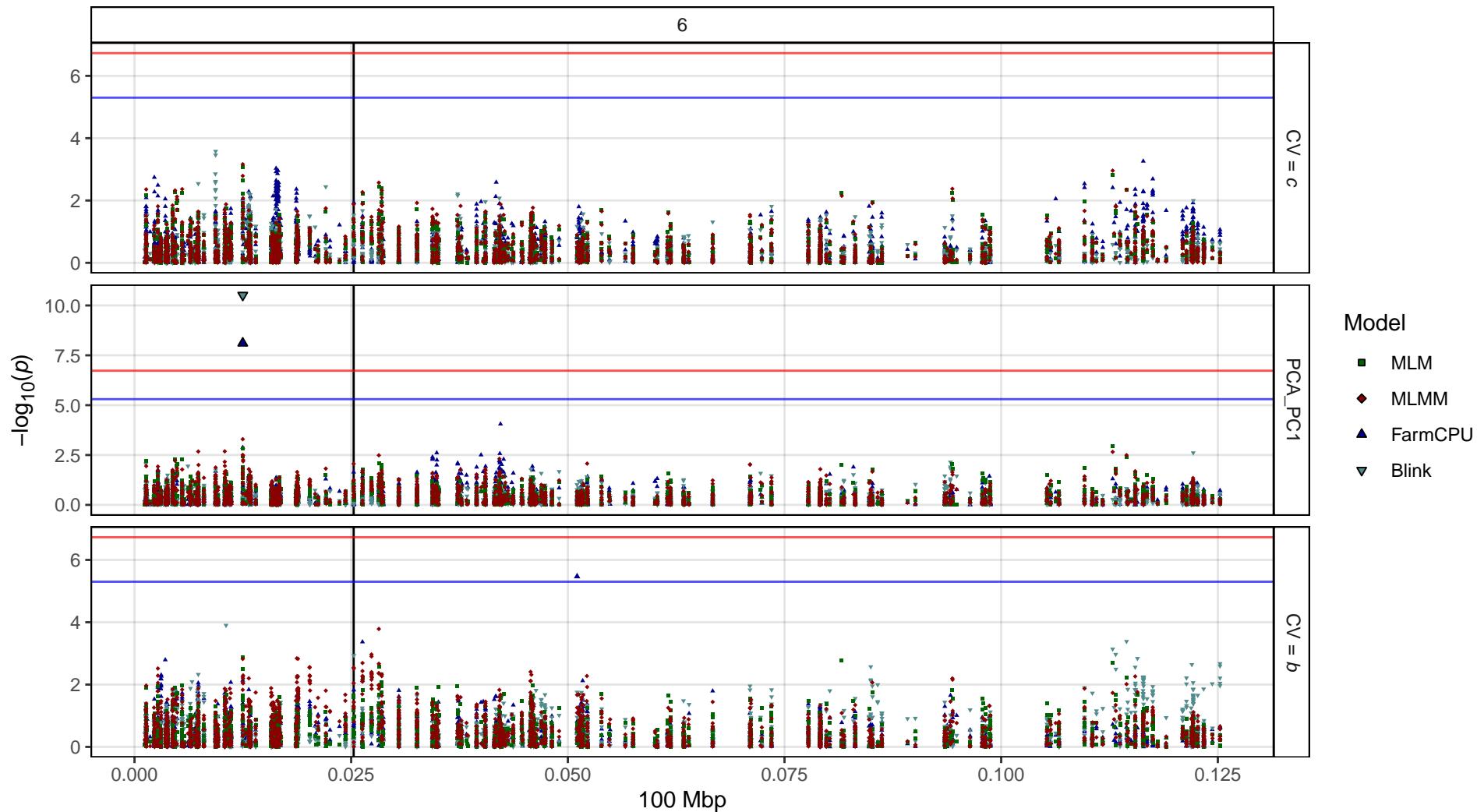


PCA\_PC1

LcFTb1

6



## PCA\_PC2

LcFTb1

6

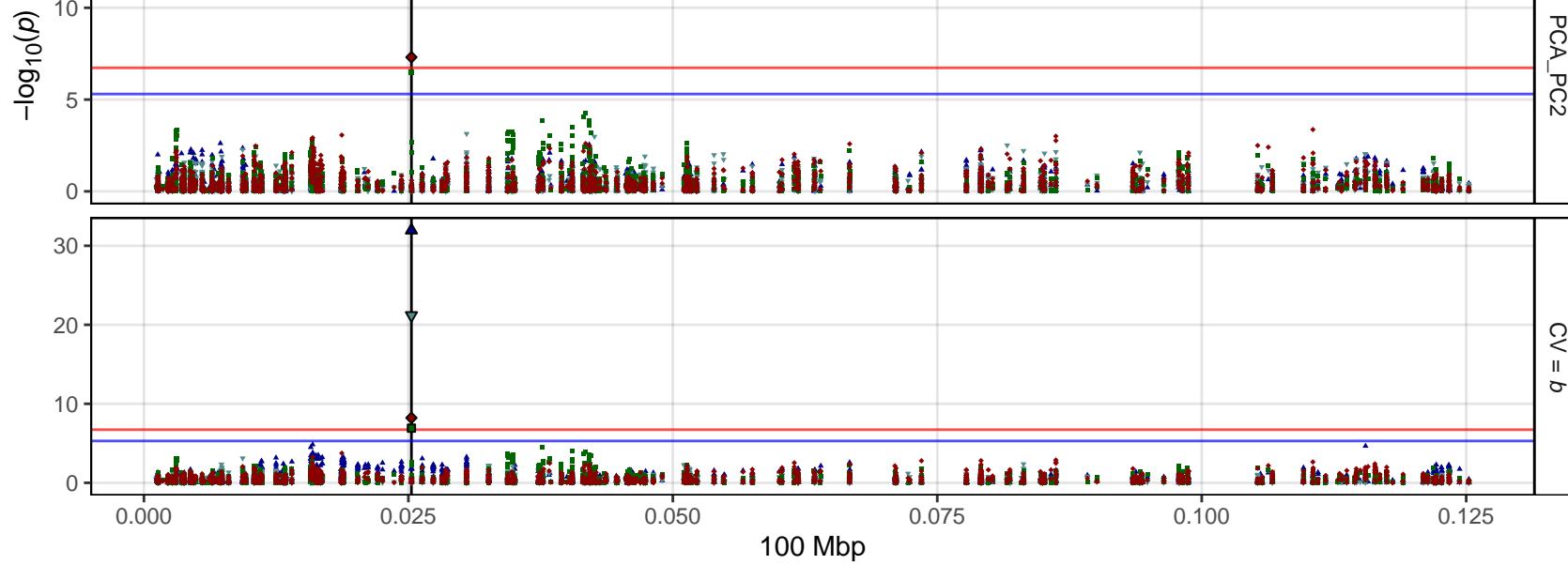
 $CV = c$ 

Manhattan plot showing the results of a GWAS analysis for PCA\_PC2 with  $CV = c$ . The x-axis represents genomic position in Mbp, ranging from 0.000 to 0.125. The y-axis represents the negative logarithm of the p-value,  $-\log_{10}(p)$ , ranging from 0 to 6. Four models are compared: MLM (green squares), MLMM (red diamonds), FarmCPU (blue triangles), and Blink (black inverted triangles). A vertical black line is drawn at approximately 0.025 Mbp. Two horizontal reference lines are shown: a red line at  $-\log_{10}(p) \approx 6.3$  and a blue line at  $-\log_{10}(p) \approx 5.5$ . The MLM model shows several significant peaks, notably around 0.005, 0.025, 0.04, and 0.05 Mbp.

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

PCA\_PC2

 $CV = b$ 

PCA\_PC3

LcFTb1

6

$CV = c$

( $\sigma$ )<sup>101601</sup>

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

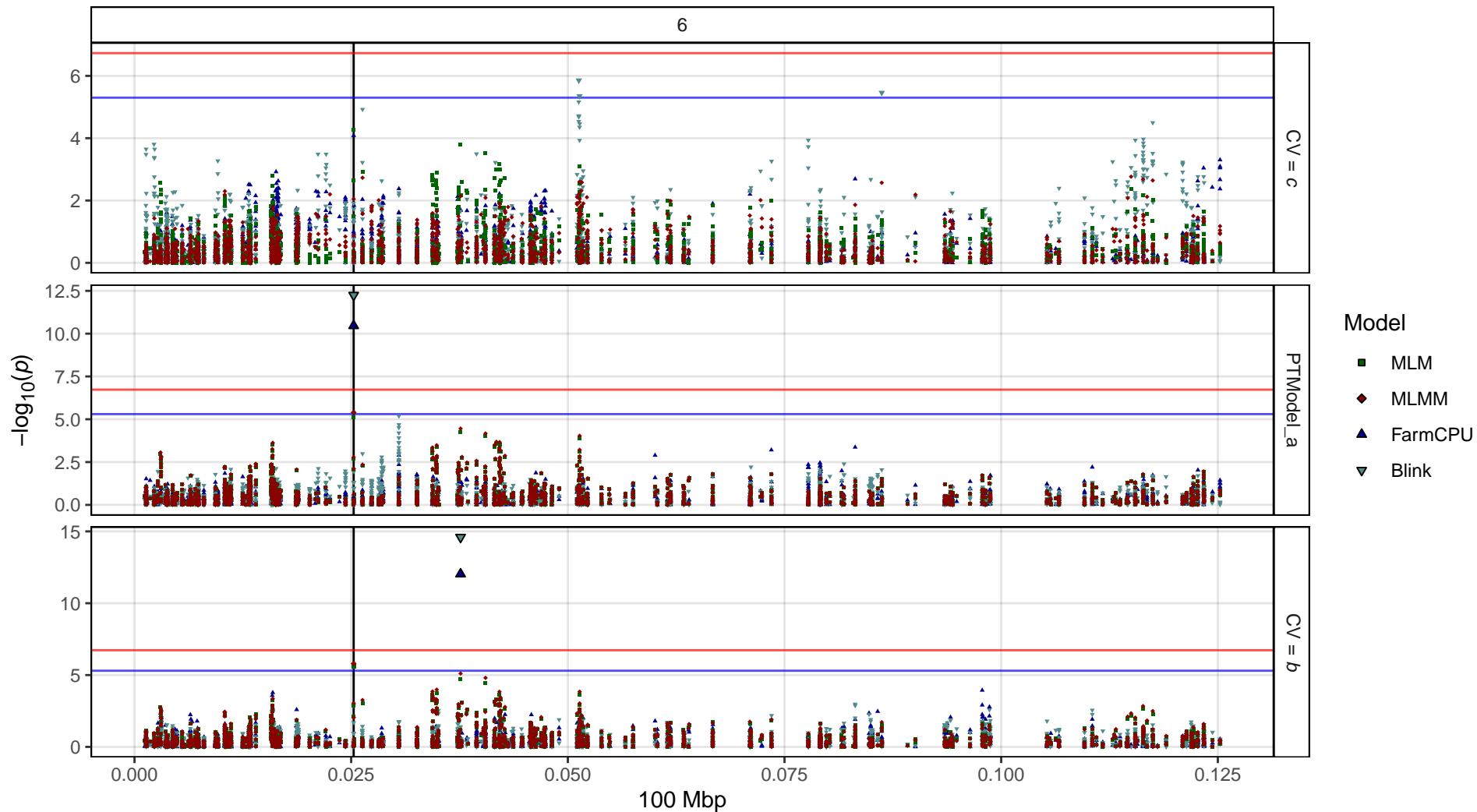
$CV = b$

0.000 0.025 0.050 0.075 0.100 0.125

100 Mbp

## PTModel\_a

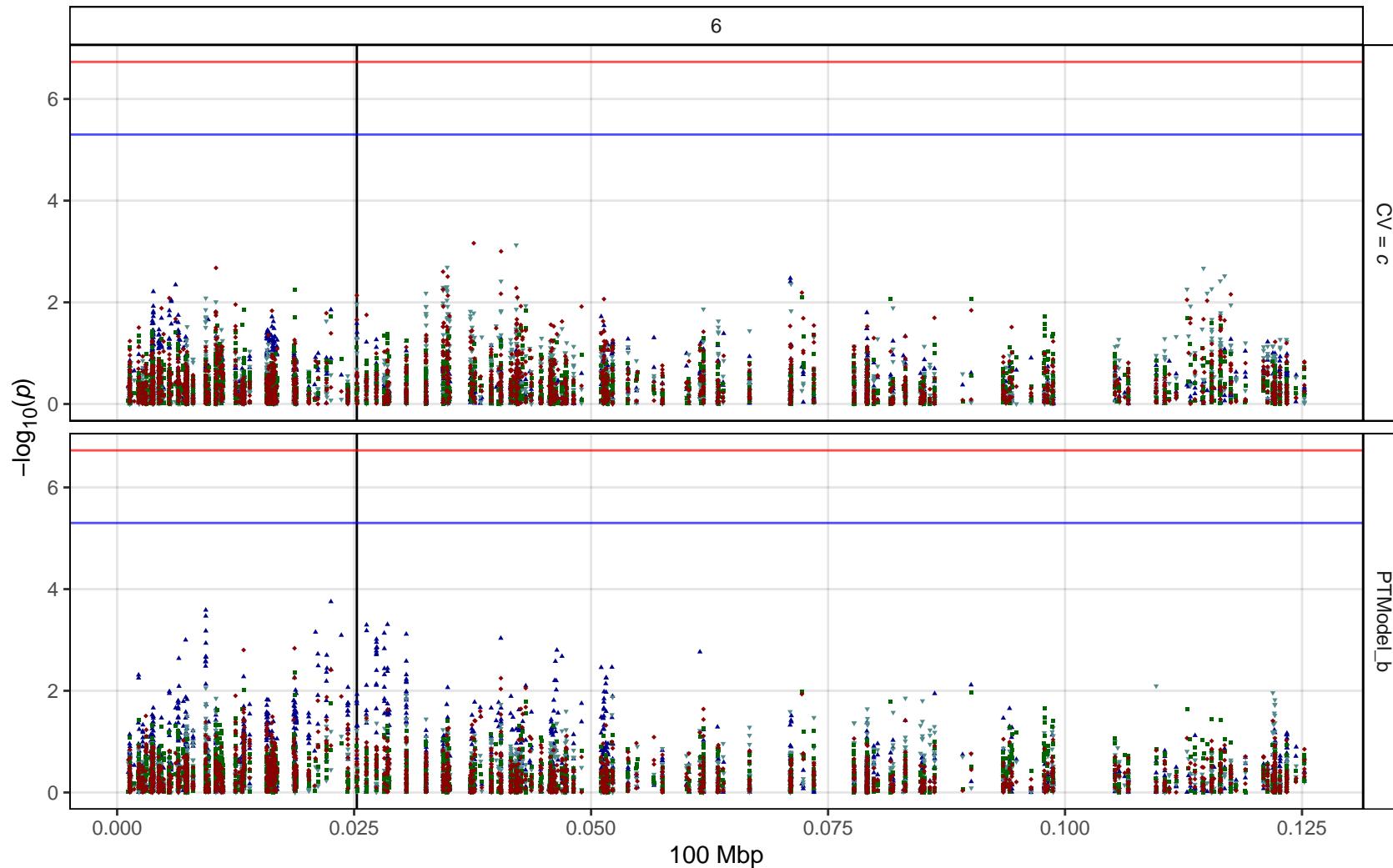
LcFTb1



PTModel\_b

LcFTb1

6



PTModel\_c

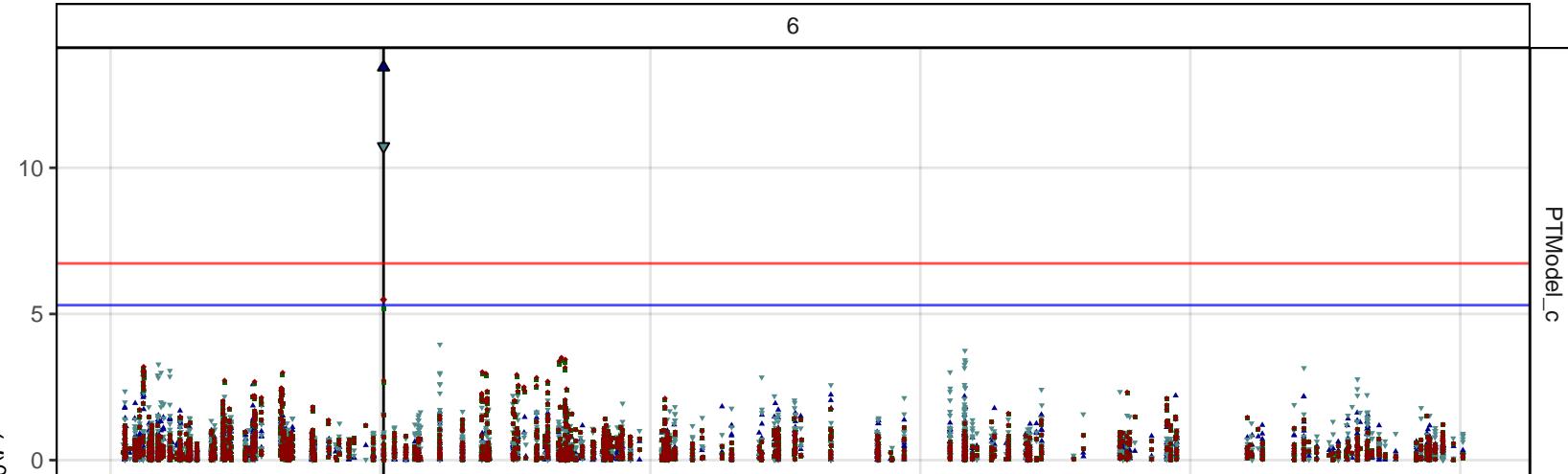
LcFTb1

6

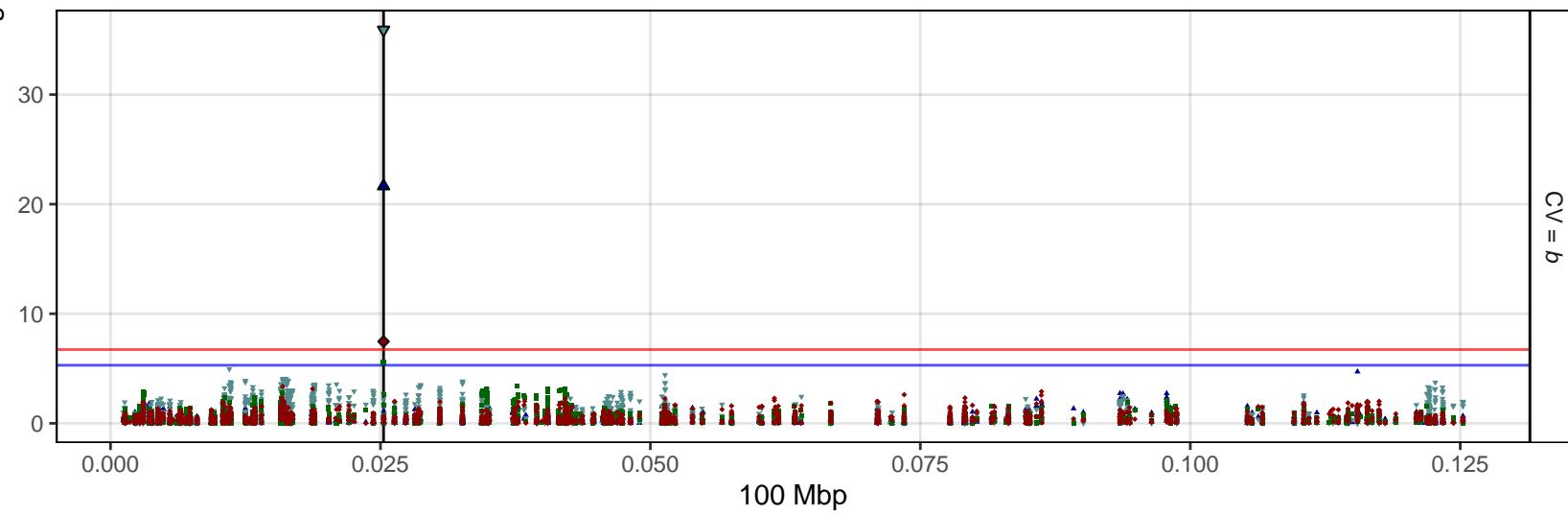
PTModel\_c

Model  
■ MLM  
◆ MLMM  
▲ FarmCPU  
▼ Blink

$-\log_{10}(p)$



$CV = b$

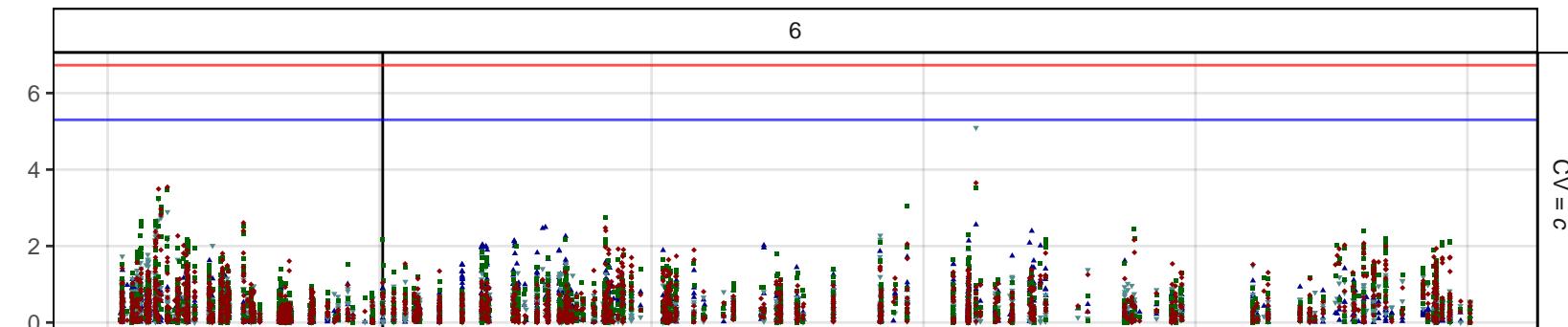


100 Mbp

## Ro16\_DTF

LcFTb1

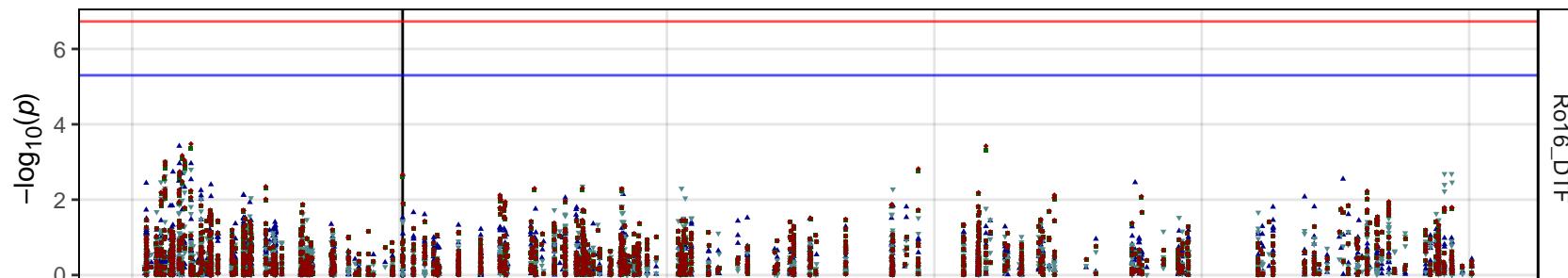
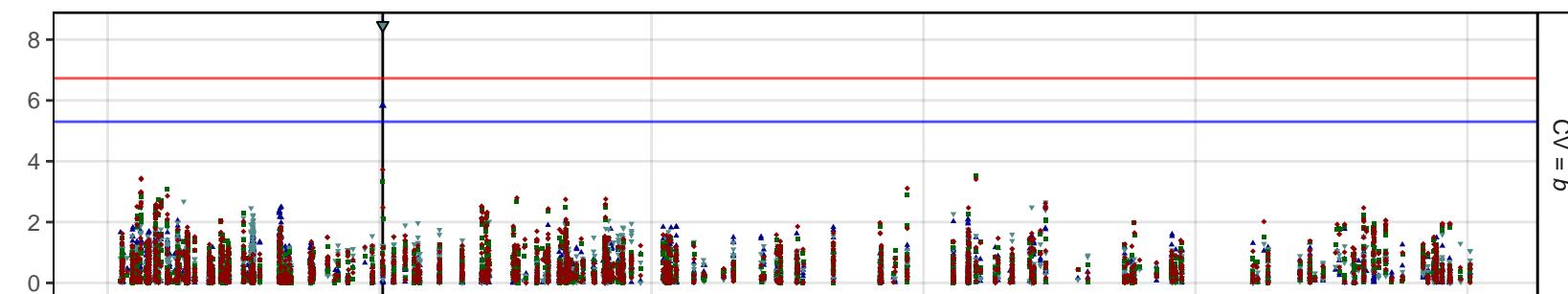
6

 $CV = c$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Ro16\_DTF

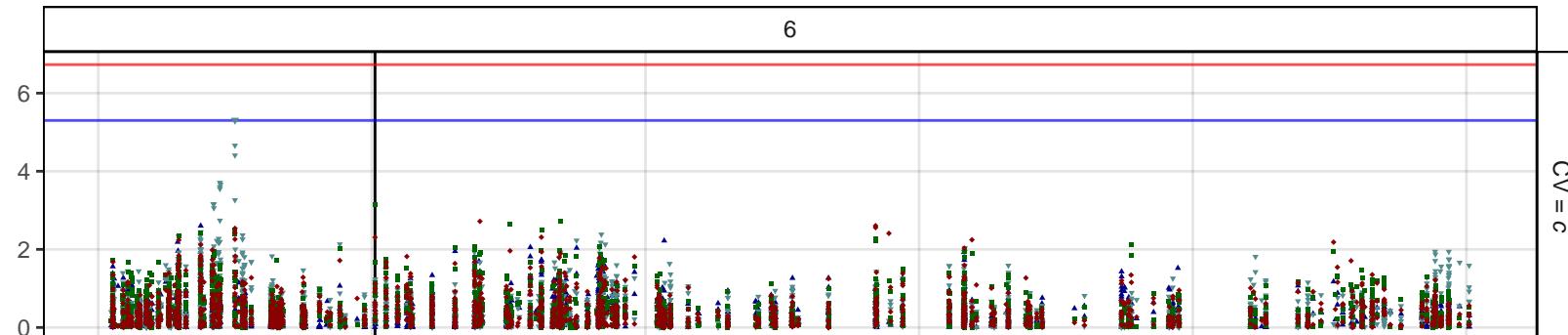
 $CV = b$ 

100 Mbp

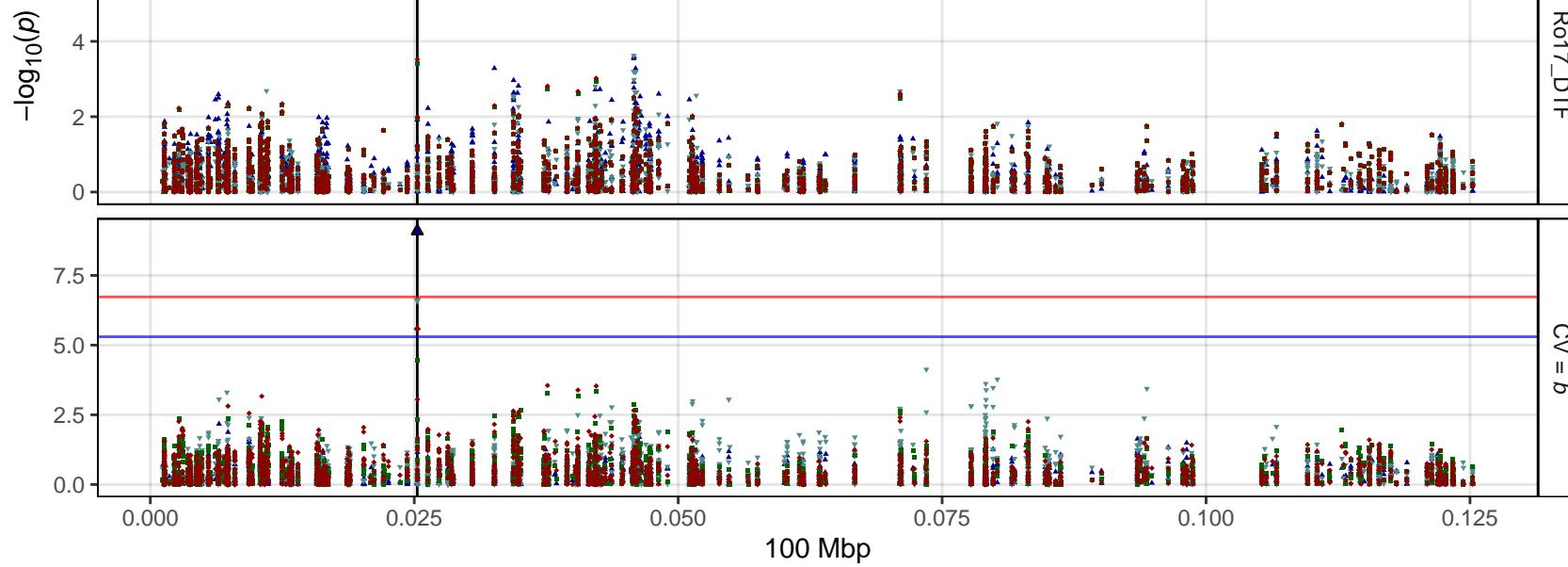
Ro17\_DTF

LcFTb1

6

 $CV = c$ 

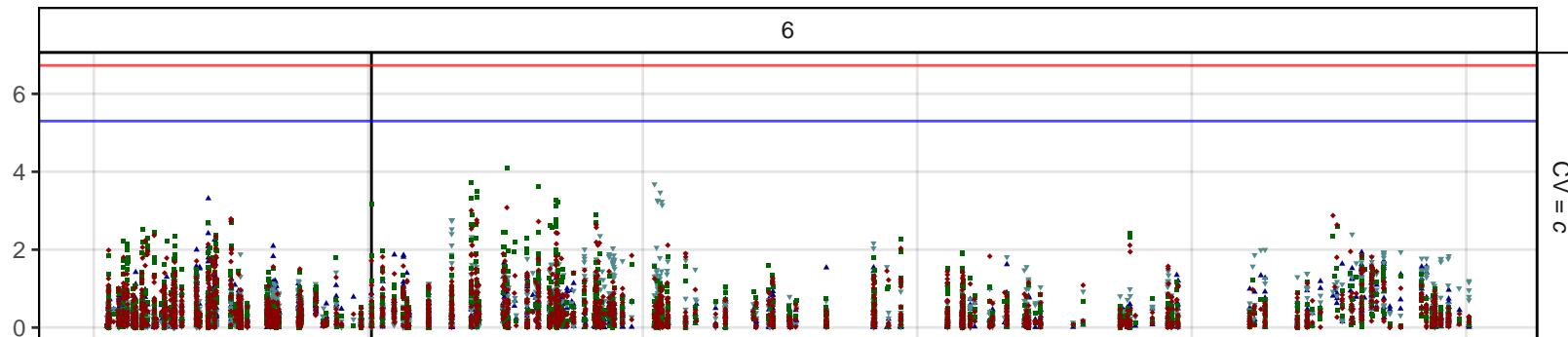
Ro17\_DTF

 $CV = b$ 

## Su16\_DTF

LcFTb1

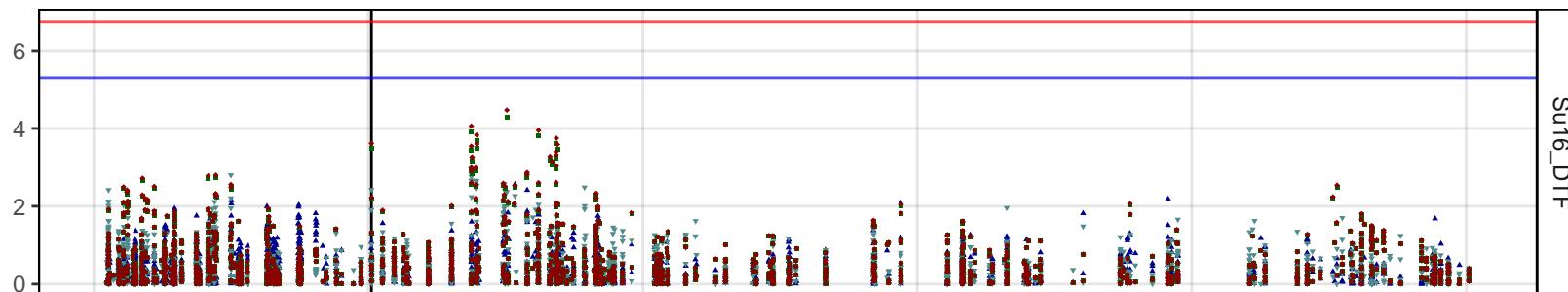
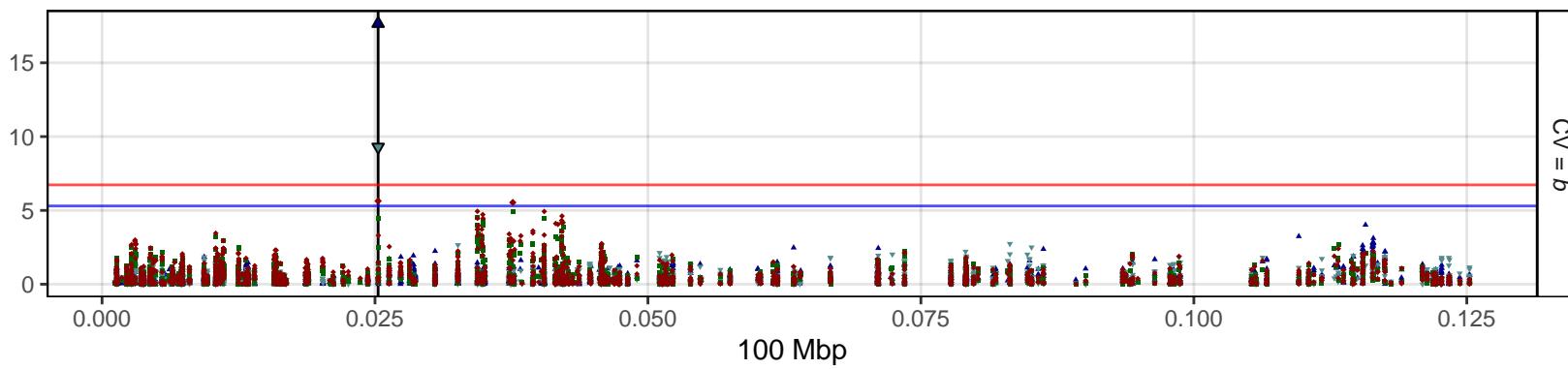
6

 $CV = c$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Su16\_DTF

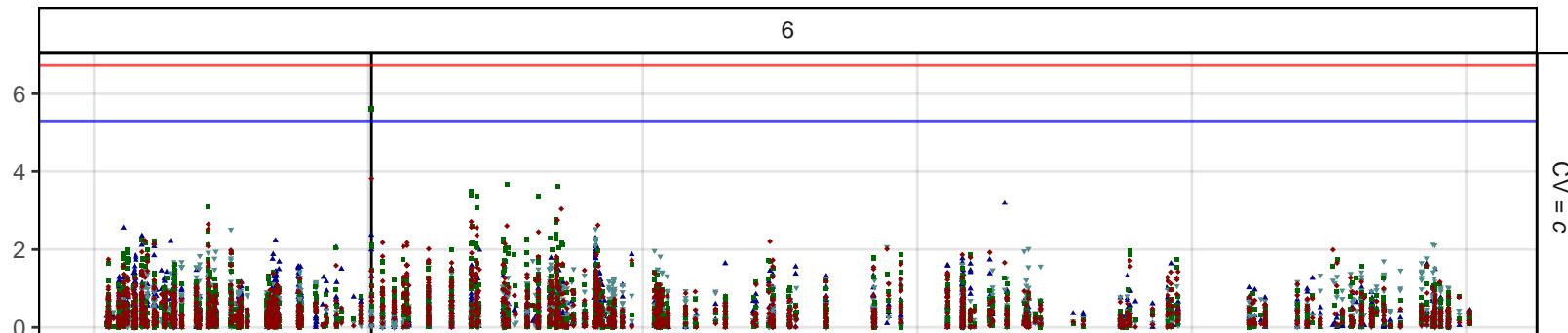
 $CV = b$ 

100 Mbp

## Su17\_DTF

LcFTb1

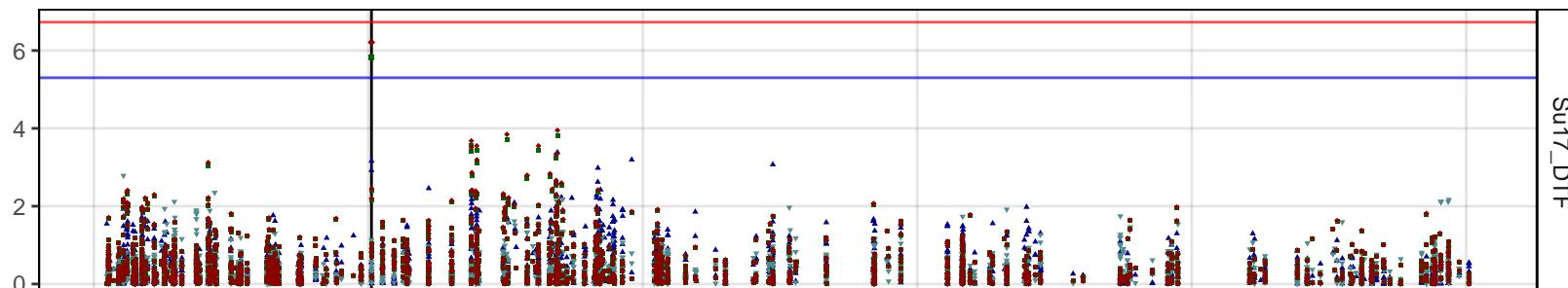
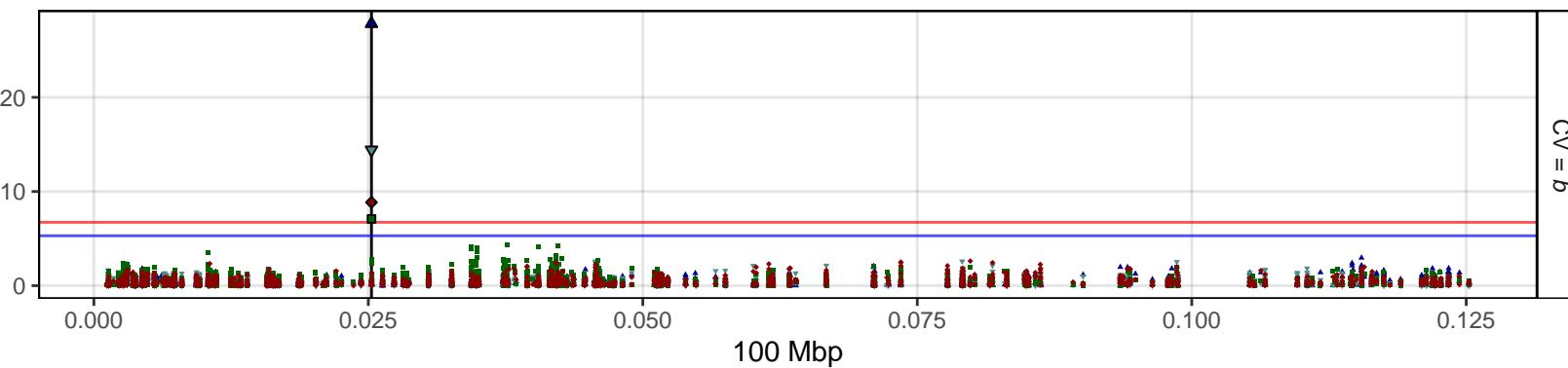
6

 $CV = c$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

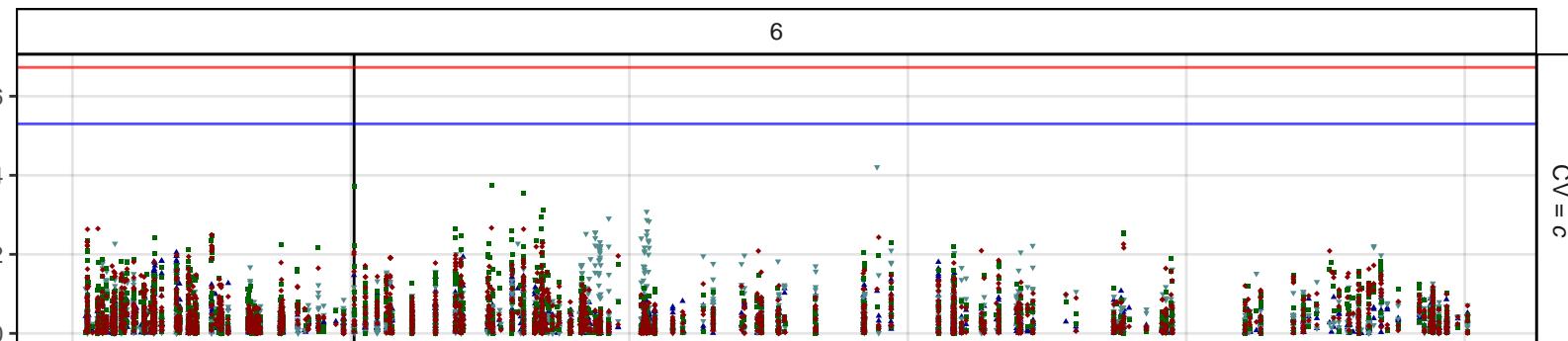
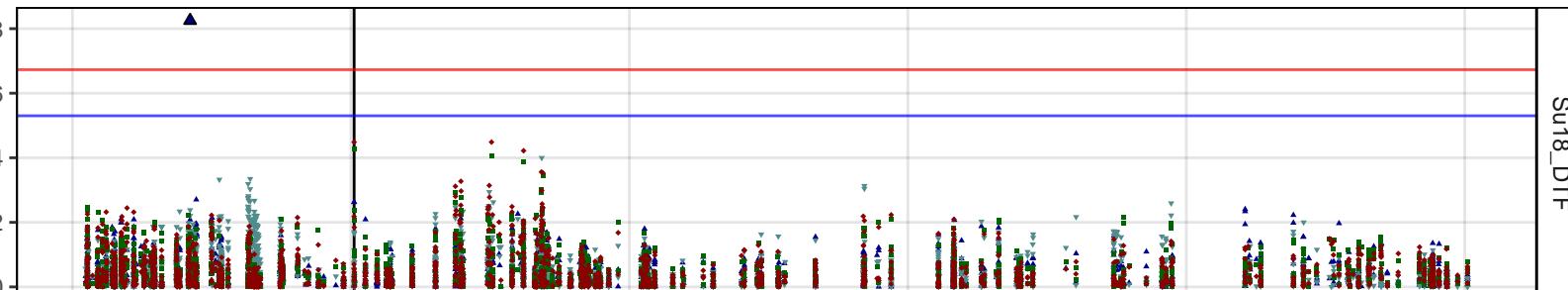
Su17\_DTF

 $CV = b$ 

## Su18\_DTF

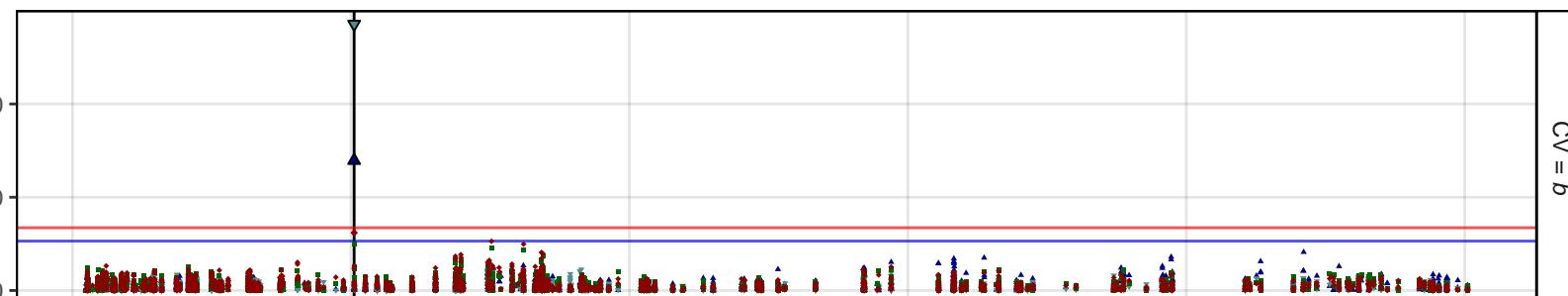
LcFTb1

6

 $-\log_{10}(p)$  $CV = c$  $Su18\_DTF$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

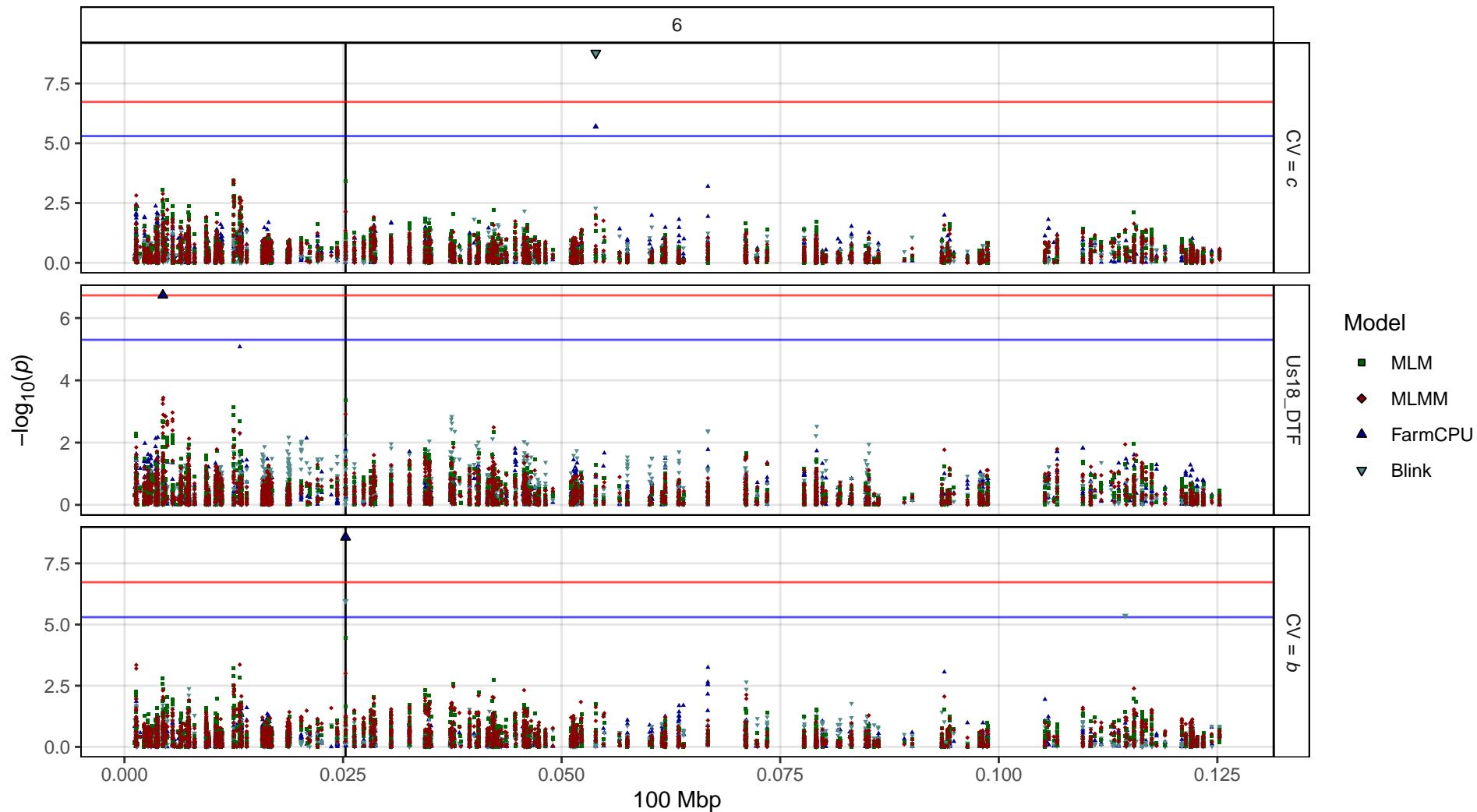
 $CV = b$ 

100 Mbp

## Us18\_DTF

LcFTb1

6



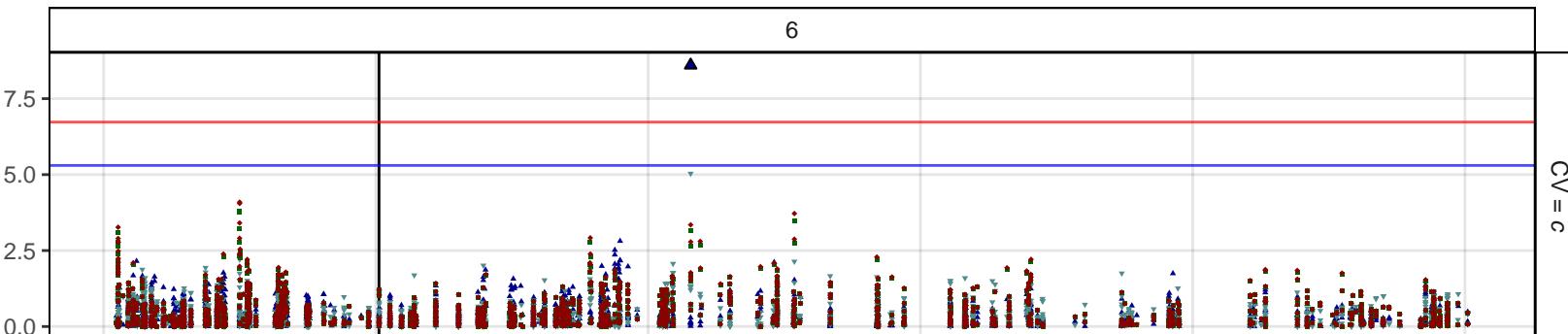
In16\_DTF

LcFTb1

6

$CV = c$

$-\log_{10}(p)$

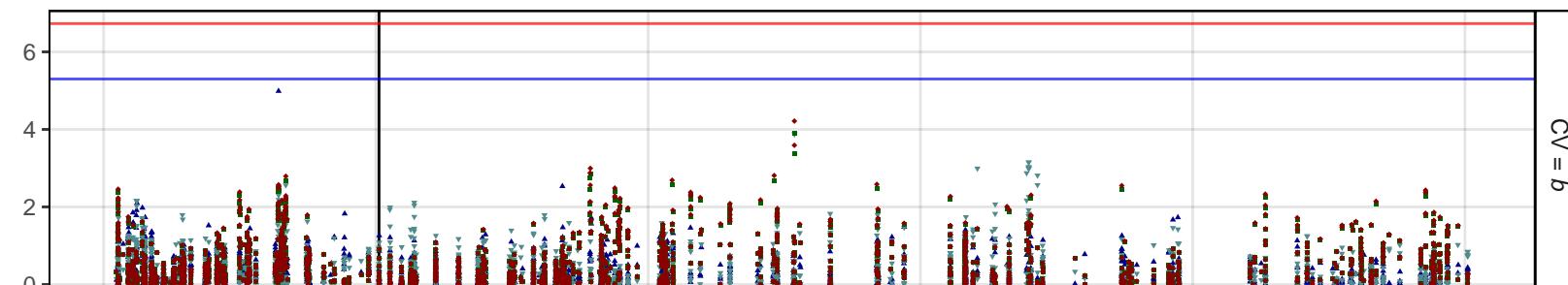


Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

In16\_DTF

$CV = b$



100 Mbp

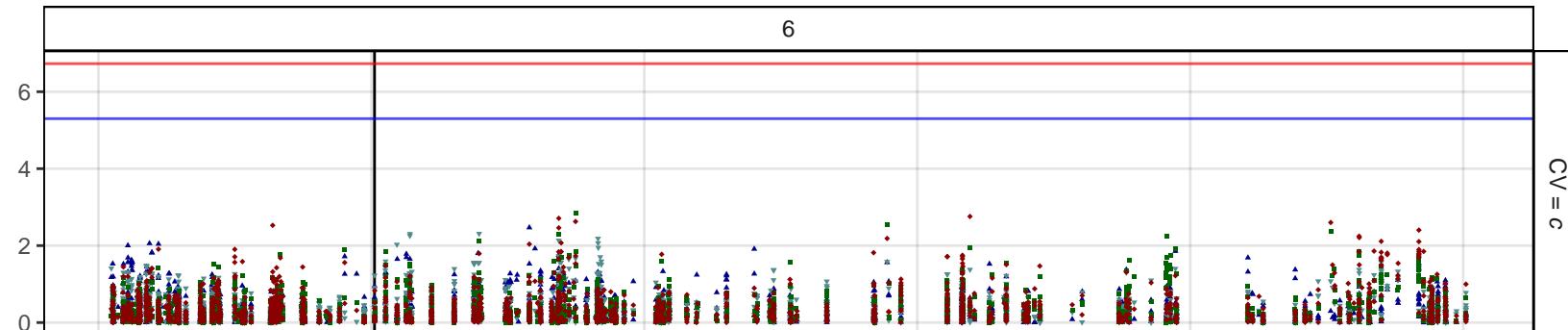
In17\_DTF

LcFTb1

6

$CV = c$

$-\log_{10}(p)$



Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

In17\_DTF

$-\log_{10}(p)$



$CV = b$

100 Mbp

100 Mbp

## Ba16\_DTF

LcFTb1

6

 $CV = c$  $-\log_{10}(p)$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

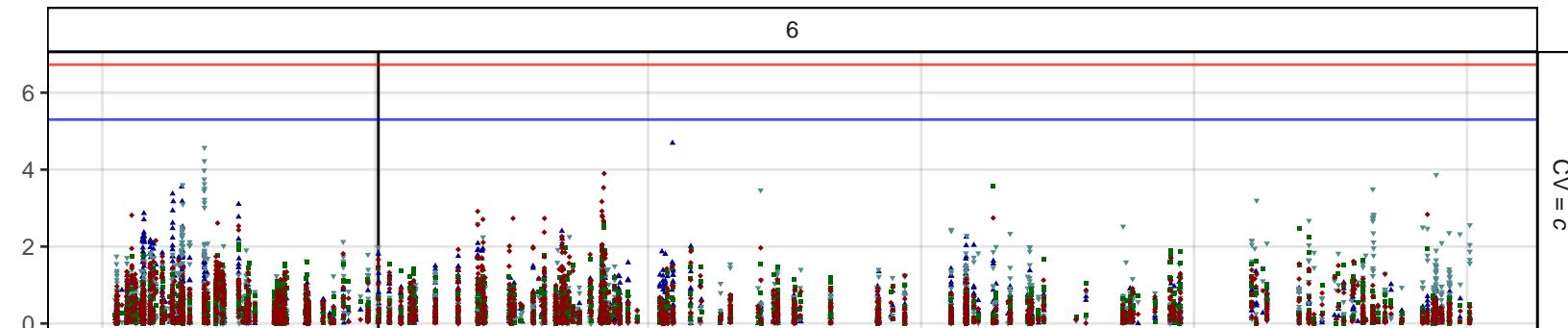
Ba16\_DTF

 $CV = b$ 0.000 0.025 0.050 0.075 0.100 0.125  
100 Mbp

## Ba17\_DTF

LcFTb1

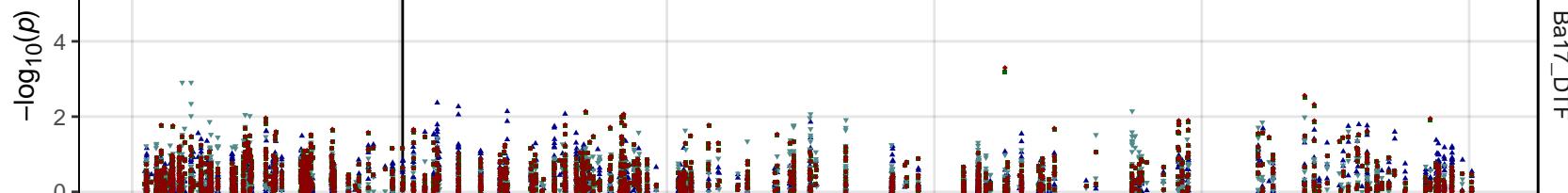
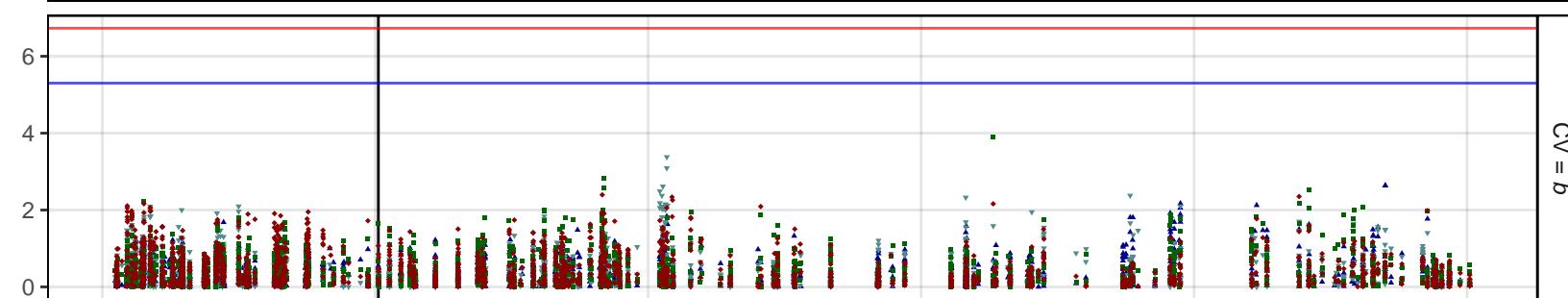
6

 $CV = c$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Ba17\_DTF

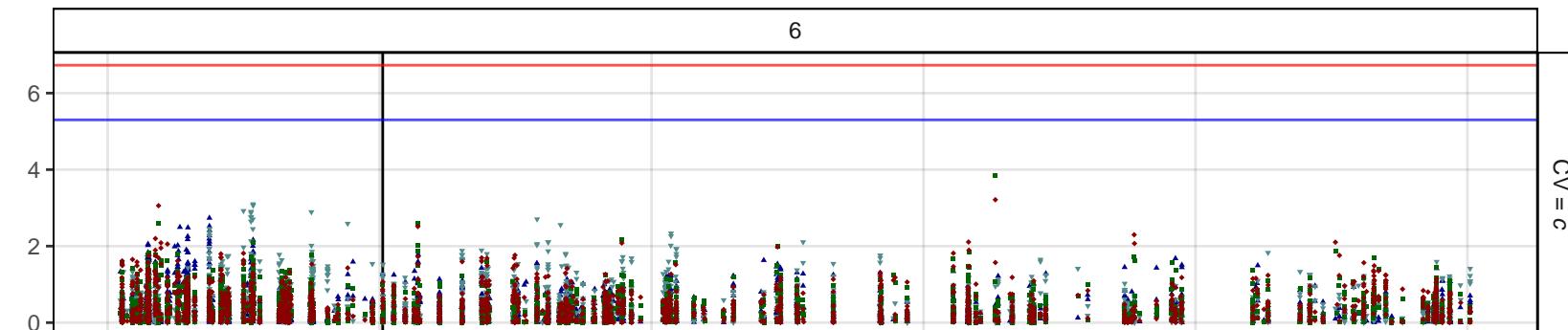
 $CV = b$ 

100 Mbp

## Ne16\_DTF

LcFTb1

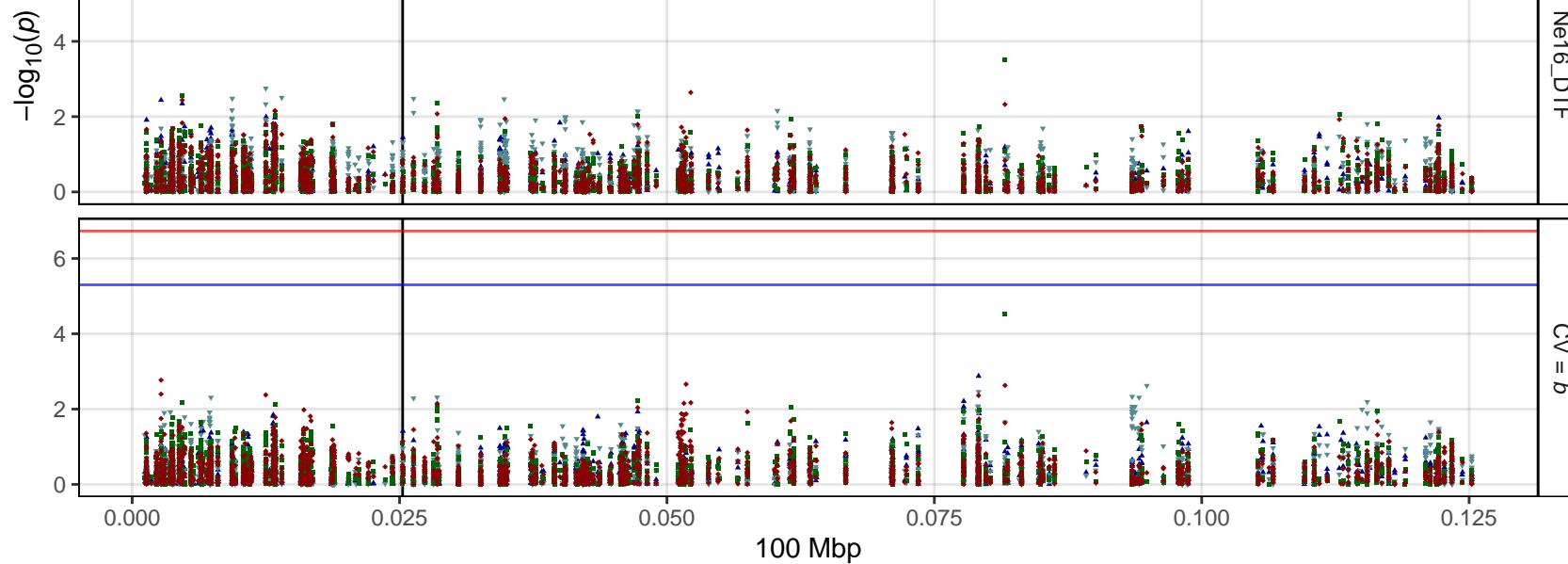
6

 $CV = c$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Ne16\_DTF

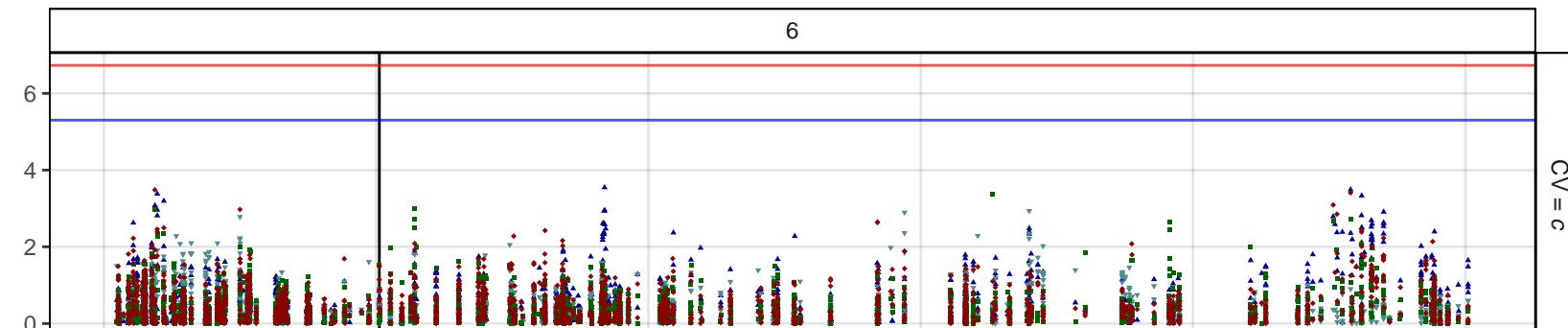
 $CV = b$ 

100 Mbp

## Ne17\_DTF

LcFTb1

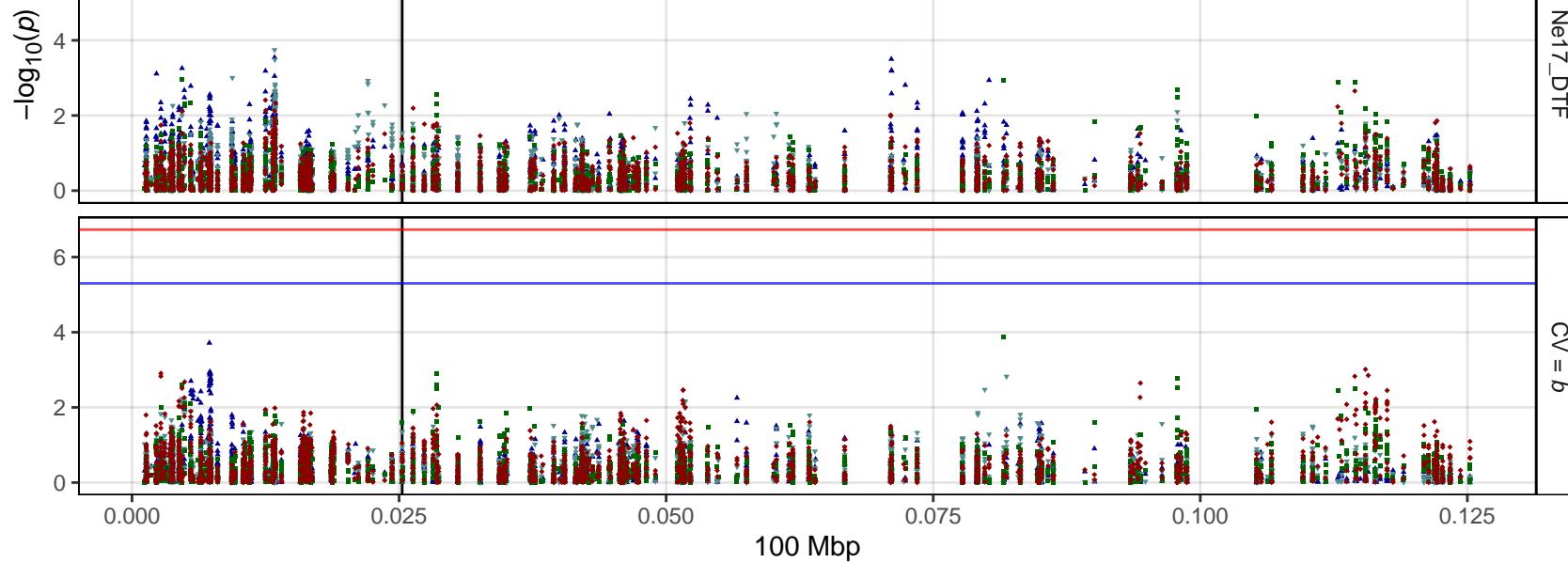
6

 $CV = c$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Ne17\_DTF

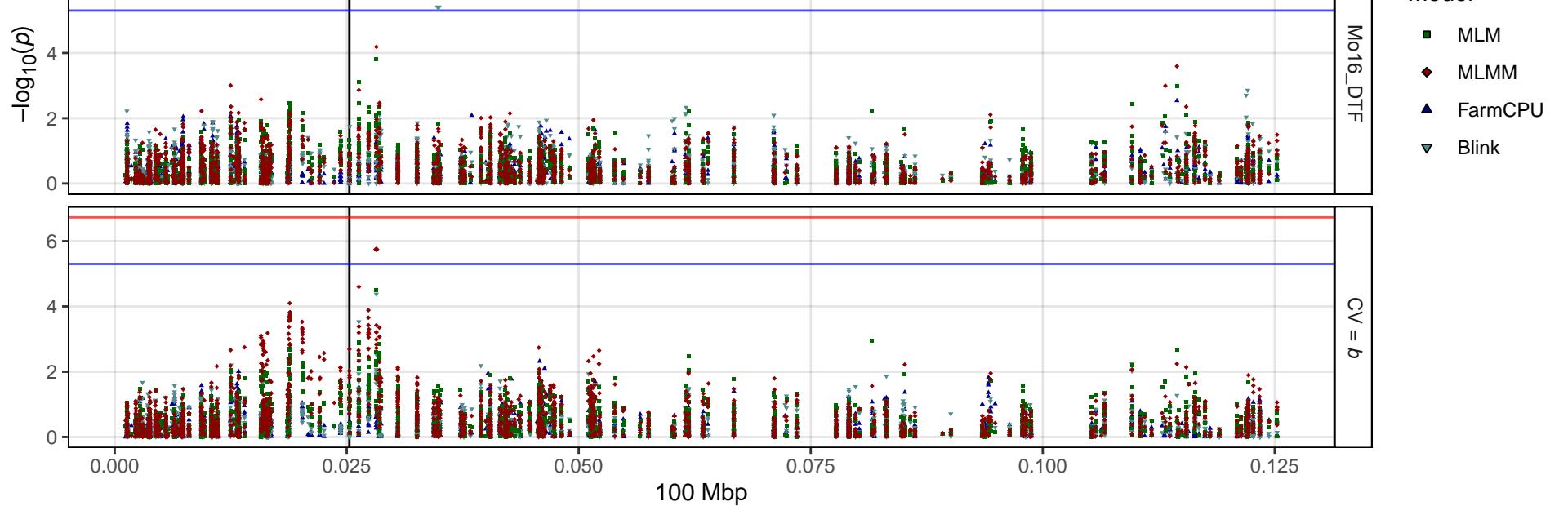
 $CV = b$ 

100 Mbp

## Mo16\_DTF

LcFTb1

6

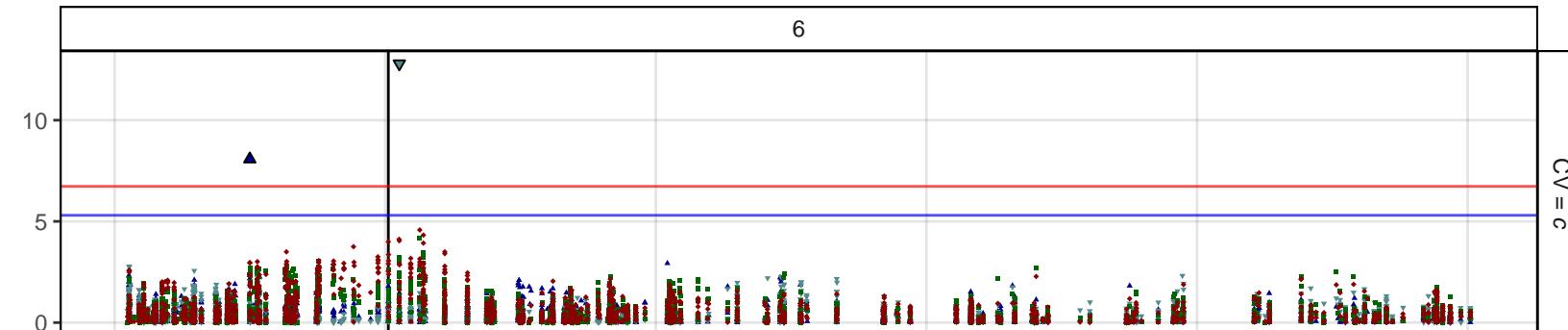
 $CV = c$ 

Mo17\_DTF

LcFTb1

6

$CV = c$

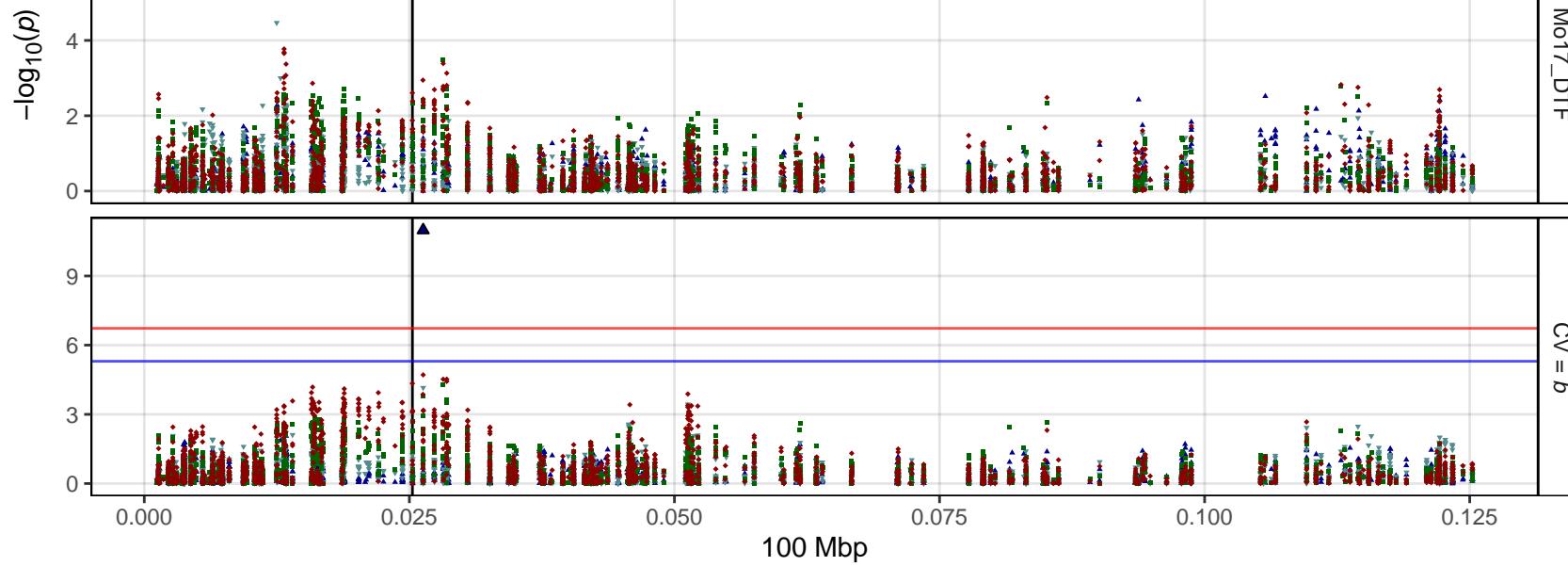


Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Mo17\_DTF

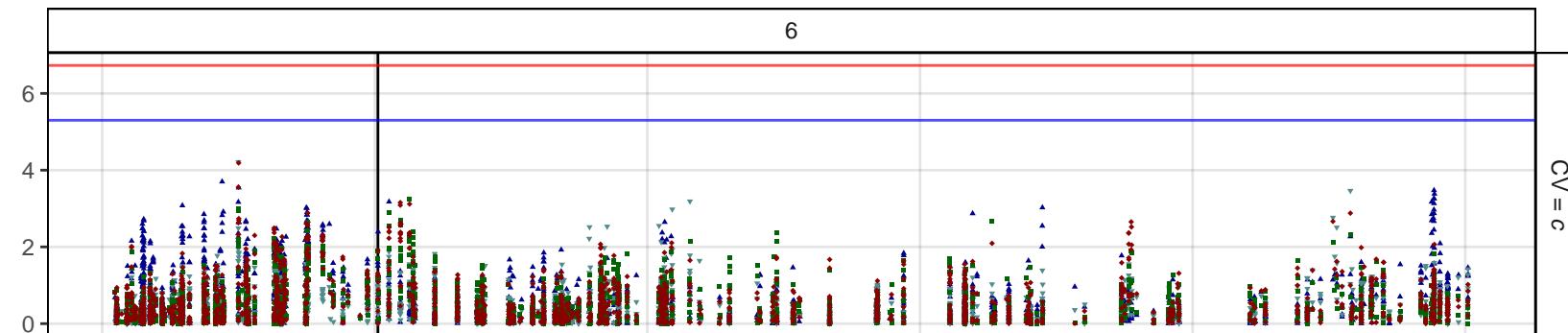
$CV = b$



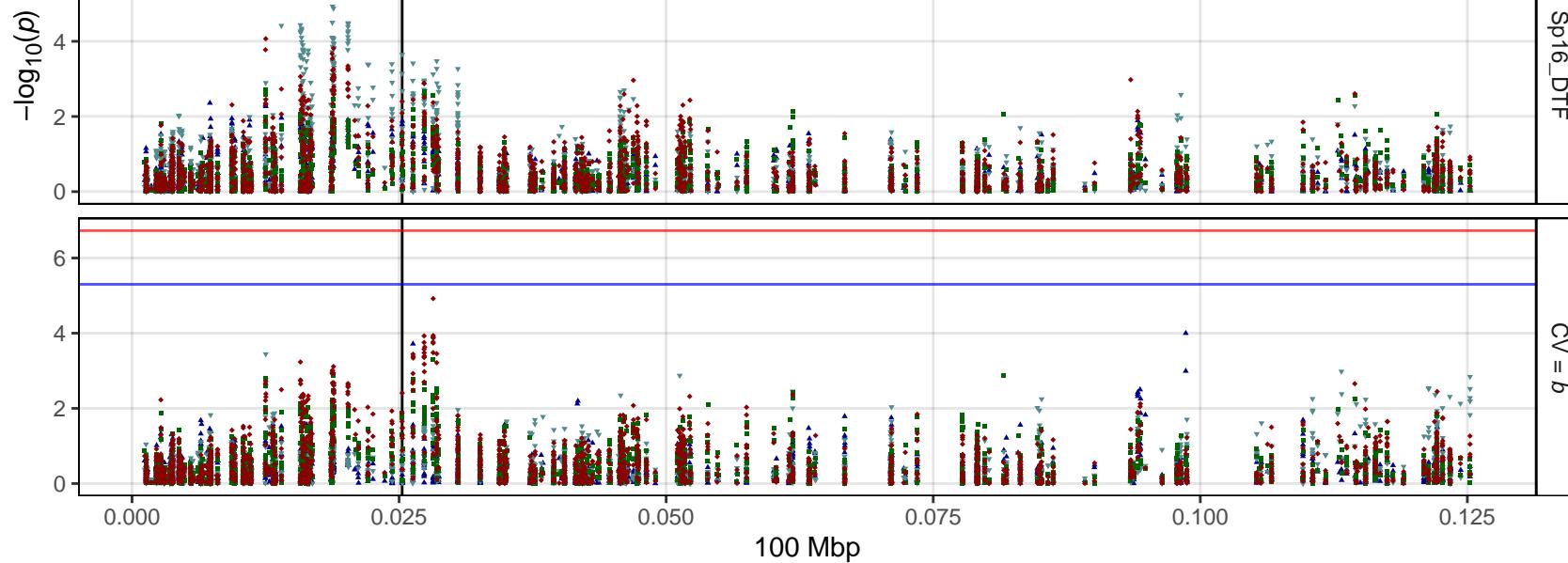
## Sp16\_DTF

LcFTb1

6

 $CV = c$ 

Sp16\_DTF

 $CV = b$ 

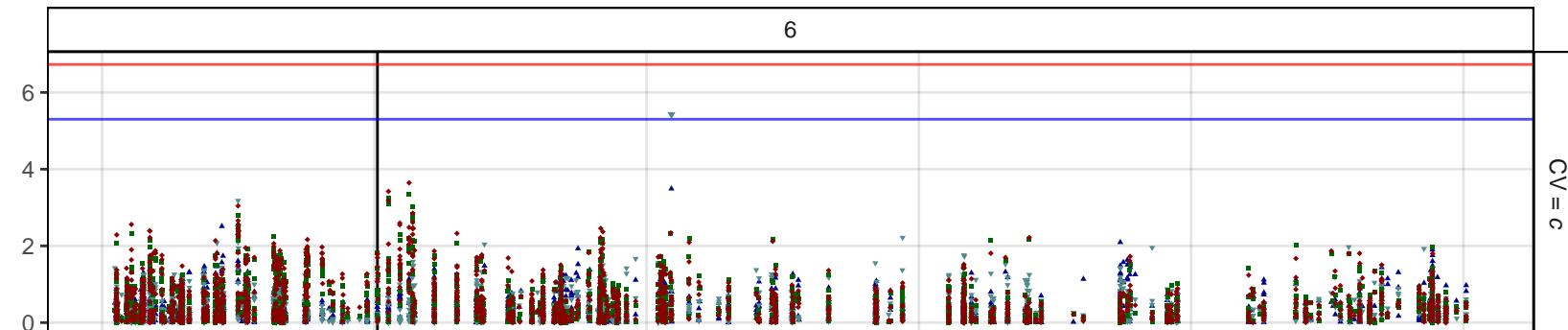
100 Mbp

## Sp17\_DTF

LcFTb1

6

CV = c

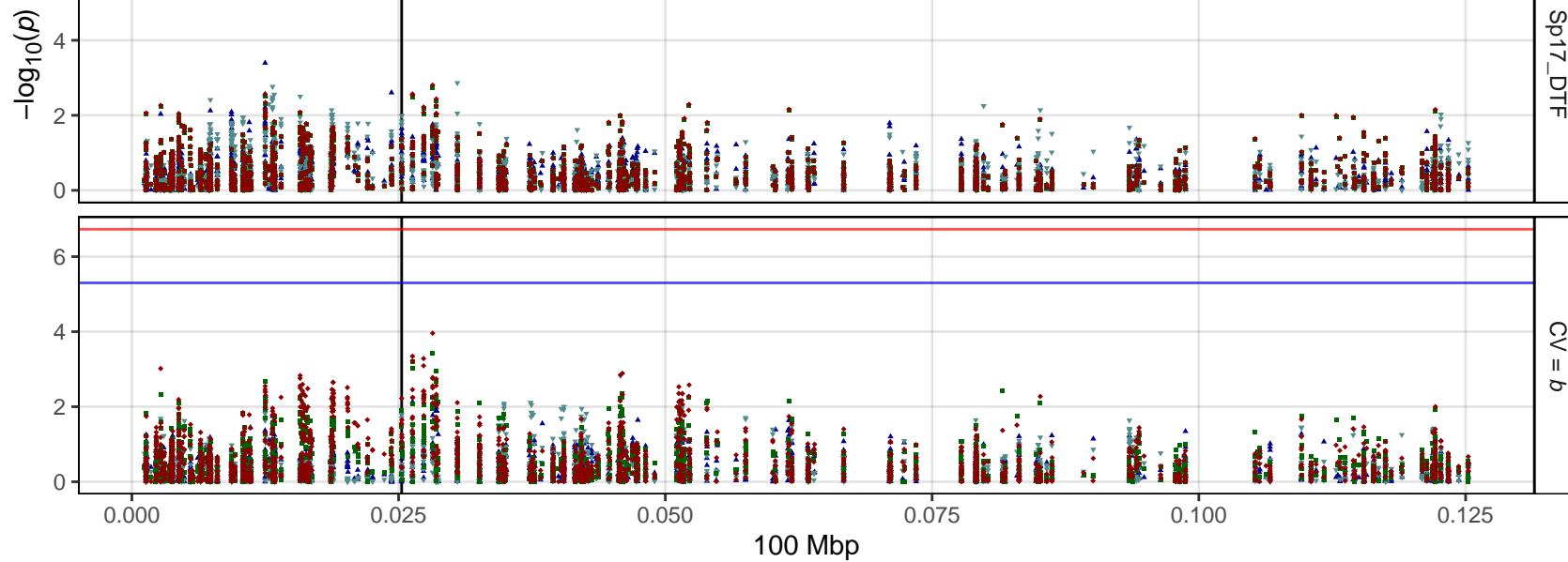


Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Sp17\_DTF

CV = b



100 Mbp

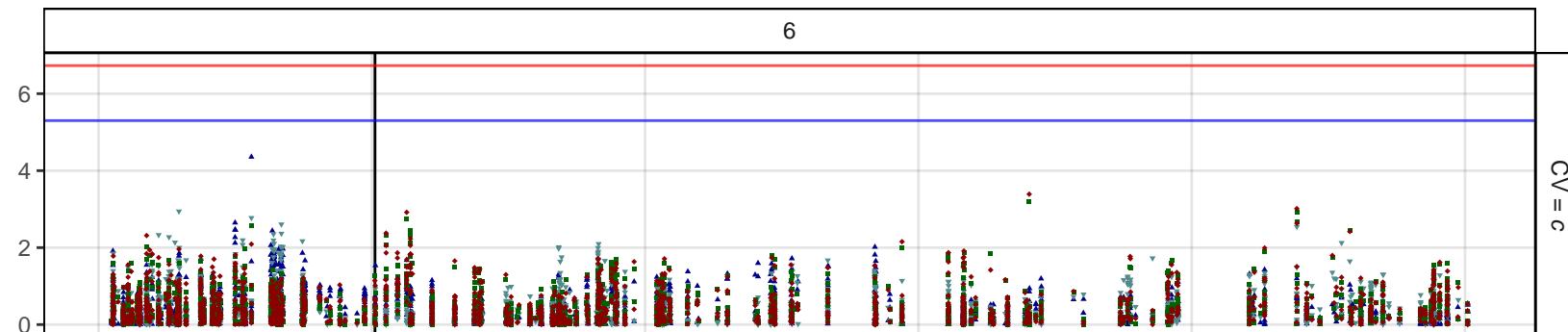
lt16\_DTF

LcFTb1

6

$CV = c$

$-\log_{10}(p)$

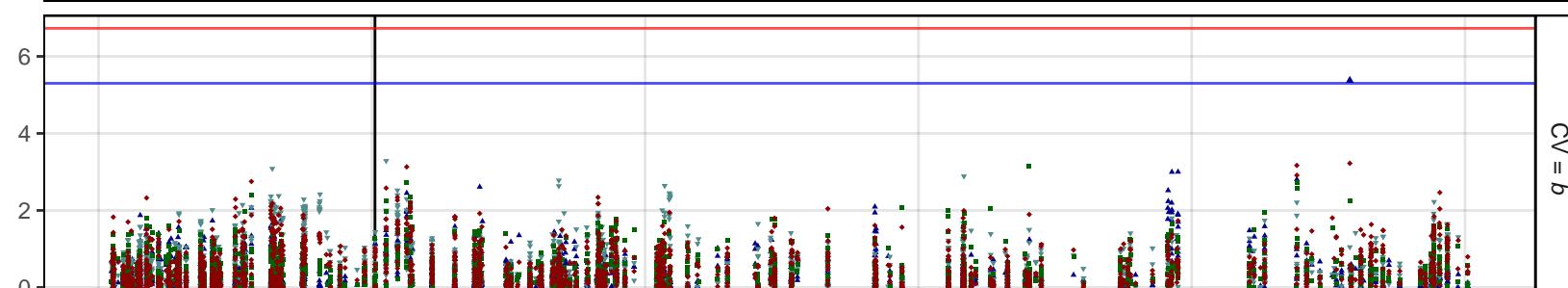


Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

lt16\_DTF

$CV = b$

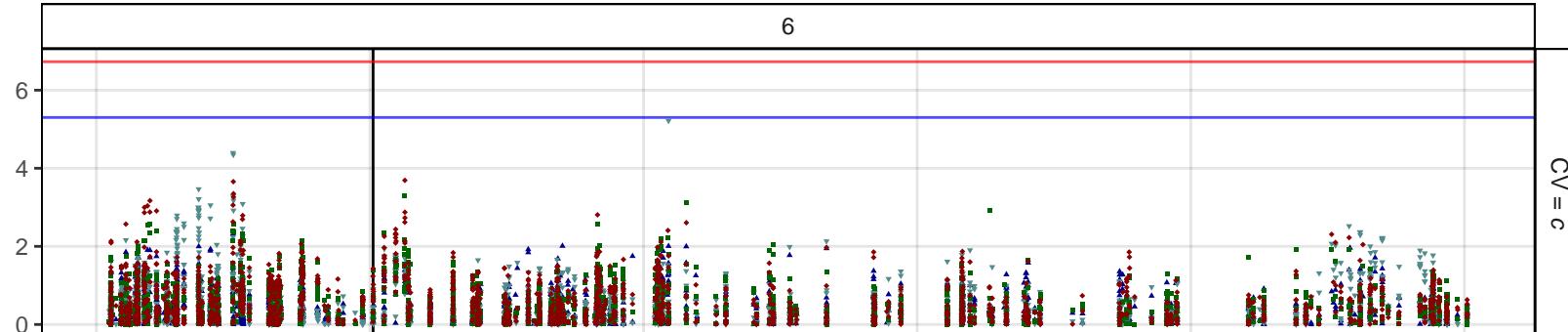


100 Mbp

It17\_DTF

LcFTb1

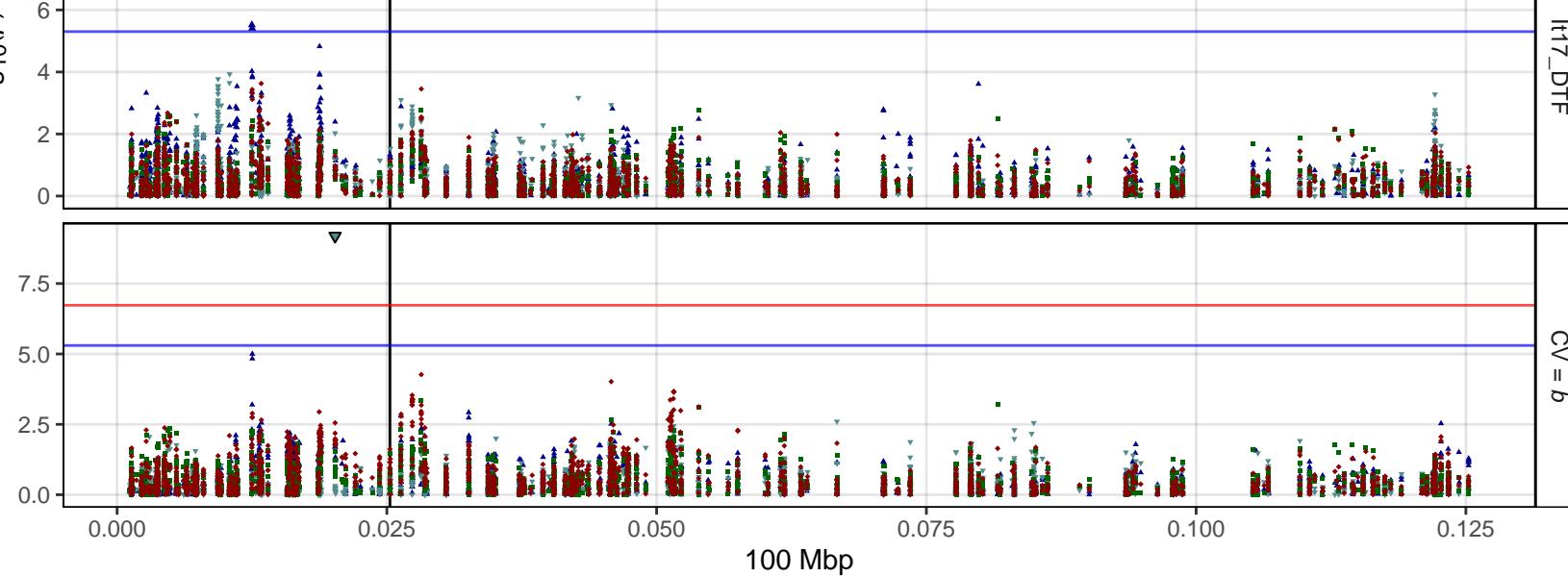
6

 $CV = c$ 

Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

It17\_DTF

 $CV = b$ 

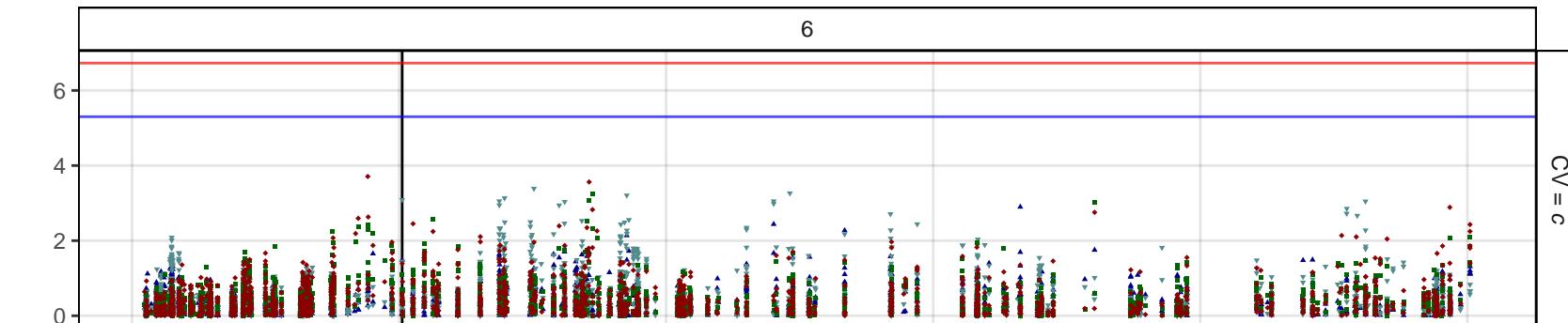
100 Mbp

Su17\_Tf

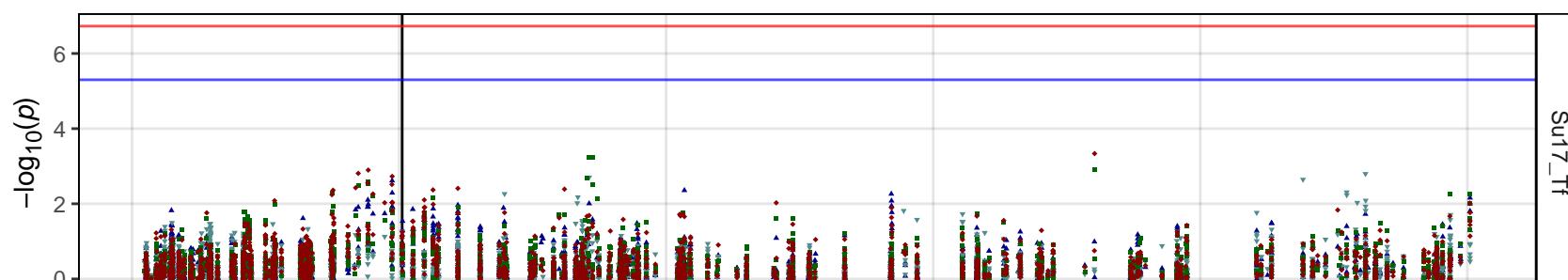
LcFTb1

6

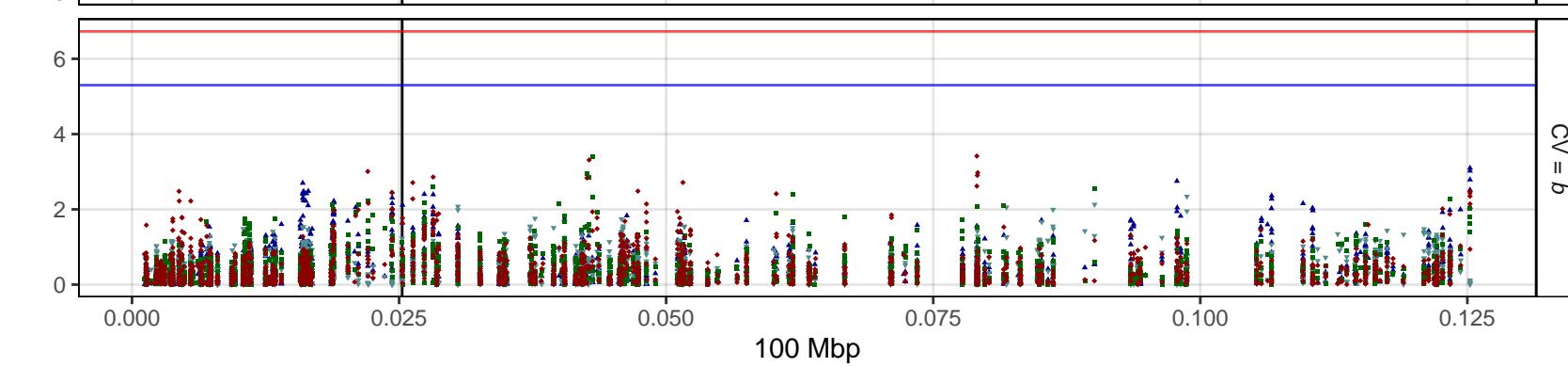
$CV = c$



Su17\_Tf



$CV = b$



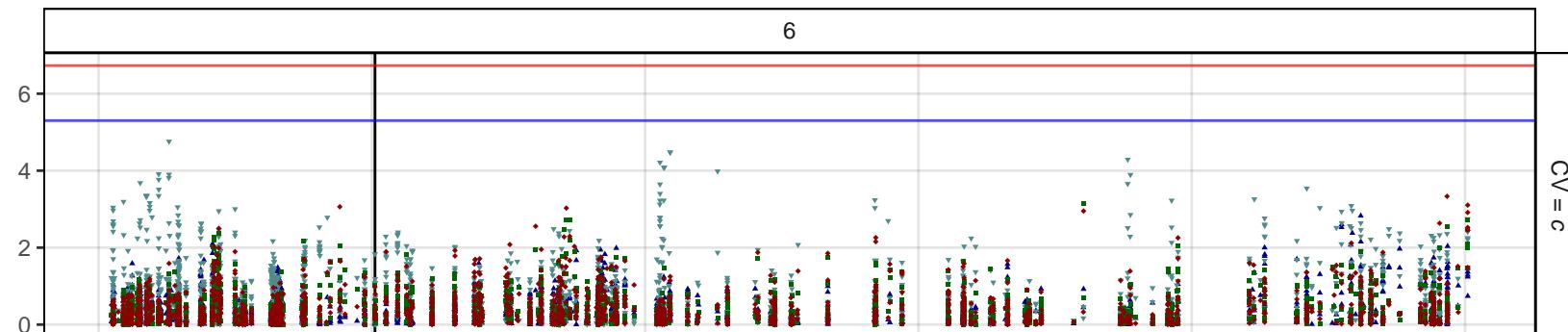
Ba17\_Tf

LcFTb1

6

$CV = c$

( $\sigma$ )

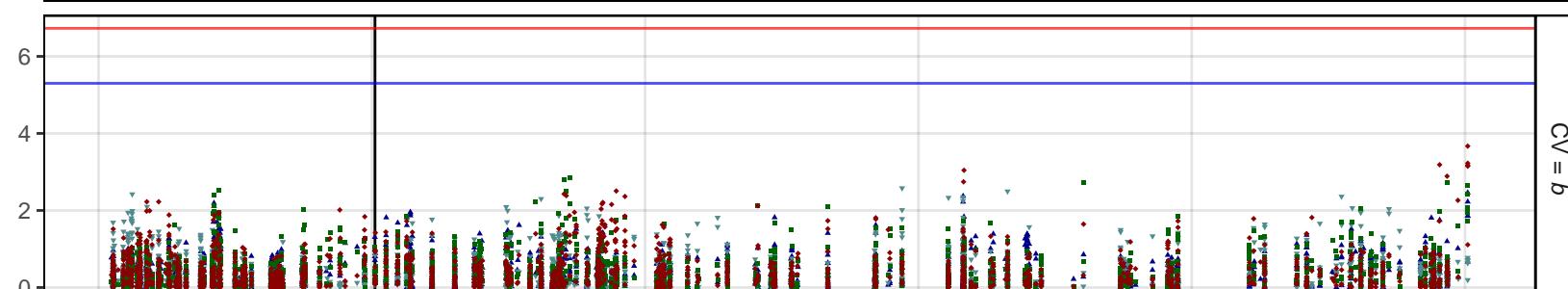


Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Ba17\_Tf

$CV = b$



100 Mbp

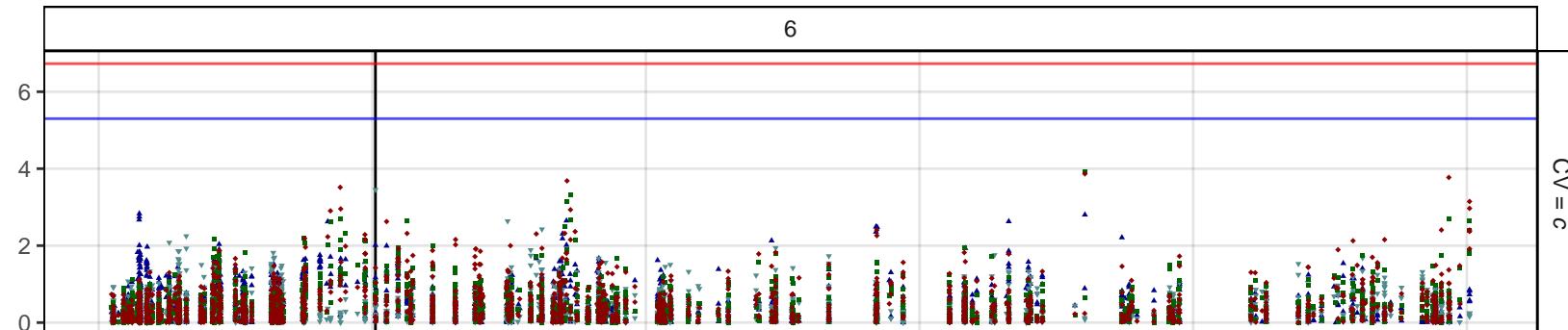
It17\_Tf

LcFTb1

6

$CV = c$

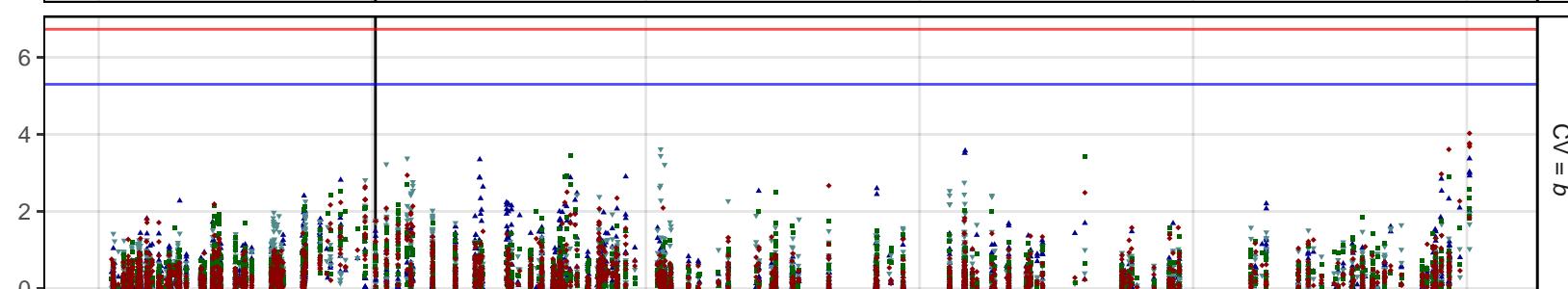
$-\log_{10}(p)$



Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

It17\_Tf  
 $CV = b$



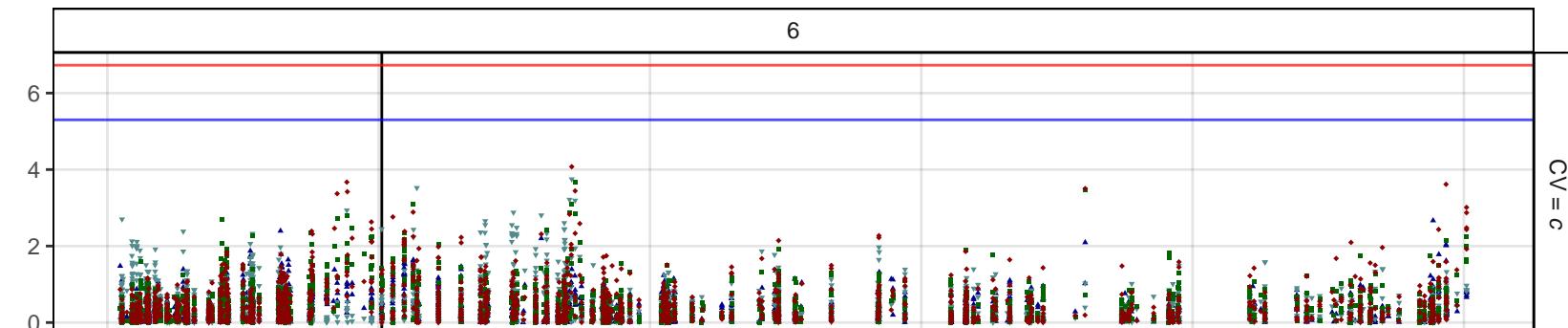
100 Mbp

Su17\_Tb

LcFTb1

6

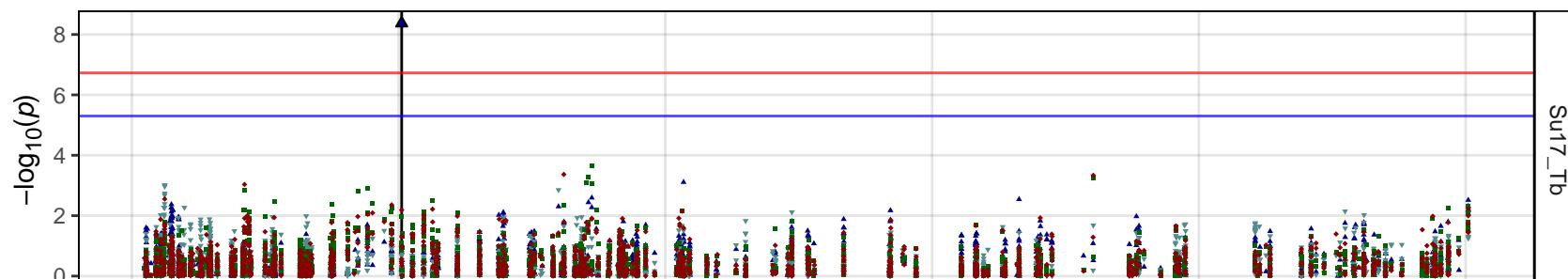
$CV = c$



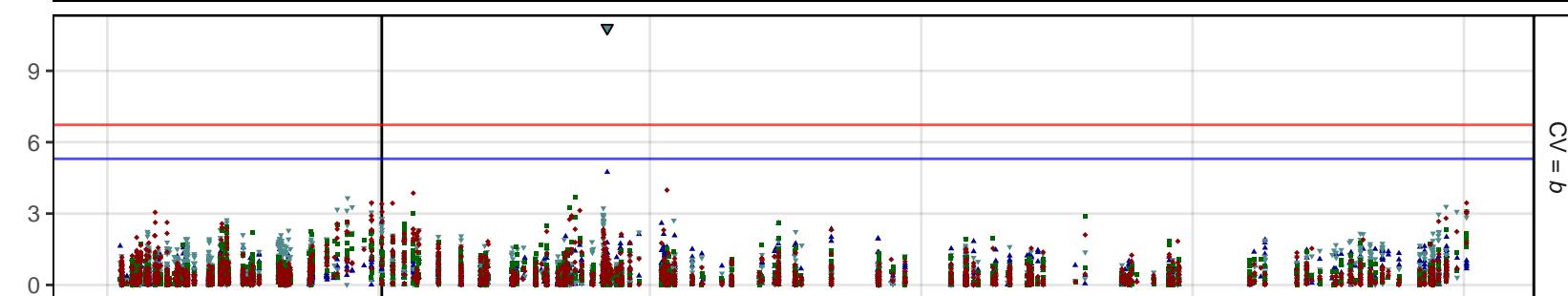
Model

- MLM
- MLMM
- FarmCPU
- Blink

Su17\_Tb



$CV = b$



Ba17\_Tb

LcFTb1

6

$CV = c$

( $-\log_{10}(p)$ )

Model

- MLM
- MLMM
- FarmCPU
- Blink

Ba17\_Tb

$CV = b$

0.000 0.025 0.050 0.075 0.100 0.125

100 Mbp

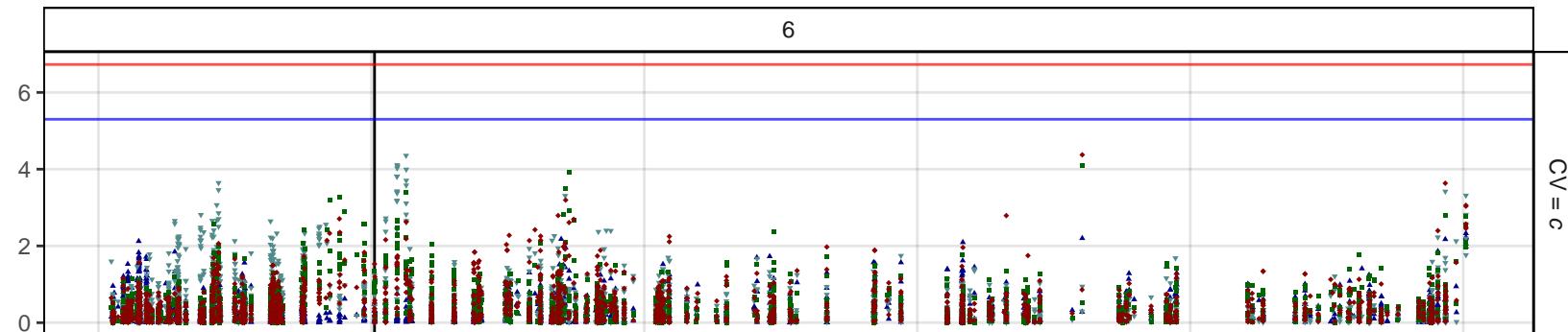
lt17\_Tb

LcFTb1

6

$CV = c$

$-\log_{10}(p)$



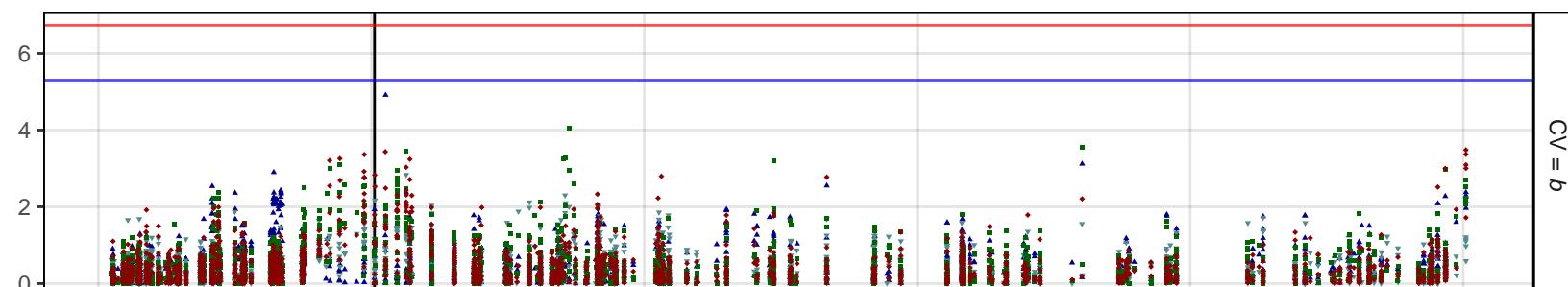
Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

lt17\_Tb

$CV = b$

$-\log_{10}(p)$



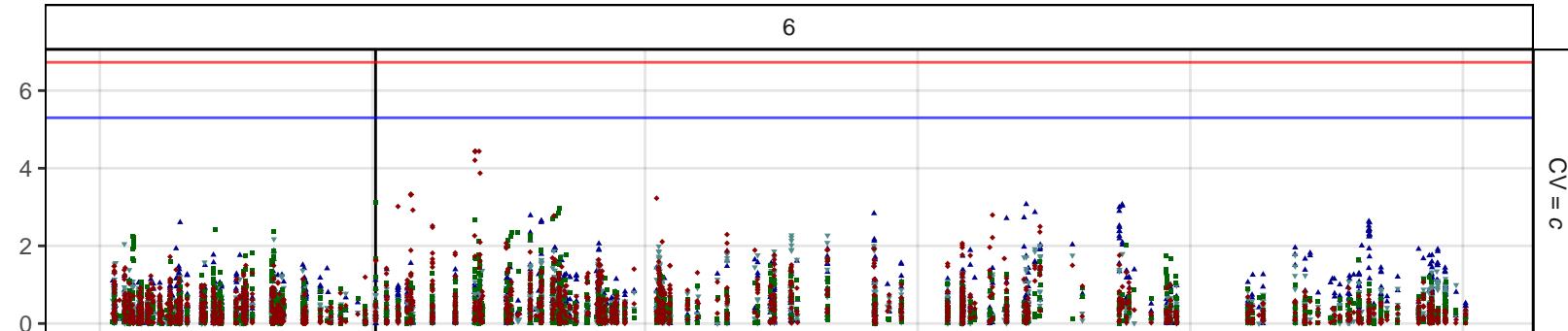
100 Mbp

Su17\_Pf

LcFTb1

6

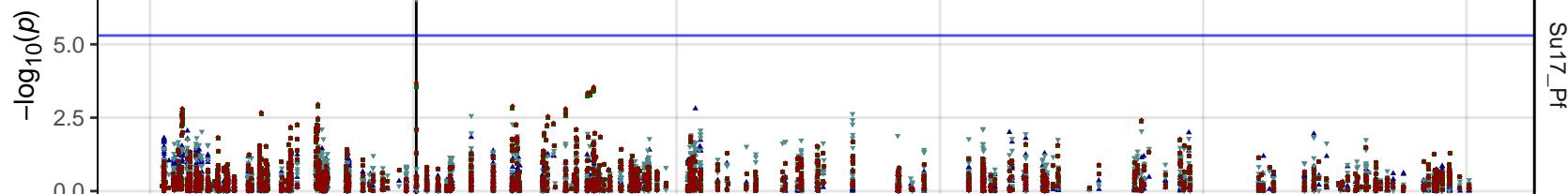
$CV = c$



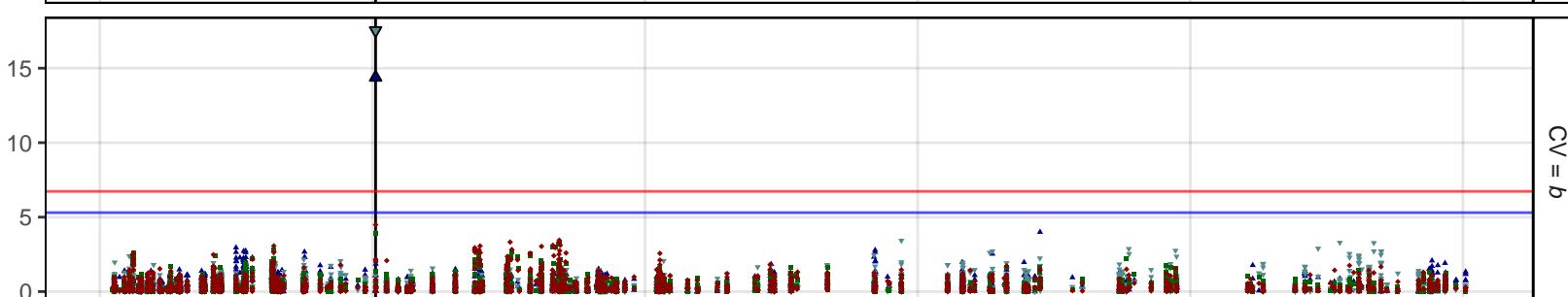
Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Su17\_Pf



$CV = b$



100 Mbp

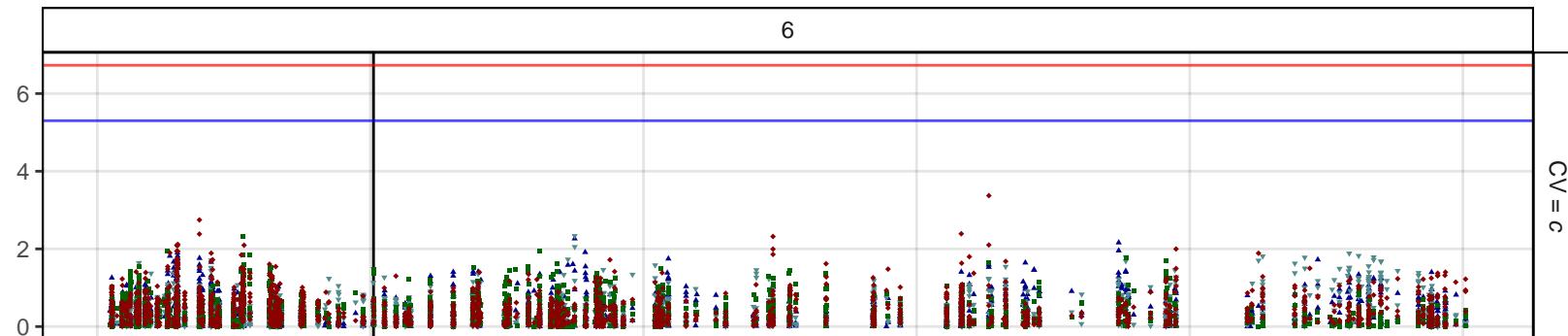
Ba17\_Pf

LcFTb1

6

$CV = c$

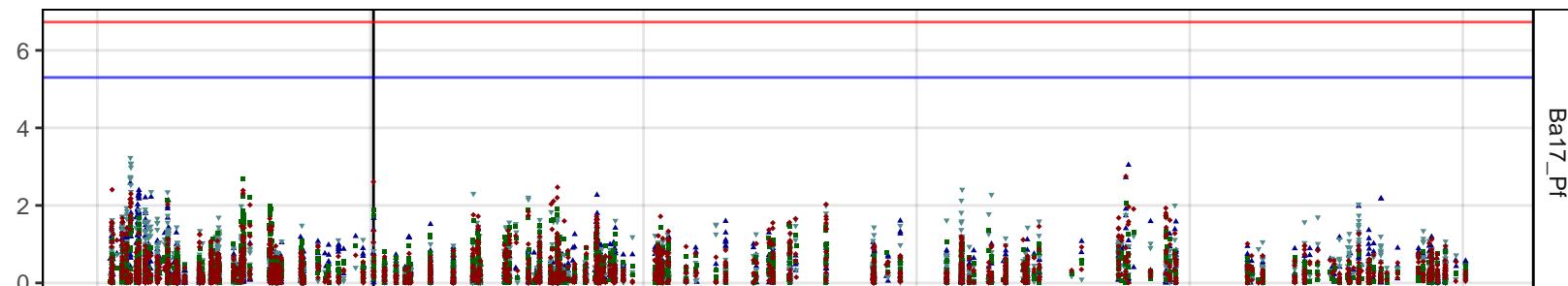
$-\log_{10}(p)$



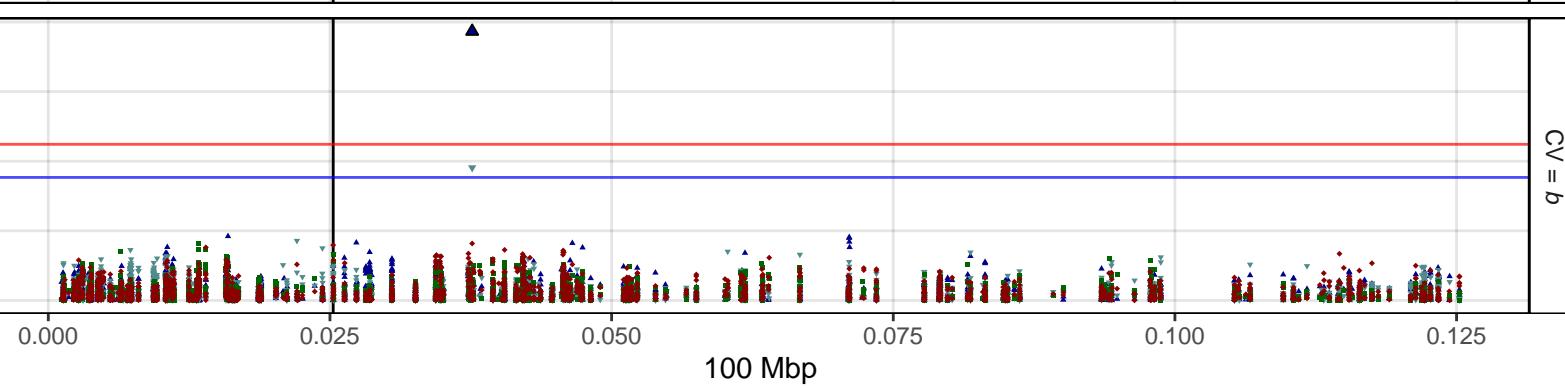
Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Ba17\_Pf



$CV = b$



100 Mbp

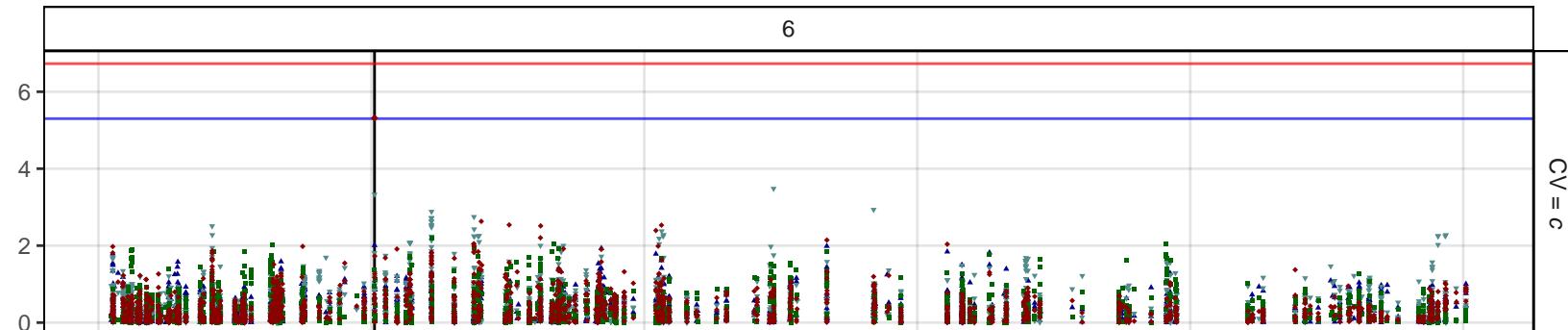
It17\_Pf

LcFTb1

6

CV = c

$-\log_{10}(p)$

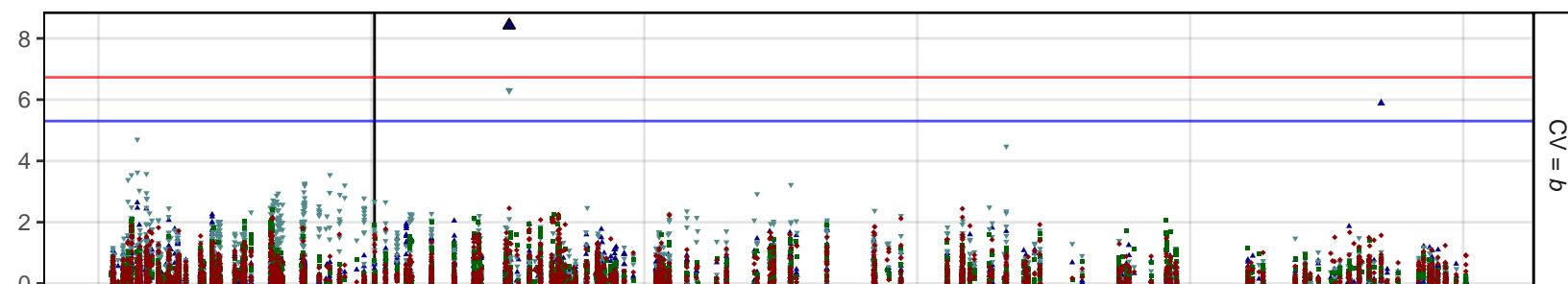


Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

It17\_Pf

CV = b



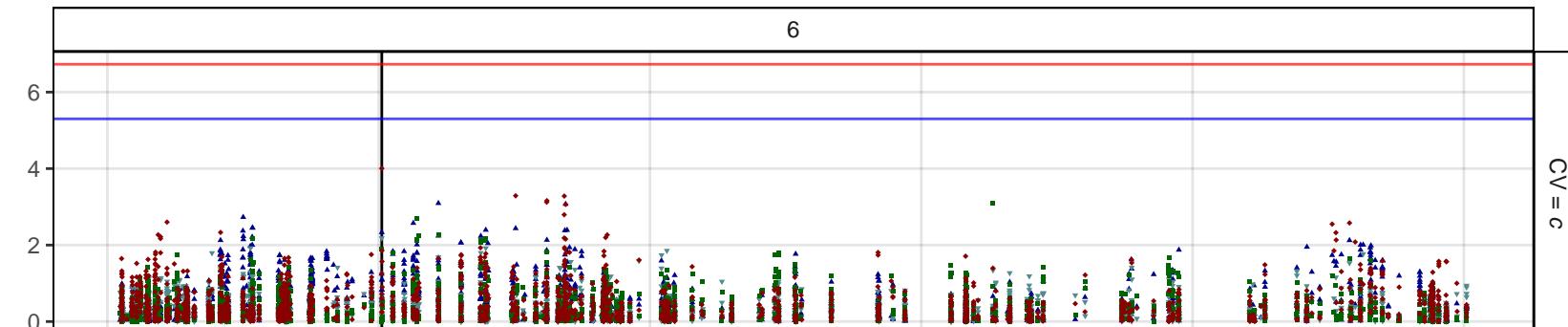
100 Mbp

Su17\_Pc

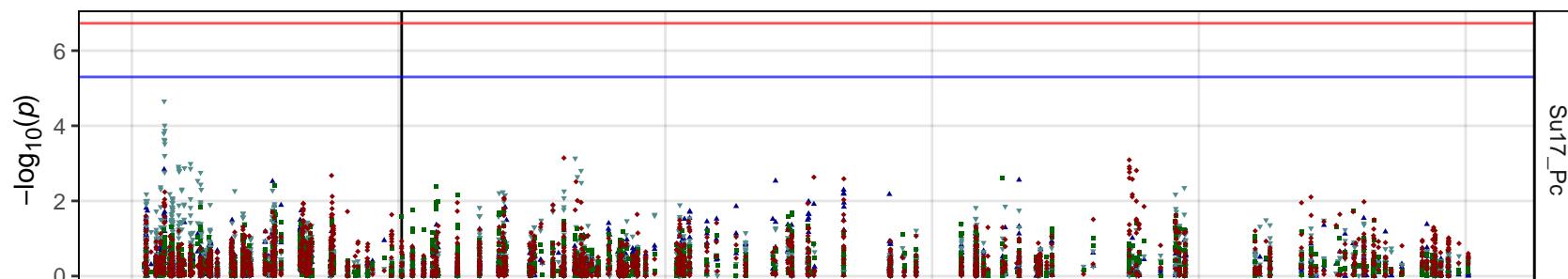
LcFTb1

6

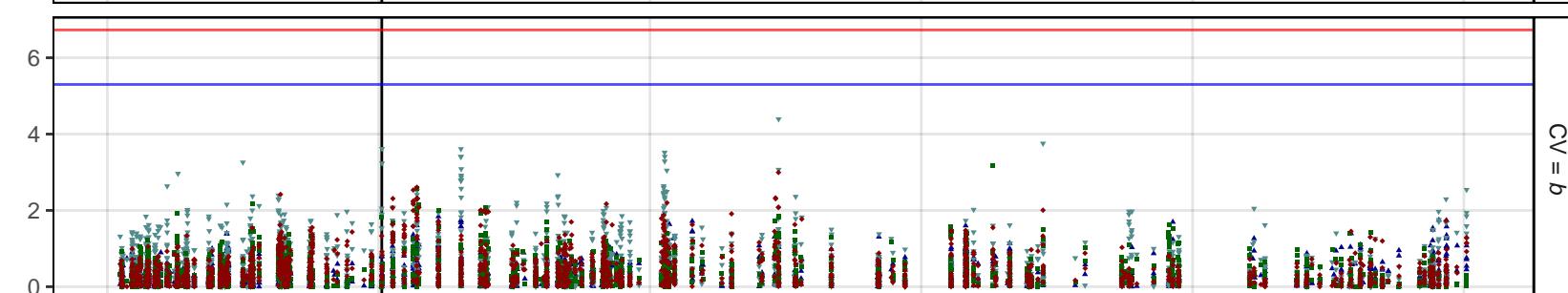
$CV = c$



Su17\_Pc



$CV = b$



Su17\_Pc

$CV = b$

Su17\_Pc

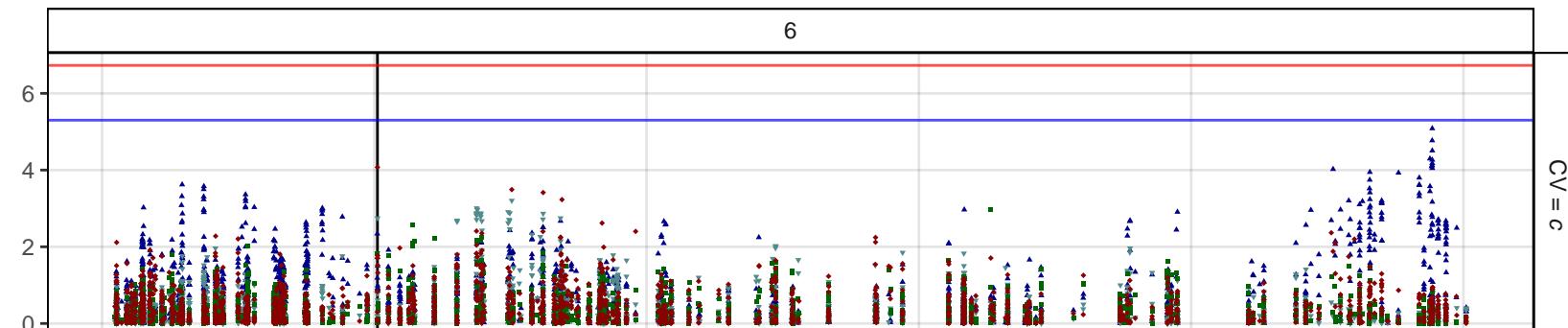
$CV = b$

Ba17\_Pc

LcFTb1

6

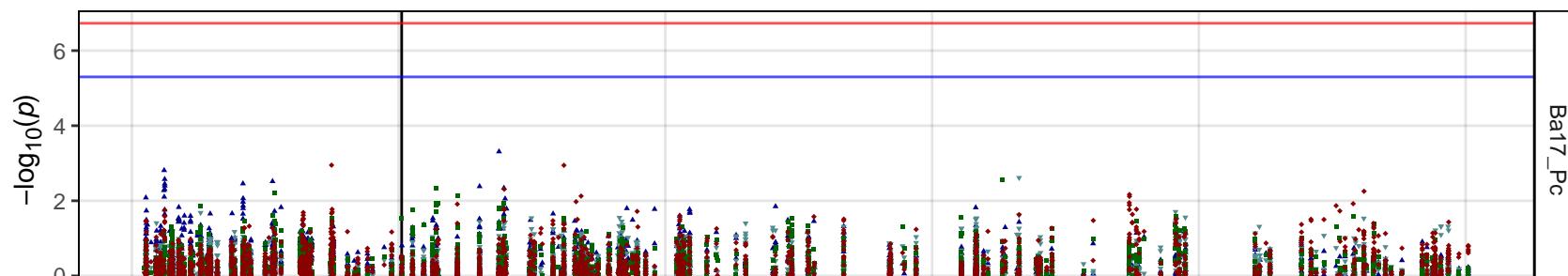
$CV = c$



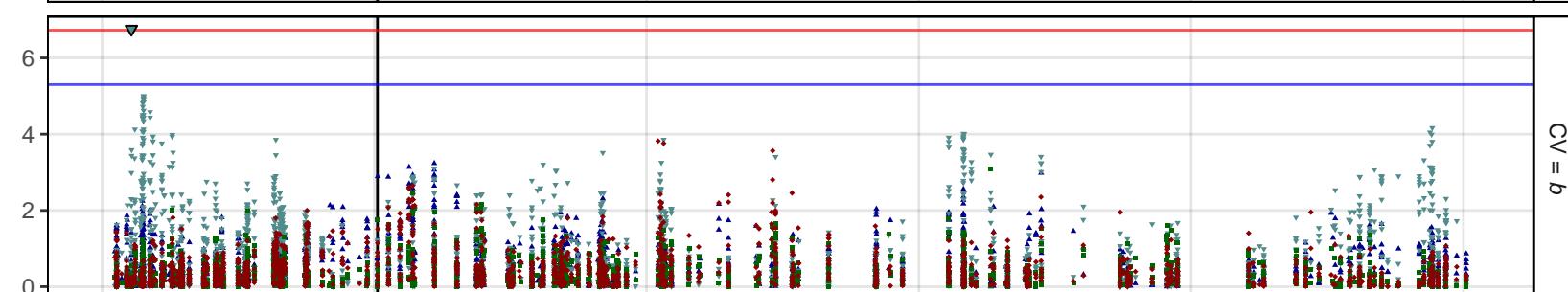
Model

- MLM
- ◆ MLMM
- ▲ FarmCPU
- ▼ Blink

Ba17\_Pc



$CV = b$

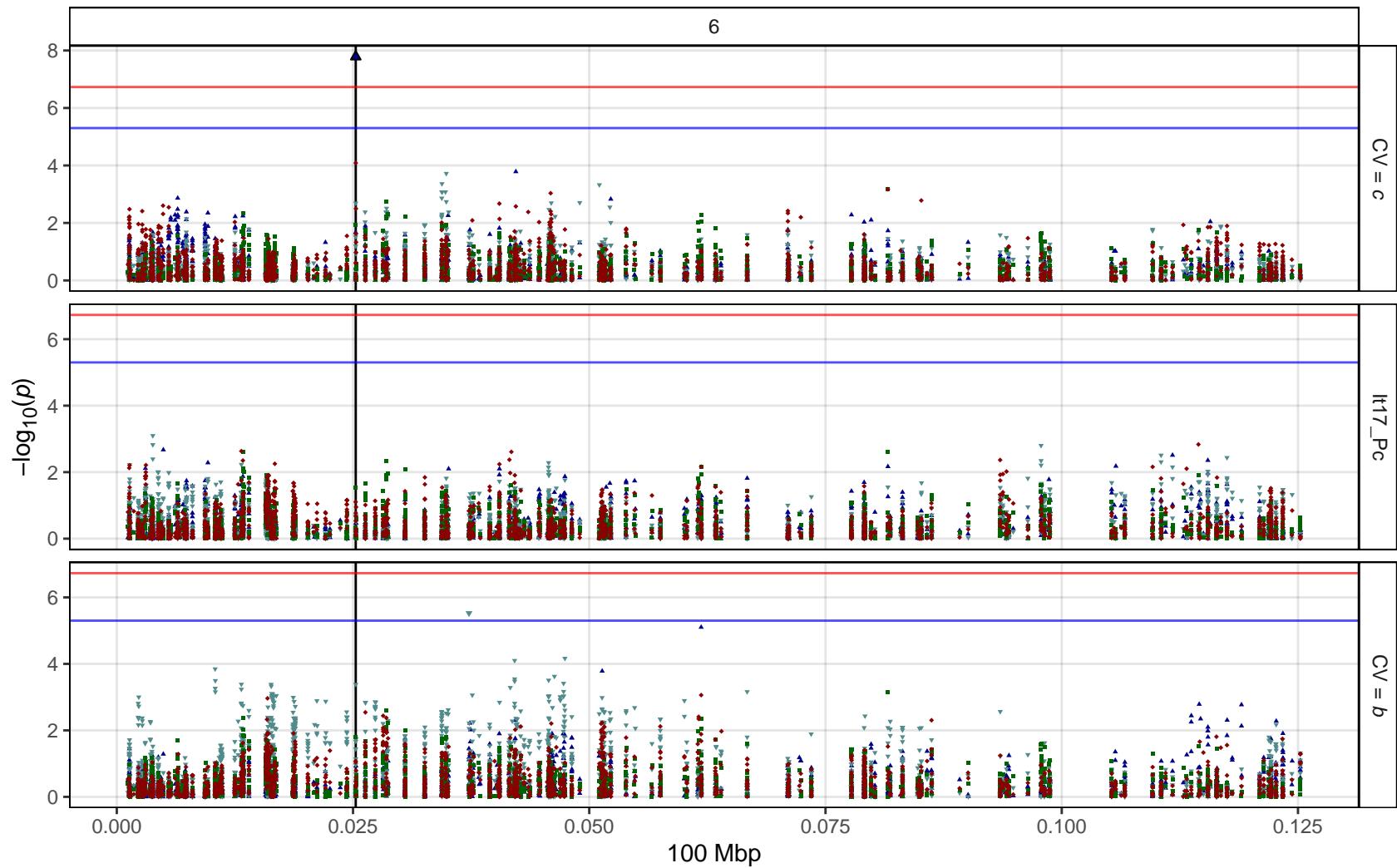


100 Mbp

lt17\_Pc

LcFTb1

6



Model

- MLM
- MLMM
- FarmCPU
- Blink