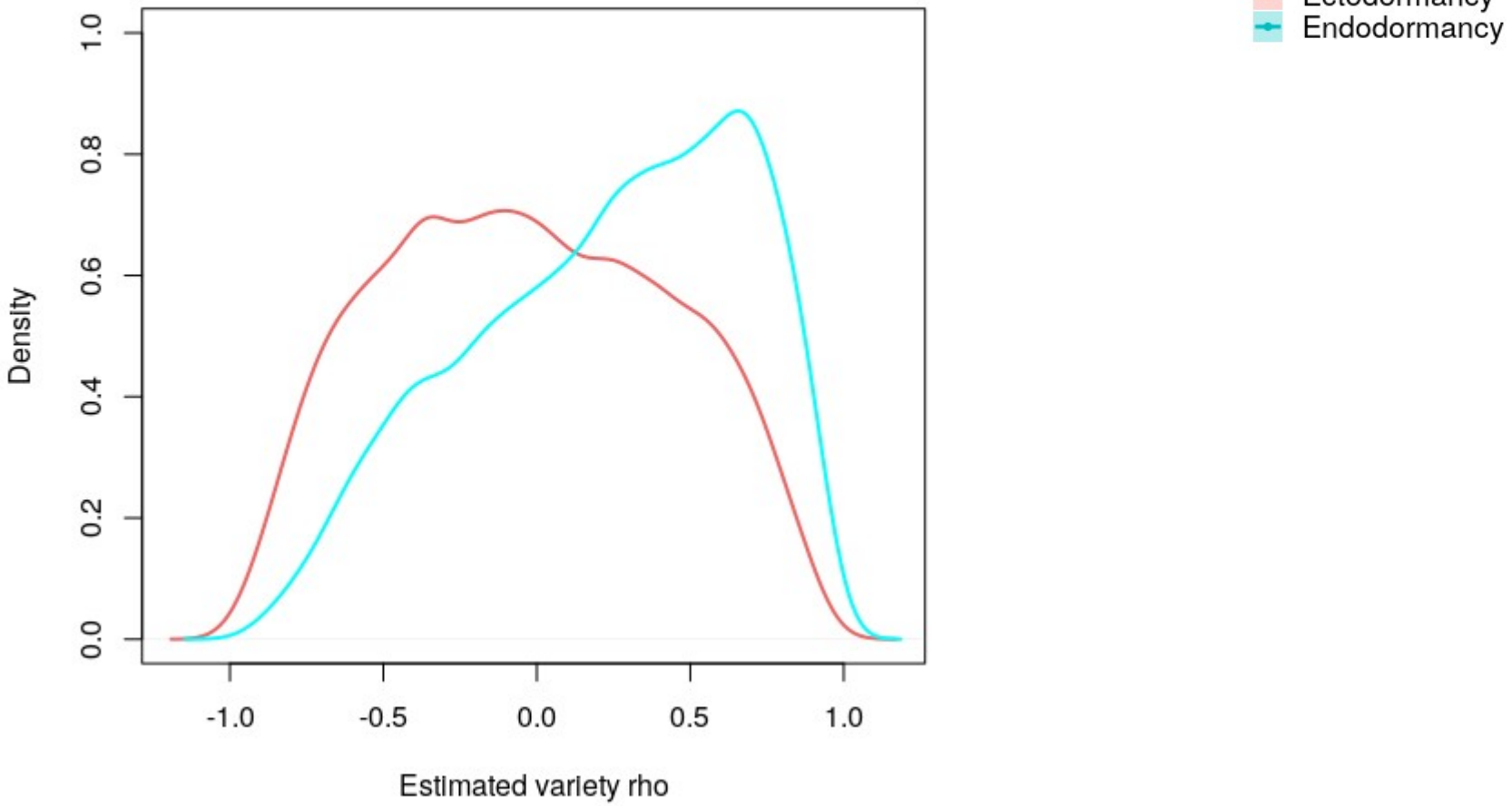
Site Effect



Site differences less pronounced during endodormancy (winter acclimation)

Maybe because vines are more sensitive to microclimactic variation as they react more quickly to changes in temperature?


timePeriod
Ectodormancy
Endodormancy
Black Sage
Kelowna
Naramata Bench
OK Falls, east
OK Falls, west
Oliver, east
Oliver, west
Osoyoos west
Osoyoos, northeast
Osoyoos, southeast
West Kelowna
-1
0
1
-1.0
-0.5
0.0
0.5
1.0


timePeriod
Ectodormancy
Endodormancy
Density
0.0
0.2
0.4
0.6
0.8
1.0
-1.0
-0.5
0.0
0.5
1.0
Estimated variety rho

Quadratic model

- Similar model, but with quadratic element
- Also no site
- Data z scored
- quad_nonCentre_slopeVarietyCov.stan

$$ltePred_i \sim Normal(\mu_i, \sigma)$$

$$\mu_i = \alpha_{var,i} + \beta_{var,i} * x_i + \beta_{quad} * x_i^2$$

$$\begin{bmatrix} \alpha_{var} \\ \beta_{var} \end{bmatrix} \sim MVnorm\left(\begin{bmatrix} \alpha \\ \beta \end{bmatrix}, S \right)$$

$$S = \begin{pmatrix} \sigma_{\alpha Var} & 0 \\ 0 & \sigma_{\beta Var} \end{pmatrix} \rho \begin{pmatrix} \sigma_{\alpha Var} & 0 \\ 0 & \sigma_{\beta Var} \end{pmatrix}$$

$$\alpha \sim Normal(-15, 12)$$

$$\beta \sim lognormal(0, 1)$$

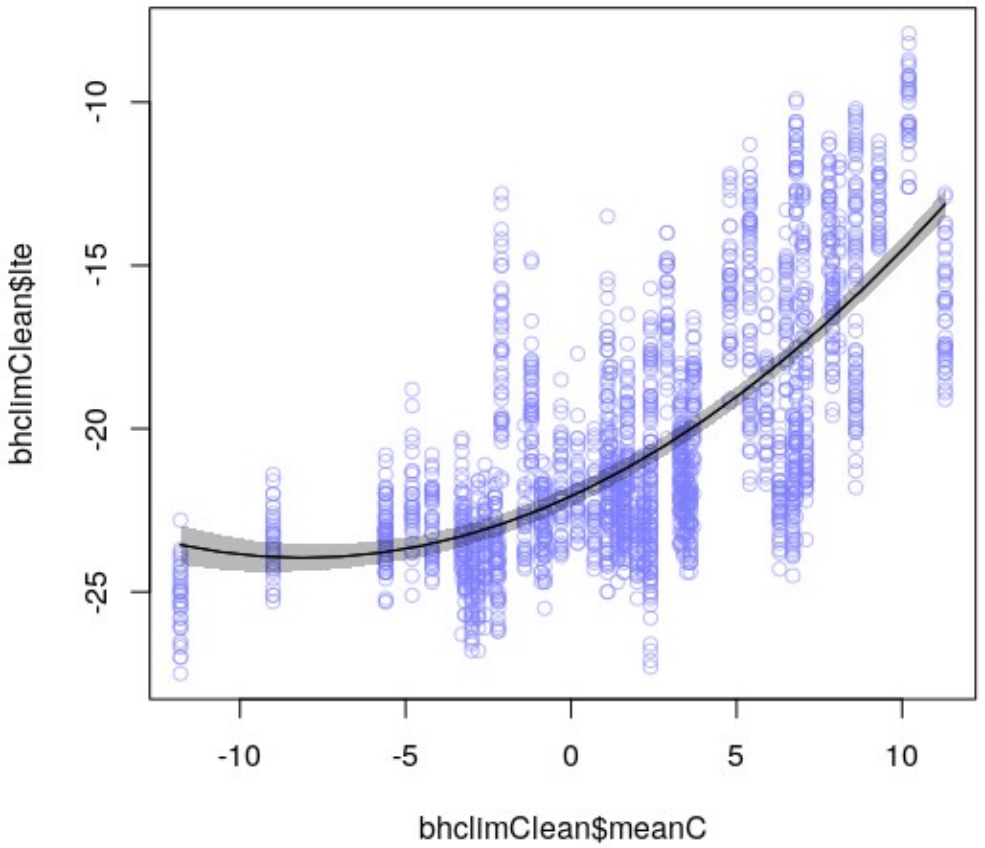
$$\beta_{quad} \sim Normal(0, 1)$$

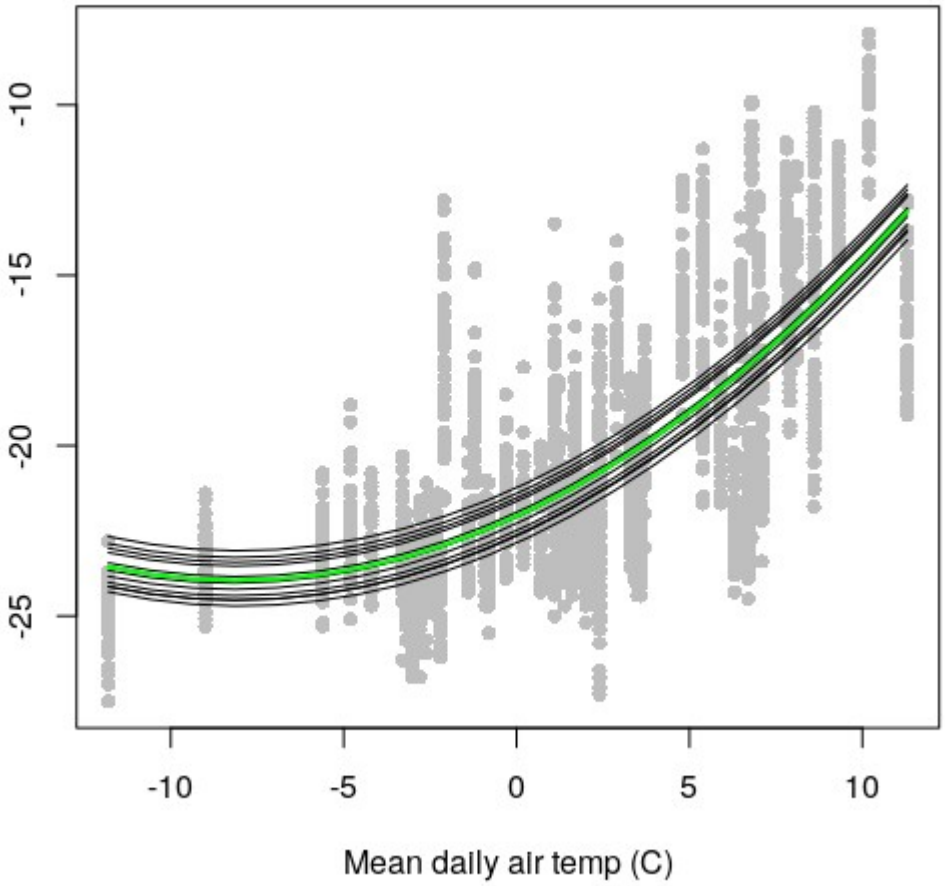
$$\sigma \sim truncNormal(0, 5)$$

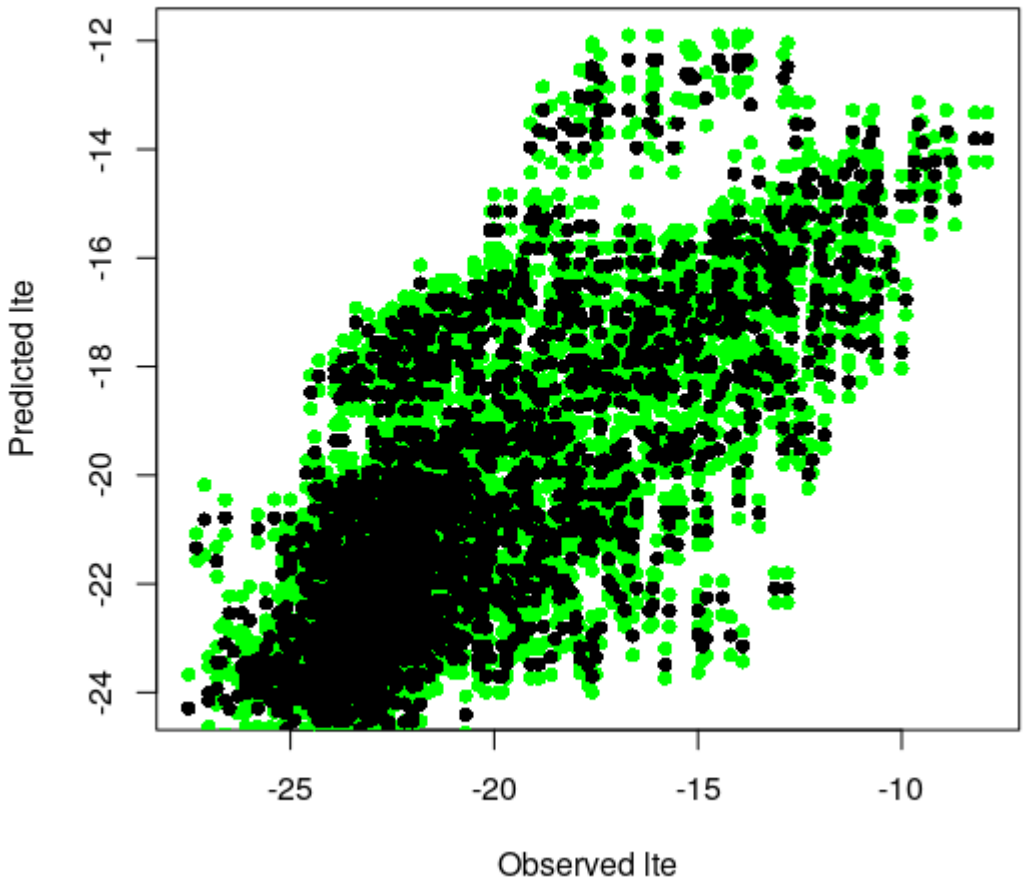
$$\sigma_{\alpha Var} \sim truncNormal(0, 5)$$

$$\sigma_{\beta Var} \sim truncNormal(0, 1)$$

$$\rho \sim LKJcorr(2)$$


bhclimClean$lte
-10
-15
-20
-25
-10
-5
0
5
10
bhclimClean$meanC

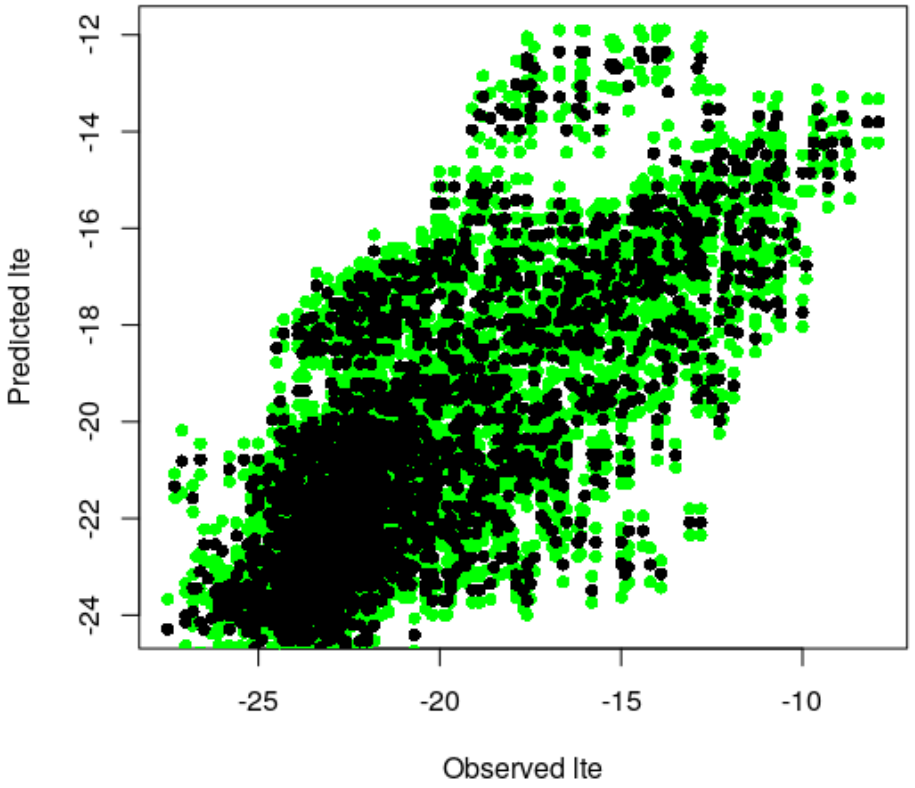

-10
-15
-20
-25
-10
-5
0
5
10
Mean daily air temp (C)



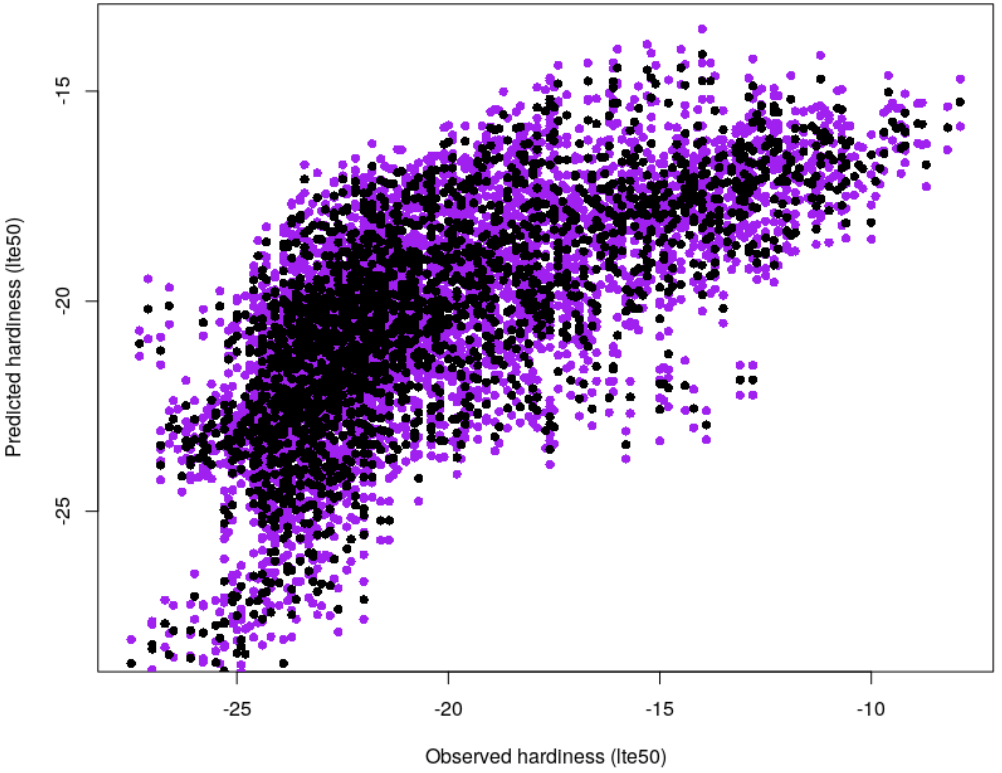
A generally more linear relationship,
But still some wierd stuff going on.

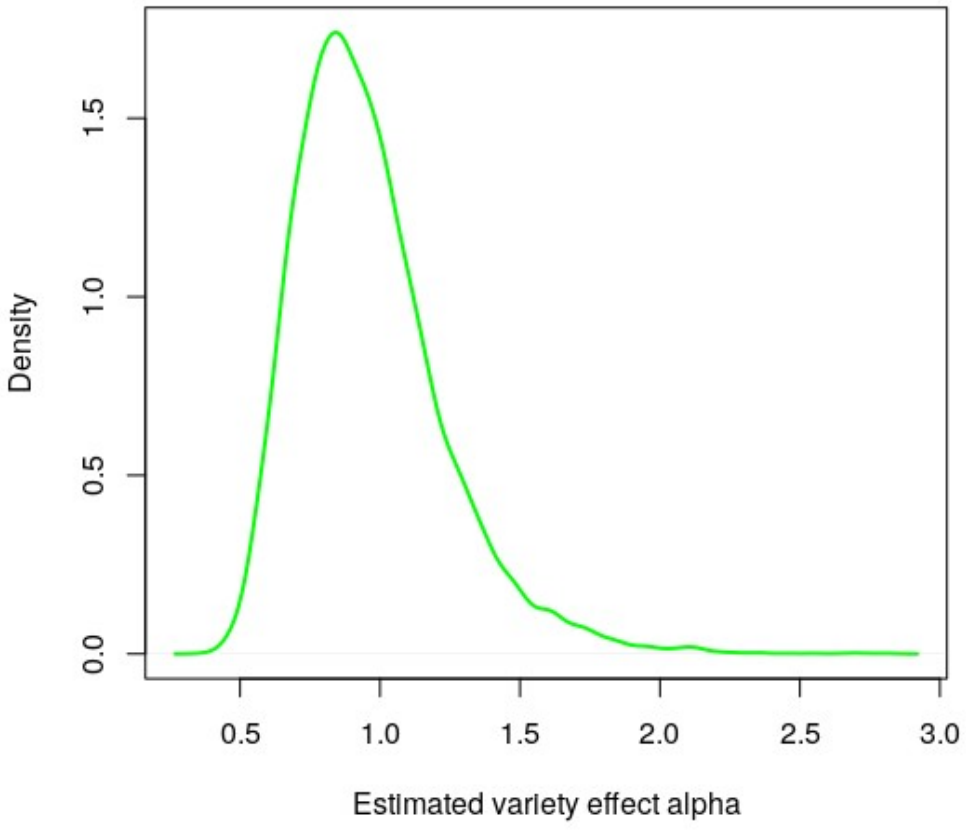
Lots of scatter/error (4ish degrees c) around the trend, but less than linear Model (but standardised data?)

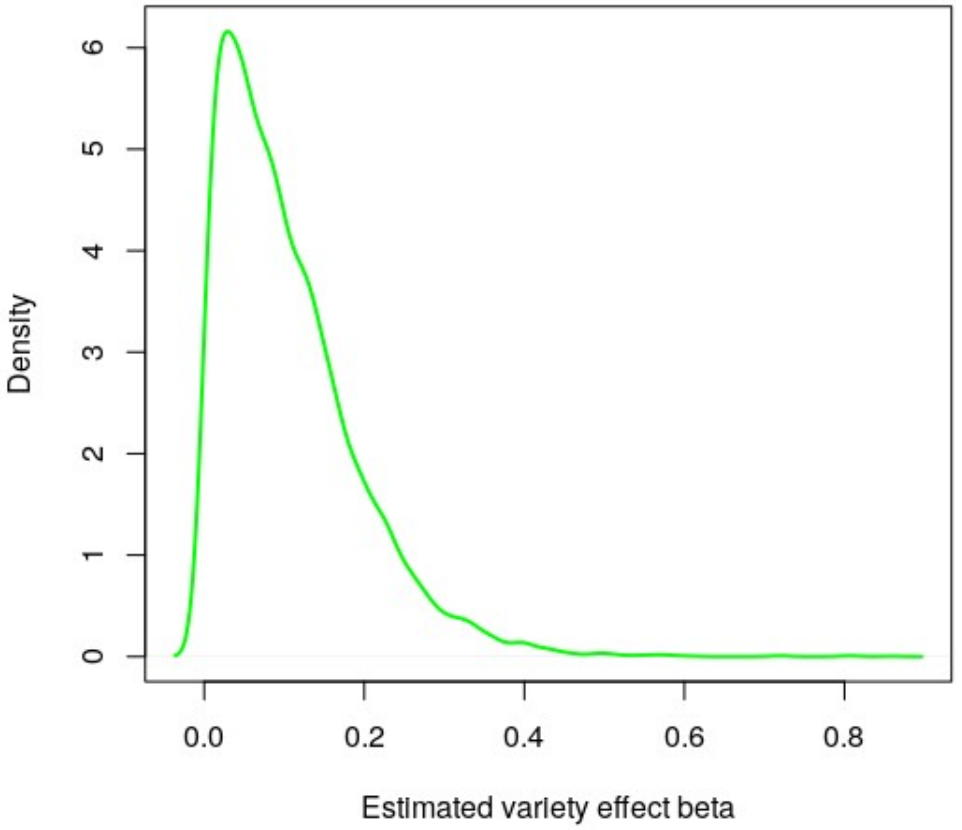
Quadratic



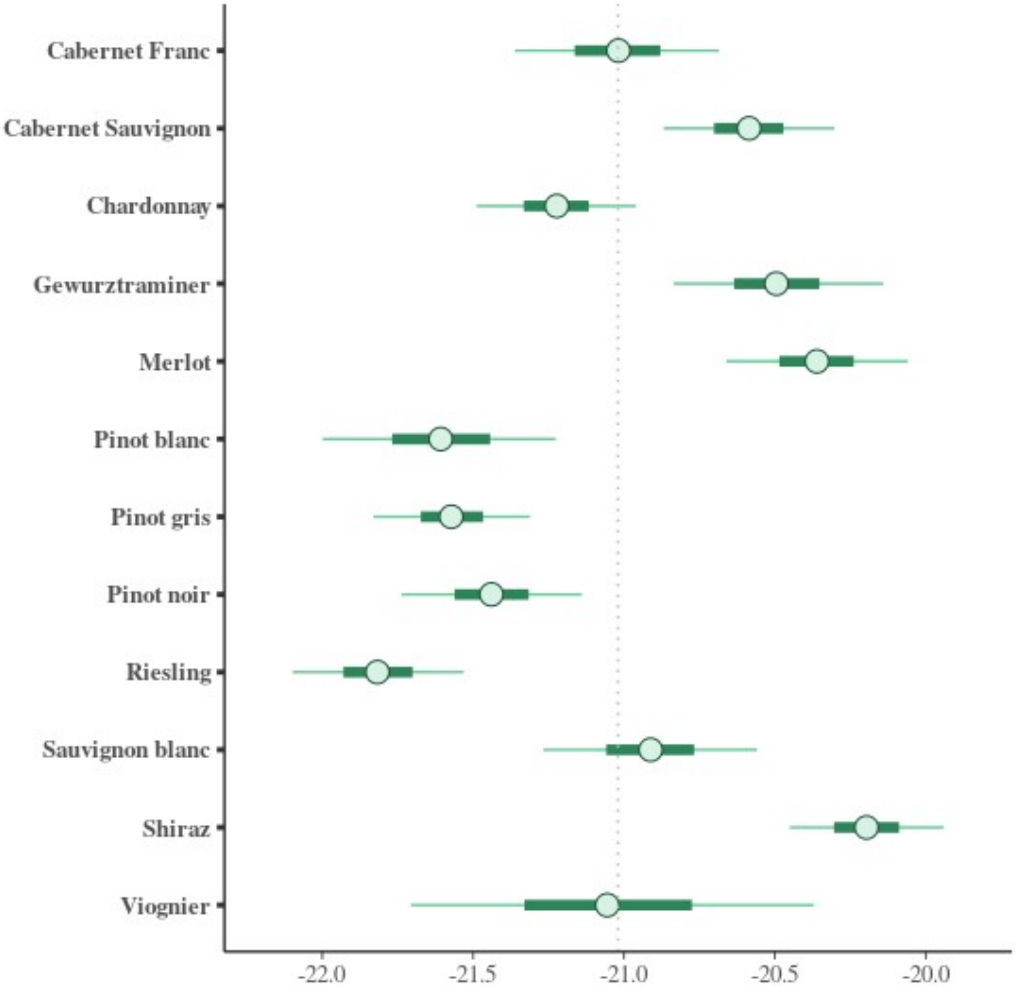
Not quadratic



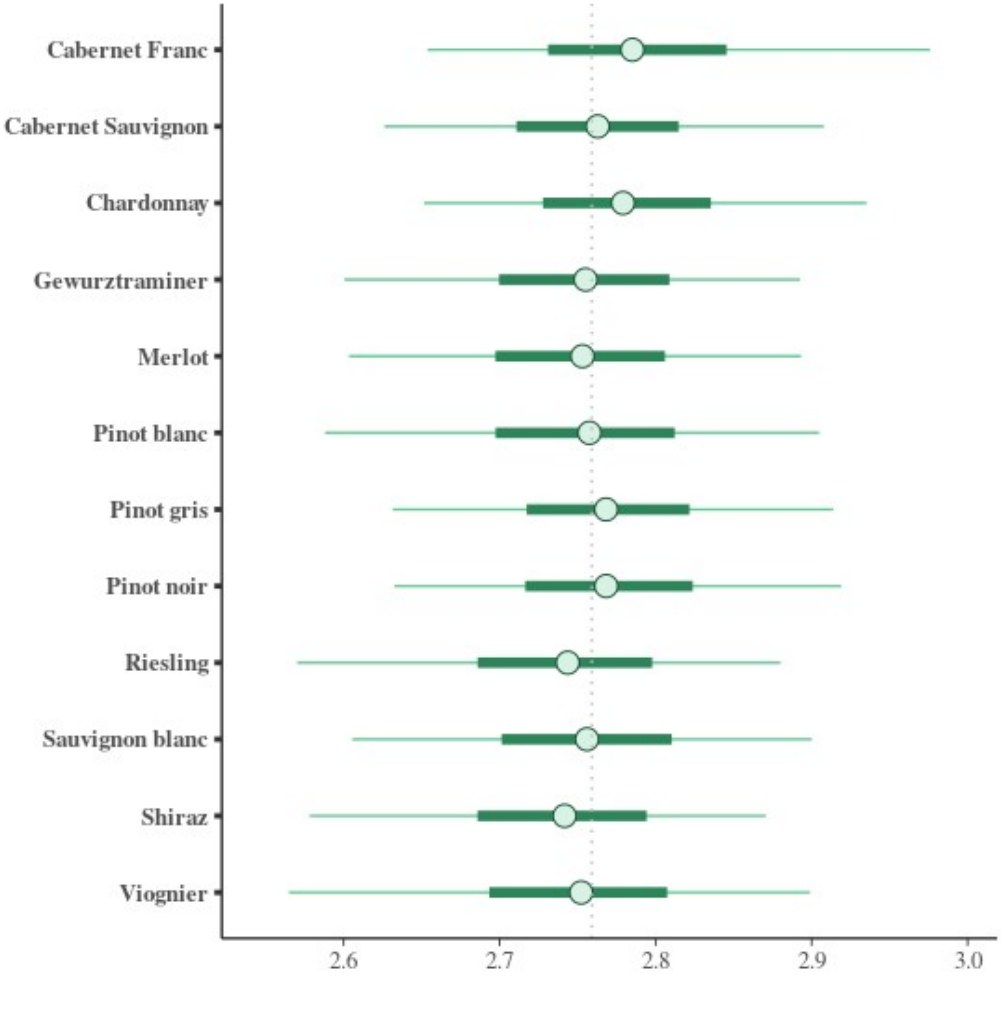

Density
0.0
0.5
1.0
1.5
0.5
1.0
1.5
2.0
2.5
3.0
Estimated variety effect alpha


Density
0
1
2
3
4
5
6
0.0
0.2
0.4
0.6
0.8
Estimated variety effect beta

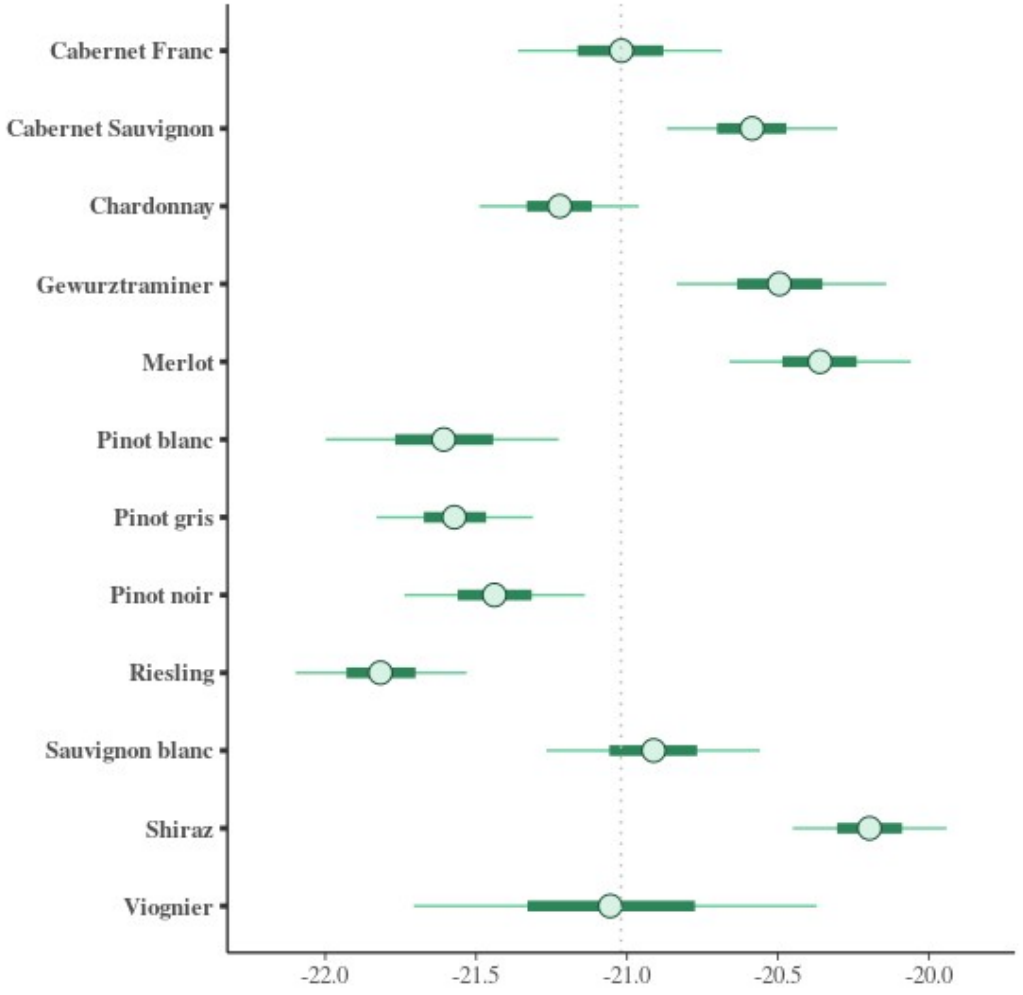
alpha


Cabernet Franc
Cabernet Sauvignon
Chardonnay
Gewurztraminer
Merlot
Pinot blanc
Pinot gris
Pinot noir
Riesling
Sauvignon blanc
Shiraz
Viognier
-22.0
-21.5
-21.0
-20.5
-20.0

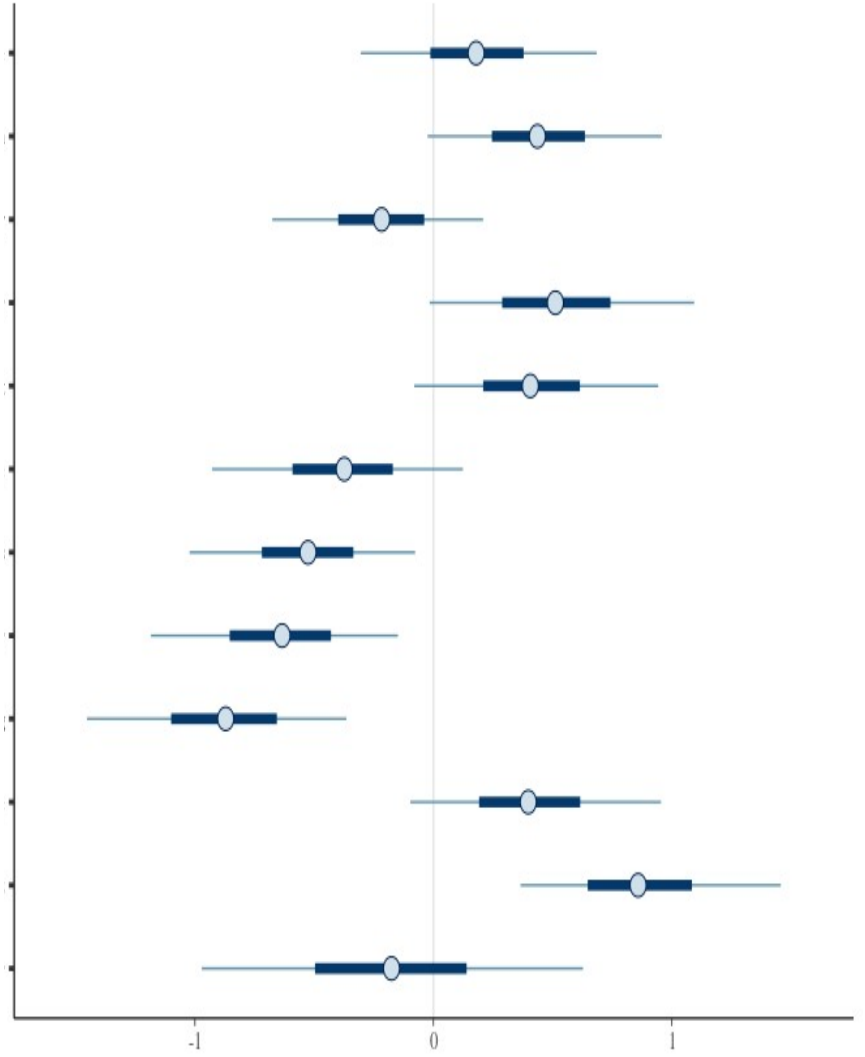
beta


Cabernet Franc
Cabernet Sauvignon
Chardonnay
Gewurztraminer
Merlot
Pinot blanc
Pinot gris
Pinot noir
Riesling
Sauvignon blanc
Shiraz
Viognier
2.6
2.7
2.8
2.9
3.0

Quadratic



No quadratic



Next steps

- Include a dummy variable endo/ecto that affects grand mean alpha and beta. But how to let it affect variety effects?
- Does the quadratic model make sense?